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CONTENTS

Year 2022 Volume 6 Issue 12

Articles

IEJES International e-Journal of Educational Studies
e-ISSN: 2602-4241

CONTENTS

Year 2022 Volume 6 Issue 12

Articles

IEJES International e-Journal of Educational Studies
e-ISSN: 2602-4241

CONTENTS

Year 2022 Volume 6 Issue 12

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From the Editor

Dear IEJES reader,

We would like to share important news with you. International e-journal of Educational Studies indexed in **EBSCO Education Source H.W. Wilson Index** since January 7th, 2020.
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We are excited and happy to publish the last issue of 2022 (Volume 6, Issue 12). Many thanks to the authors who have shared their studies from *Turkey, and South Africa* with us as well as to the referees who have made contributions with their valuable ideas, and DergiPark Team.

In the present issue, there are twenty one articles. 6 of these articles are review articles, 2 of these articles are opinion articles and 13 of them are research articles. Our authors present in this issue are composed of researchers working in different universities and institutions.

We look forward to seeing you in 2023 Volume 7 Issue 13 of the International e-Journal of Educational Studies (IEJES). We are inviting submission of manuscripts for the forthcoming issue.

Yours Sincerely

Prof.Dr. Tamer KUTLUCA
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Review Article

Comparison of 5th to 8th Grade Mathematics Curricula in Turkey and Greece *

Enta ISMAIL AMET [1] **Gül KALELİ YILMAZ** [2]

Abstract

This study compares the Turkish secondary school mathematics curriculum and the 5-8th grades mathematics curriculum in Greece, which has an essential place in the history of mathematics in terms of their general structure and content (learning areas, sub-learning areas, achievements, and course hours). In this study, we have used the document analysis method and curricula as a data collection tool. As a result of the research, we have seen that although the Turkish mathematics curriculum is structured as a single document, the Greek mathematics curriculum has a detailed document covering the aims, general objectives, and basic concepts of the interdisciplinary approach. While primary school is 6 years and secondary school is 3 years in Greece, both are 4 years in Turkey. The number of achievements in the Greek mathematics curriculum is higher than in Turkey, but the course hours are less than in Turkey. In addition, sets, linear equations, and similarity learning areas are included in the Turkish curriculum, but not in Greece. Similarly, sub-learning areas such as Functions and Trigonometry are included in the Greek curriculum, but not in Turkey. In line with these results, it can be ensured that the mathematics course hours are different at each grade level, and the course hours increase as the grade level increases in the mathematics curriculum conducted in Turkey, as in the Greek mathematics curriculum. In addition, as in previous curricula, a broader curriculum including activities, educational materials, and mathematical illustrations that will contribute to students' understanding of the subject can be developed in line with re-achievements.

Keywords: Curriculum, comparative education, Turkey, Greece

1. INTRODUCTION

We see mathematics, which emerges from daily needs, in many places in nature. Nature has the best examples of mathematics, such as the number of petals of daisies, the seeds on pine cones being in two helixes intersecting each other, the ivy plant drawing a helix curve while climbing a tree. The dividing of the circumference of all circles by its diameter constantly is also an example by nature (Altun, 2015). Human beings have felt the need to use mathematics, which nature has wonderfully accommodated, for various historical reasons. Due to the flooding of the Nile River every year, the Egyptians' land borders deteriorated. The borders had to be redefined after the waters receded, and the Egyptians needed to use geometry. From such historical information, we understand that all of the developments in the pre-Ancient Greek period were the work of eastern cultures such as Sumer, Babylon, Egypt, India, and China. However, the contribution of Ancient Greek mathematicians to the present is an undeniable fact since the studies in the pre-Ancient Greek period were practically oriented, and no work could be found on the concept of proof. We know that although Babylon and Egypt influenced the ancient Greek mathematicians, they were not content with their inspiration and gave mathematics a new identity (Baki, 2014; Yıldırım, 1988). For this reason, the contribution of Greek mathematicians to the development of mathematics is enormous.

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Mathematics course in schools aims to enable students to take place in occupational groups in line with the needs of the society by developing students' mathematical culture and mathematical thinking skills, and this aim imposes essential responsibilities on mathematics course in all countries (Baki, 2006). There are various studies carried out in Turkey and the world for the development of the mathematics course, which has an essential place in the student's daily life and educational life. We think that the place of the curriculum, which is a determining factor in the quality of education, in these studies is valuable. A curriculum is a life system that includes all activities related to teaching a subject to students in or out of school (Demirel, 2015). In addition, education programs clarify the responsibilities that students and teachers will undertake and explain the subjects to be learned and how to learn them (Keskin & Yazar, 2020; Korkmaz, 2006). For this purpose, a curriculum is prepared specifically for each course to be taught. The effectiveness and quality of teaching depend on the curriculum and its practical implementation (Çelen, 2011).

Curriculums are regularly developed and rearranged worldwide (Lee, 2013). During these developments, knowing the content of the curricula of other countries can make various contributions. There have been various studies in comparative education in the literature for years (Abid, 2017; Böke, 2002; Demir, 2015; Erbilge, 2019; Kaytan, 2007; Sugandi, 2015). Comparative education studies help solve various problems by comparing education between countries. As is known, comparative education is defined as a discipline that helps to reveal the similarities and differences in the education systems of different cultures and countries and gives helpful advice about the education methods of people (Türkoğlu, 1998). After researching the facts and problems related to education through comparative education, they can be analyzed and resolved with a holistic perspective. It can contribute to the formation of theory by obtaining inferences from the results of a study on a particular subject in a country. In addition, with comparative education, the role of education in the current position of a particular country can be determined and it contributes to the understanding of the relationship between education and development (Türkoğlu, 1998). Comparing the curricula in the field of comparative education would be helpful for countries to see their deficiencies in their content and make the necessary arrangements accordingly. In the literature, many studies have been conducted on comparing mathematics curricula in many different countries and Turkey (Çetinbağ, 2019; Erbilgin & Boz, 2013). In these studies, many countries such as Singapore, South Korea, the United States of America, Canada, Finland, Japan, and Turkey have been compared with different aspects of mathematics curricula. However, no study has been found comparing the mathematics curriculum of Greece and Turkey, which hosted essential mathematicians in their history. Although this study is similar to the studies comparing the programs of different countries, it is also valuable because it is based on the comparison of the Greek mathematics curriculum, which has an important place in the history of mathematics to gain a theoretical qualification, with the Turkish mathematics curriculum. We think that comparing the mathematics curriculum currently being applied in secondary schools in Turkey (5th to 8th Grade) and the current Greek mathematics curriculum will contribute to the literature in revealing the similarities and differences of both countries. In this context, the research problem of this study is "What are the similarities and differences between secondary school 5^{th} and 8^{th} grade mathematics curriculum in Turkey and Greece?". Within the scope of this purpose, the sub-problems of the research are:

1. What are the general structures of the 5th to 8th grades mathematics curricula in Turkey and Greece?
2. What are the contents of the 5^{th} to 8^{th} grades mathematics curricula in Turkey and Greece?
   2.1. What are the data obtained from the comparison in terms of learning areas?
   2.2. What are the data obtained from the comparison in terms of sub-learning areas?
   2.3. What are the data obtained from the comparison in the context of achievements and course hours?

2. METHOD

2.1. Research Model

We have conducted document analysis on the existing curricula of Turkey and Greece in this study, which is comparative research. Document analysis includes the examination of written materials containing information about the case or cases that are aimed to be investigated (Yıldırım & Şimşek, 2013). According to O'Leary (2017), document analysis collects, reviews, queries, and analyzes various written text formats as the primary research data source. Within the scope of this research, we have used the document analysis method because we have collected data directly from the curricula and compared them.

2.2. Data Collection Tools

The research data collection tools are 5th to 8th grades mathematics curricula in Turkey and Greece. We have obtained curricula of Turkey and Greece from their official websites. Curriculum in Turkey is organized by the Ministry of National Education of the Republic of Turkey as separate documents for each course. The mathematics curriculum has been prepared as a single document for primary and secondary 1st to 8th grades (Ministry of National Education [MoNE], 2018). The curriculum is frequently updated, and the data presented in this study contains information for 5th to 8th grades in the 2018 curriculum. The Greek Mathematics Curriculum, on the other hand, is in two separate documents for primary schools and secondary schools. However, since these two different curricula are presented as a single document with the title of "Complete Compulsory Education," this document has been used in the research (Interdisciplinary Common Mathematics Curriculum Framework [ICMCF], 2003). We have examined the details in the document related to the 5th to 8th grades within the scope of the research.

2.3. Data Analysis

In the research, all parts related to the 5-8th grades mathematics curricula were translated into Turkish by the corresponding author who was born in Greece and studied there until university. She has been teaching mathematics in Greece since her graduate education. The teacher who is corresponding author knew Greek and Turkish checked the curriculum translated from Greek into Turkish. After the controls, we have analyzed all data related to the general structure and content of 5th to 8th grades mathematics curricula with the descriptive analysis technique in line with the research problems. In the descriptive analysis, data are summarized and interpreted according to predetermined themes. “Data are described systematically. These descriptions are interpreted, and some results are reached with the cause and effect relationship” (Yıldırım & Şimşek, 2013, p. 256).

While conducting the data analysis of this study, we have determined the themes (sub-problems) by examining the Turkish and Greek curricula. In this context, we have decided to present the data in terms of the general structures and contents of the curriculum (learning areas, sub-learning areas, achievements, and course hours). Afterward, we have organized the data in line with these themes and compared the similar and different characteristics of the countries with the tables in the relevant parts.

2.4. Validity and Reliability

Validity is a concept that reveals whether the research is conducted in line with its purpose (Akerlind, 2012). However, validity in qualitative research is different from quantitative research. According to Yıldırım and Şimşek (2013), validity in qualitative research is the presentation of the research topic as it is without being changed by the researcher. In this case, to ensure validity in qualitative research, the researcher should be impartial throughout the research process and compare the findings impartially. The reliability of qualitative research reflects whether the results obtained are consistent with the research data (Merriam, 2009). To increase the validity and reliability of this study, we have meticulously examined the data, abided by the information given in the curricula of both

countries, presented the data impartially without any changes, and repeated the analyzes one month after the first analyzes for consistency. We have determined that the analyses made in the past period are compatible. The coding was done at different times by corresponding author and reliability was ensured by using the time factor.

3. FINDINGS

In this section, the findings obtained from the research are presented in line with the sub-problems. Within the scope of the research, we compared 5th to 8th grades mathematics curricula in Turkey and Greece in terms of general structures and contents (learning areas, sub-learning areas, achievements, and course hours).

3.1. Comparison of 5th to 8th Grades Mathematics Curricula in Turkey and Greece in Terms of General Structures

3.1.1. Similarities

- Students of both countries compared are faced with mathematics lessons starting from the first grade of primary school.
- We have grouped learning areas in the curricula of the two countries compared according to a specific order for each grade level.

3.1.2. Differences

- Primary and secondary school in Turkey is four years, while in Greece primary school is six years, and secondary school is three years.
- The Turkish mathematics curriculum is a single document created for primary and secondary schools, including Primary Education Institutions. However, the Greek mathematics curriculum is presented in two separate documents, as separate documents for primary and secondary schools and as a combined document for kindergarten, primary and secondary school covering compulsory education. There is also an extra document covering the aims, general objectives, and basic concepts of the interdisciplinary approach of mathematics teaching in Greece.
- The Turkish mathematics curriculum consists of 76 pages, while the Greek curriculum consists of 183 pages for primary school and 114 pages for secondary school. However, the combined Greek mathematics curriculum used in the research consists of 286 pages. In addition to the Greek curriculum, the document containing the aims and general objectives also consists of 56 pages.
- The Turkish mathematics curriculum gives the achievements as a list for each class, and there is an explanation under the achievement if it needs attention. On the other hand, the Greek curriculum gives the achievements according to the subject, activity, and educational material they correspond to in the table. In addition, as in the Turkish curriculum, there is no guidance explicitly given for that achievement.
- In the Greek mathematics curriculum, in addition to the activities indicated by numbers in the table (different from the Turkish mathematics curriculum), there are plenty of sample activities for group work that can be applied by bringing together various classes (for example, 5th and 6th grades together).

3.2. Comparison of 5th to 8th Grades Mathematics Curricula in Turkey and Greece in Terms of Contents

Content is one of the elements of the annual curriculum or the plans that teachers prepare daily. In this study, which is a comparative analysis, we have examined the content, learning areas, sub-learning areas, and achievements and course hours in three criteria. We have created tables according to these determined criteria and then interpreted the similarities and differences.

3.2.1. Comparison of 5th to 8th Grades Mathematics Curricula in Turkey and Greece in Terms of Learning Areas

There are five learning areas in the 5th to 8th grades mathematics curriculum in Turkey. These are Numbers and Operations, Algebra, Geometry and Measurement, Data Processing, and Probability (MoNE, 2018). Although the 5th and 6th grades are at the primary school level in the Greek mathematics curriculum, and the 7th and 8th grades are at the secondary school level, both levels consist of the same learning areas. These learning areas consist of Numbers, Algebra, Geometry – Space, Measurement, Statistics and Probability (ICMCF, 2003).

Table 1 presents the learning areas of the mathematics curricula in Turkey and Greece according to grade levels.

Table 1. Learning areas of the mathematics curricula in Turkey and Greece according to grade levels

Grade / Country	Turkey	Greece
5th Grade	Numbers and Operations Geometry and Measurement Data Processing	Numbers Algebra Geometry -Space Assessment Statistics Probability
6th Grade	Numbers and Operations Algebra Geometry and Measurement Data Processing	Numbers Algebra Geometry -Space Assessment Statistics Probability
7th Grade	Numbers and Operations Algebra Geometry and Measurement Data Processing	Numbers Algebra Geometry -Space Assessment Statistics Probability
8th Grade	Numbers and Operations Algebra Geometry and Measurement Data Processing Probability	Numbers Algebra Geometry -Space Assessment Statistics Probability

According to Table 1, while learning areas determined for 5th-8th grades in the mathematics curriculum of Greece exist for each Grade, the learning area of Algebra starts from the 6th Grade, and the learning area of probability starts from the 8th Grade in the mathematics curriculum of Turkey. The learning areas of both countries are similar to each other. However, although they are similar in content, the learning area of Numbers in the Greek mathematics curriculum is given as Numbers and Operations in the Turkish curriculum. While Measurement is also determined as a learning area in the Greek mathematics curriculum, it is combined with the Geometry learning area in the Turkish mathematics curriculum. In addition, Space is included in the Geometry learning area of the Greek mathematics curriculum. In addition, the Statistics learning area in the Greek mathematics curriculum and the Data Processing learning area in the Turkish mathematics curriculum are similar in content. However, it is named Data in the Greek mathematics curriculum and is located at a lower level of the Statistics learning area.

3.2.2. Investigation of Primary Education Mathematics Curricula in Turkey and Greece in Terms of Sub-Learning Areas

Table 2 presents the similarities and differences for the sub-learning areas in the Numbers and Operations learning area.

Table 2. Comparison of mathematics curricula in Turkey and Greece according to sub-learning areas in the numbers and operations learning area

Sub-learning Areas	Turkey	Greece
Natural number	X	X
Operations with Natural Numbers	X	X
Fractions	X	X
Operations with Fractions	X	X
Decimal Notation	X	X
Percentages	X	X
Factors and Multiples	X	X
Sets	X	
Whole Numbers	X	X
Operations with Whole Numbers	X	X
Rational numbers	X	X
Operations with Rational Numbers	X	X
Ratio	X	X
Ratio and Proportion	X	X
Exponential Expressions	X	X
Square Root Expressions	X	X

According to Table 2, after examining the sub-learning areas belonging to the Numbers and Operations learning areas, we see similarities between the two countries. The only difference in sub-learning areas between curricula in Turkey and Greece is that the subject of sets, which is in the 6th grade of the Turkish mathematics curriculum, is not included in the 5th to 8th grades of the Greek mathematics curriculum. The subject of sets is included in the 10th Grade in the Greek mathematics curriculum. Table 3 presents similarities and differences according to the sub-learning areas in the Algebra learning area.

Table 3. Comparison of mathematics curricula in Turkey and Greece according to sub-learning areas in the algebra learning area

Sub-learning Areas	Turkey	Greece
Algebraic Expressions	X	X
Equation	X	X
Linear Equations	X	
Algebraic Expressions and Identities	X	X
Inequalities	X	X
Functions		X

Examining the sub-learning areas belonging to the algebra learning area, we see that the students in the Turkish curriculum encounter this learning area in the 6th Grade, but the subject is covered in detail in the 8th Grade. However, there are sub-learning areas in the Algebra learning area starting from the 5th Grade in the Greek mathematics curriculum. Only a small part of the subjects in the Linear Equations sub-learning area, included in the Turkish mathematics curriculum, are briefly covered in Greece about functions. However, examining the Greek curriculum in detail, we see that the solution and detailed explanation of this type of equation is included in Equations and Linear Equation Systems in the 9th Grade high school level, the last year of secondary school. Therefore, in the Greek curriculum, the student comprehends the concepts of variable and slope in the previous class and learns the solution of linear equations in the next class.

The patterns existing in the Patterns - Functions sub-learning area in the Greek mathematics curriculum are taught in 5th to 8th grades in the Turkish curriculum. In contrast, the functions are not included in the secondary school curriculum but the 10th Grade in the high school curriculum.

Table 4 shows the similarities and differences according to the sub-learning areas in the Geometry and Measurement learning area.

Table 4. Comparison of mathematics curricula in Turkey and Greece according to sub-learning areas in the geometry and measurement learning area

Sub-learning Areas	Turkey	Greece
Basic Geometric Concepts and Drawings	X	X
Triangles and Quadrilaterals	X	X
Triangles	X	X
Measuring Length and Time	X	X
Measuring Area	X	X
Geometric Objects	X	X
Angles	X	X
Lines and Angles	X	X
Circumference	X	X
Circumference and Circle	X	X
Measuring Liquid	X	X
Transformation Geometry	X	
Polygons	X	X
Views of Objects from Different Sides	X	
Congruence and Similarity	X	
Trigonometry		X

Investigating the sub-learning areas according to the Geometry and Measurement learning area, we see that the Parity and Similarity sub-learning area is not included in the grades under the scope of the research in the Greek curriculum and is in the 9th Grade high school level. In addition, the sub-learning areas of Transformation Geometry and Views of Objects from Different Aspects are not seen in the grades under the research in the Greek mathematics curriculum. These subjects are included in the Greek curriculum in high school 1st and 2nd grades. Unlike Turkey, Trigonometry is also included in the Greek mathematics curriculum while it is taught in the 9th Grade high school level in the Turkish curriculum. Table 5 gives the similarities and differences according to the sub-learning areas in the Data Processing learning area.

Table 5. Comparison of mathematics curricula in Turkey and Greece according to sub-learning areas in the data processing learning area

Sub-learning Areas	Turkey	Greece
Data Collection and Evaluation	X	X
Data Analysis	X	X

After comparing the sub-learning areas in the Data Processing learning area, we have seen a remarkable similarity between the two curricula. The subjects included in the Turkish curriculum are also available in the Greece curriculum. Pictograms (figure graph) and time graphs are taught in the Data sub-learning area in the Greece curriculum and the Turkish curriculum. In addition, the basic concepts of statistics are introduced under the title of Descriptive Statistics in the Data sub-learning area in the 8th Grade, which is the last year of the Greek curriculum included in the research. In this section, different from the Turkish curriculum, the concepts of frequency and relative frequency are introduced, and the histogram is included.

Table 6 gives the similarities and differences according to the sub-learning areas in the Probability learning area.

Table 6. Comparison of mathematics curricula in Turkey and Greece according to sub-learning areas in the probability learning area

Sub-learning Areas	Turkey	Greece
Probability of Simple Events	X	X

Probability is introduced earlier in the Greek mathematics curriculum than in the Turkish curriculum. Although the Probability of Simple Events sub-learning area is only included in the 8th Grade in the Turkish curriculum, the subject of Probability is included in the 5th, 6th and 7th grades in the Greek curriculum.

3.2.3. Comparison of 5th to 8th Grades Mathematics Curricula in Turkey and Greece in the Context of Achievements and Course Hours

We have compared the achievements in the 5th to 8th grades mathematics curricula of both countries based on the learning areas in the Turkish curriculum. We have arranged the achievements in the Greek mathematics curriculum according to the learning areas of the Turkish curriculum. When comparing the number of achievements of the relevant countries, we have stated them separately based on grades. We have shown the number of course hours in which the relevant achievements are taught in the table.

Table 7 gives comparisons of the number of achievements and the course hours corresponding to these achievements in the Numbers and Operations learning area based on the grades.

Table 7. The number of achievements and course hours in the numbers and operations learning area in Turkey and Greece

Grade	Turkey		Greece	
	Number of Achievements	Course Hours	Number of Achievements	Course Hours
5th Grade	33	108	23	62
6th Grade	32	101	13	60
7th Grade	25	98	30	38
8th Grade	16	50	9	8
Total	106	357	75	168

When analyzing the achievements in the Numbers and Operations learning area in the Turkish mathematics curriculum quantitatively, we see 106 achievements, 33 of which are in the 5th Grade, 32 in the 6th Grade, 25 in the 7th Grade, and 16 in the 8th Grade. There are 75 achievements, 23 of which are in the 5th Grade, 13 in the 6th Grade, 30 in the 7th Grade, and 9 in the 8th Grade in the Numbers and Operations learning area in Greece. The highest number of achievements and course hours in this learning area is in Turkey.

Table 8 gives the comparison of the number of achievements and the course hourse corresponding to these achievements in the Algebra learning area based on the grades.

Table 8. The number of achievements and the course hours in the algebra learning area in Turkey and Greece

Grade	Turkey		Greece	
	Number of Achievements	Course Hours	Number of Achievements	Course Hours
5th Grade	-	-	9	9
6th Grade	3	10	12	9
7th Grade	7	30	13	13
8th Grade	13	55	32	38
Total	23	95	66	69

When analyzing the achievements in the algebra learning area of the Turkish mathematics curriculum quantitatively, we see that this learning area is not included in the 5th Grade, and there are a total of 23 achievements, including 3 achievements in the 6th Grade, 7 in the 7th Grade and 13 in the 8th Grade. On the other hand, there are 66 achievements, 9 of which are in the 5th Grade, 12 in the 6th Grade, 13 in the 7th Grade, and 32 in the 8th Grade in the Algebra learning area in Greece. Therefore, the number of achievements in the Algebra learning area in the Greek curriculum is higher than in Turkey. However, although the number of achievements is much higher in Greece, the allocated course hours for this learning area are lower than in Turkey.

Table 9 gives the comparison of the number of achievements and the course hours corresponding to these achievements in the Geometry and Measurement learning area based on the grades.

Table 9. The number of achievements and the course hours in the geometry and measurement learning area in Turkey and Greece

Grade	Turkey		Greece	
	Number of Achievements	Course Hours	Number of Achievements	Course Hours
5th Grade	20	62	32	36
6th Grade	19	58	25	35
7th Grade	12	37	11	32
8th Grade	16	51	16	47
Total	67	208	84	150

When analyzing the achievements in the Numbers and Operations learning area in the Turkish mathematics curriculum quantitatively, we see that there are 67 achievements, 20 of which are in the 5th Grade, 19 in the 6th Grade, 12 in the 7th Grade, and 16 in the 8th Grade. In Greece, there are 84 achievements, 32 of which are in the 5th Grade, 25 in the 6th Grade, 11 in the 7th Grade, and 16 in the 8th Grade in the Geometry and Measurement learning area. Thus, the number of achievements in this learning area is higher in the Greek curriculum. However, although the number of achievements in the Greek curriculum is higher, the Geometry and Measurement learning area is taught in more course hours in the Turkish curriculum.

The total number of achievements in the geometry and measurement learning area is 25.37% higher in Greece, but the corresponding course hours are 38.66% higher in Turkey.

Table 10 gives the comparison of the number of achievements and the course hours corresponding to these achievements in the Data Processing learning area based on the grades.

Table 10. The number of achievements and the course hours in the data processing learning area in Turkey and Greece

Grade	Turkey		Greece	
	Number of Achievements	Course Hours	Number of Achievements	Course Hours
5th Grade	3	10	5	6
6th Grade	5	11	4	7
7th Grade	4	15	15	9
8th Grade	2	12	8	7
Total	14	48	32	29

When analyzing the achievements in the Data Processing learning area of the Turkish mathematics curriculum quantitatively, we see that there are 14 achievements, 3 of which are in the 5th Grade, 5 in the 6th Grade, 4 in the 7th Grade, and 2 in the 8th Grade. In Greece, there are 32 achievements in total, 5 of which are in the 5th Grade, 4 in the 6th Grade, 15 in the 7th Grade, and 8 in the 8th Grade in the Data Processing learning area. As is seen, the highest number of achievements in this learning area is in Greece. However, the number of course hours corresponding to the total achievement numbers is higher in Turkey than in Greece.

The total number of achievements in the data processing learning area is 128.57% higher in Greece, but the corresponding course hours are 65.51% higher in Turkey.

Table 11 gives the comparison of the number of achievements and the course hours corresponding to these achievements in the Probability learning area based on the grades.

Table 11. The number of achievements and the course hours in the probability learning area in Turkey and Greece

Grade	Turkey		Greece	
	Number of Achievements	Course Hours	Number of Achievements	Course Hours
5th Grade	-	-	2	4
6th Grade	-	-	2	5
7th Grade	-	-	4	5
8th Grade	5	12	-	-
Total	5	12	8	14

When analyzing the achievements in the Probability learning area of the Turkish mathematics curriculum quantitatively, we see that the Probability learning area is not included in the 5th, 6th, and 7th grades. Still, it is included in the 8th Grade for the first time with 5 achievements. In Greece, there are 8 achievements, 2 of which are in the 5th Grade, 2 in the 6th Grade, and 4 in the 7th Grade in the Probability learning area. The highest number of achievements in this learning area is in Greece.

The total number of achievements in the probability learning area is 60% higher in Greece and the corresponding course hours are 16.66% higher in Turkey.

4. DISCUSSION AND CONCLUSIONS

This part of the research gives discussions and results in the context of the general structures and contents of the mathematics curricula (learning areas, sub-learning areas, achievements, and course hours).

Although the Turkish mathematics curriculum is structured as a single document for primary and secondary schools, the Greek mathematics curriculum also has an extra document covering the aims, general objectives, and basic concepts of the interdisciplinary approach and the curriculum covering compulsory education. In this case, we can say that the Turkish curriculum is more useful in

terms of application and analysis. However, we see that the Greek mathematics curriculum is more detailed when looking at the number of pages quantitatively. At the same time, these two countries differ in terms of primary and secondary school years. While primary school is 6 years and secondary school is 3 years in Greece, both are 4 years in Turkey.

Within the scope of the research, we have examined the curricula in terms of content under three main headings: learning areas, sub-learning areas, achievements, and course hours. After comparing the learning areas, we have determined five learning areas, namely Numbers and Operations, Algebra, Geometry and Measurement, Data Processing, and Probability, in the Turkish secondary school mathematics curriculum. On the other hand, there are six learning areas in Greece: Numbers, Algebra, Geometry – Space, Measurement, Statistics, and Probability. Although the numbers are different, we see that the contents of the learning areas overlap to a large extent. In his study examining mathematics curricula in Turkey, Canada, and Singapore, Karakaya (2021) found that a significant portion of the sub-learning areas was similar. While the learning areas determined for the 5th to 8th grades are found at each grade level in Greece's mathematics curriculum, the algebra learning area in the Turkish mathematics curriculum starts to be applied from the 6th Grade and the probability learning area from the 8th Grade. In a separate study, it may be helpful to examine the advantages and disadvantages of teaching algebra and probability in Turkey starting from the 5th Grade. At the same time, it can also be determined what kind of benefits teaching these subjects from the 5th Grade has in Greece.

We have also examined sub-learning areas in the context of learning areas given in the Turkish mathematics curriculum. We have created tables by adding the parts included in the Greek mathematics curriculum but not in the Turkish curriculum. As a result of these examinations, although the sub-learning areas are generally similar, we have identified some differences. For example, while the sets are taught in the Numbers and Operations learning area in the 6th Grade in Turkey, it is not taught in the 5th to 8th grades in Greece. We have determined that this subject is included in the Greek mathematics curriculum in the 10th Grade. Also, there is another difference in the Algebra learning area. In the Turkish curriculum, students encounter this learning area in the 6th Grade, but the subject is taught in detail in the 8th Grade. However, from the 5th Grade in the Greek mathematics curriculum, the sub-learning areas in the Algebra learning area are included at all grade levels under the research. Additionally, although the subject of Functions exists in the 5th to 8th grades mathematics curriculum in Greece, it is not taught in secondary school but in high school (10th Grade) in Turkey. We have also determined differences between countries in the subject of Functions, the sub-learning area in the Geometry and Measurement learning area. One of these differences is that the Parity and Similarity sub-learning area existing in the 5th to 8th grades in the Turkish mathematics curriculum is not included in the grades under the research in the Greek curriculum and is in the 9th Grade high school level. In addition, the sub-learning areas of Transformation Geometry and Views of Objects from Different Aspects are included in the Greek curriculum in high school 1st and 2nd grades. Unlike Turkey, the Trigonometry learning area is also included in the Greek mathematics curriculum while it is taught in the 9th Grade high school level in the Turkish curriculum.

We have seen a remarkable similarity after comparing the sub-learning areas in the Data Processing learning area. The subjects included in the Turkish curriculum are also available in the Greece curriculum. Unlike the Turkish curriculum, we have observed that the pictogram graphic and the time graph are included in the Greek curriculum. In addition, we see that frequency, relative frequency, and histogram are included within the scope of Basic Concepts of Statistics at the 8th grade level in Greece.

As a result of comparing the sub-learning areas depending on the probability learning area, we have determined that the concept of probability is introduced earlier in the Greek mathematics curriculum than in the Turkish curriculum. Although the Probability of Simple Events sub-learning

area is only included in the 8th Grade in the Turkish curriculum, the subject of Probability is included in the 5th, 6th and 7th grades in the Greek curriculum. Thus, it is noteworthy that the subject of Probability is introduced at more expansive grade levels in the Greek curriculum.

We have seen that the achievements of the Turkish mathematics curriculum are given in order for each grade, and the details that need attention are given as explanations. On the other hand, the achievements of the Greek curriculum are given in tabular form according to the achievement, basic subjects, activity, and educational material. Under the title of basic subjects, there are basic subjects related to the achievement, while in the activity part, tips and activity examples related to the relevant acquisitions are included. In the section of educational material, we see there are directions based on the achievement. These directions sometimes show an example of a page number from the book and sometimes a material suggestion (e.g., square canvases, geographical maps, connecting cubes, tangram, and mirror). In addition, applications such as Word, Sketchpad, Cabri, and Geogebra that educators can use in the digital environment are also recommended in this section. In addition, there are illustrations that can be shown to students with various links (for example, URL5 and URL6). However, although such directions are emphasized in the Turkish mathematics curriculum, they are not explicitly included. After comparing the achievements quantitatively, we have determined that the number of achievements in Turkey is 215 and in Greece is 265. Looking at the total number of achievements in the compared grades (5, 6, 7, and 8), we have determined that the number of achievements in the Greek mathematics curriculum is higher than in Turkey. However, in many studies comparing the curricula of different countries, it has been stated that the number of achievements in Turkey is higher than in other countries (Çetinbağ, 2019; Kaytan, 2007).

We have also determined that the annual course hours of the countries compared differ. While 180 lesson hours are allocated for mathematics in Turkey, in Greece, 120 course hours are allocated for the 5th and 6th grades, determined as the primary school level, 101 for the 7th Grade, and 100 for the 8th Grade at the secondary school level. When examining the duration and the number of achievements together, we see that more time is given to teaching the achievements in Turkey. With a similar approach, Çoban (2011) stated that the subjects are repeated more and more details are given in the mathematics curriculum in Turkey. It shows that more time is given for teaching the subjects, namely the achievements. In addition, the duration of the lesson in Turkey is 40 minutes, while in Greece, the first lesson is 45 minutes, the other lesson hours are 40 minutes. Therefore, considering that the duration of a course is similar in both countries, we can say that mathematics is given more place in an academic year in Turkey.

In this context, we can make the following suggestions to researchers and program developers who want to work in this field:

- Comparative analysis of the textbooks taught within the Turkish and Greek curricula scope can be made.
- Within the scope of this research, we evaluated only 5-8th grades. A similar study can also be done in the 9-12th grades in Turkey and Greece.
- Comparative studies can be made between Turkish and Greek teacher training programs.
- In the Turkish mathematics curriculum, as in previous curricula, activities, educational materials, and mathematical illustrations that will contribute to students' understanding of the subject can be included in line with the re-achievements.
- In the Turkish mathematics curriculum, as in the Greek curriculum, activities can be offered for group work in which various classes can be brought together.

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5. REFERENCES

Abid, A. A. O. (2017). *İlköğretim matematik öğretim programlarının karşılaştırılması*: *Türkiye ve Libya* [Comparison of primary education mathematics curriculum: Turkey and Libya] (Unpublished master thesis). Kastamonu University Institute of Science and Technology, Kastamonu.

Akerlind, G. S. (2012). Variation and commonality in phenomenographic research methods. *Higher Education Research & Development, 31*(1), 115-127.

Altun, M. (2015). *Ortaokullarda (5, 6, 7 ve 8. sınıflarda) matematik öğretimi* [Teaching mathematics in secondary schools (5th, 6th, 7th and 8th grades)]. Bursa: Alpha Academy.

Baki, A. (2006). *Kuramdan uygulamaya matematik eğitimi* [Mathematics education from theory to practice]. Trabzon: Derya Bookstore.

Baki, A. (2014). *Matematik tarihi ve felsefesi* [History and philosophy of mathematics]. Pegem Academy Publishing.

Böke, C. H. (2002). *Türkiye ve İngiltere'deki ilköğretim matematik programlarının karşılaştırılması* [Comparison of primary education mathematics programs in Turkey and England] (Unpublished master thesis). Hacettepe University Institute of Social Sciences, Ankara.

Çelen, Y. (2011). *Öğretmenlerin ilköğretim matematik öğretim programına ilişkin görüşlerinin ve matematiğe yönelik tutumlarının incelenmesi* [Examination of teachers' views on the primary school mathematics curriculum and their attitudes towards mathematics] (Unpublished doctoral dissertation), Ankara University Institute of Educational Sciences, Ankara.

Çetinbağ, A. (2019). *Türkiye ve Kanada ilkokul matematik öğretim programlarının program öğeleri bağlamında karşılaştırılması* [Comparison of Turkey and Canada Primary School Mathematics Curriculum in the context of program elements]. Master Thesis, Marmara University, Turkey.

Çoban, A. (2011). *Amerika Birleşik Devletleri, İngiltere ve Türkiye ilköğretim matematik programlarının karşılaştırılması* [Comparison of primary school mathematics programs in the United States, England and Turkey] (Unpublished master Thesis), Celal Bayar University, Manisa.

Demir, M. (2015*). Türkiye ve ABD'de ilkokul 4. sınıf matematik dersi öğretim programında kullanılan alternatif değerlendirme yöntemlerinin karşılaştırmalı olarak incelenmesi* [Comparative analysis of alternative assessment methods used in primary school 4th grade mathematics curriculum in Turkey and the USA] (Unpublished doctoral dissertation). İnönü University Institute of Educational Sciences, Malatya.

Demirel, Ö. (2015). *Eğitimde program geliştirme: kuramdan* uygulamaya [Curriculum development in education: from theory to practice]. Ankara: Pegem A Publishing.

Erbilge, A. E. (2019). *Türkiye, Kanada ve Hong Kong'un ortaokul matematik öğretim programlarının karşılaştırılması* [Comparison of secondary school mathematics curriculum of Turkey, Canada and Hong Kong] (Unpublished master thesis). Marmara University Institute of Educational Sciences, Istanbul.

Erbilgin, E. & Boz, B. (2013). A comparison of mathematics teacher training programs in Turkey, Finland, Japan and Signapore. *Hacettepe University Faculty of Education Journal*, Special Issue (1), 156-170.

ICMCF. (2003). Διαθεματικό ενιαίο πλαίσιο προγράμματος σπουδών μαθηματικών [Interdisciplinary Common Mathematics Curriculum Framework]. Retrieved from: http://ebooks.edu.gr/info/cps/11deppsaps_math.pdf

Karakaya, A. (2021). *Türkiye, Kanada ve Singapur matematik öğretim programlarının geometri ve ölçme öğrenme alanının karşılaştırılması* [Comparison of geometry and measurement learning area of mathematics curriculum in Turkey, Canada and Singapore] (Unpublished master thesis), Hacettepe University, Ankara.

Kaytan, E. (2007). *Türkiye, Singapur ve İngiltere ilköğretim matematik öğretim programlarının karşılaştırılması* [Comparison of primary school mathematics curriculum in Turkey, Singapore and England] (Unpublished master thesis). Hacettepe University Institute of Social Sciences, Ankara.

Keskin, İ. & Yazar, T. (2020). Evaluation of high school mathematics curriculum according to student opinions. *Journal of Computer and Education Research, 8* (16), 567-589. https://doi.org/10.18009/jcer.740113

Korkmaz, İ. (2006). Yeni ilköğretim programının öğretmenler tarafından değerlendirilmesi [Evaluation of the new primary education program by teachers]. *Proceedings of the National Classroom Teaching Congress*, 2, 249-259. Ankara: Kök Publishing.

Lee, J. (2013*). Mathematics education in Korea: Curricular and teaching and learning practices. In J. Kim, I. Han, M. Park and J. Lee (Eds.). History of Mathematics Curriculum in Korea (pp. 21-43).* Singapore, London: World Scientific Publishing.

Merriam, S. B. (2009). *Qualitative research a guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Ministry of National Education [MoNE], (2018). *Matematik dersi öğretim programı [Mathematics curriculum] (primary and secondary school grades 1, 2, 3, 4, 5, 6, 7 and 8). Ankara.*

O'Leary, Z. (2017). *The essential guide to doing your research project*. London: Sage.

Sugandi, B. (2015). *Comparison of Turkish and Indonesian secondary mathematics curriculum; reflection of the paradigms* (Unpublished master thesis). Marmara University Instute of Educational Science, Istanbul.

Türkoğlu, A. (1998). *Karşılaştırmalı eğitim: dünya ülkelerinden örneklerle* [Comparative education: with examples from world countries]. Adana: Baki Bookstore.

Yıldırım, C. (1988). *Matematiksel düşünme* [Mathematical thinking]. Istanbul: Remzi Bookstore.

Yıldırım, A. & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri* [Qualitative research methods in the social sciences]. Ankara: Seçkin Publishing.

Research Article

The Effect of Cooperative Learning on Academic Success Levels of 8th Grade Students in the Subject of Triangles *

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Abstract

This study aims to research the effect of cooperative learning on the academic success of 8th grade students in the subject of triangles in mathematics. The study, in which the Mixed Method was used, was carried out on a total of 84 students studying two classes of a secondary school affiliated to the Ministry of National Education in the spring semester of 2017-2018 academic year. The study includes an experiment group and a control group. During the period of the four-week application process, the lessons are introduced using the cooperative learning method in the experiment group and using the traditional learning method in the control group. "Mathematical Success Test" developed by the researchers is held for experiment and control groups as pre-test and post-test in order to collect data. Furthermore, an open-ended semi-structured interview form is used at the end of the process to collect the opinions of students on the cooperative learning method. The data were analysed using SPSS.24 statistics program. Statistical analyses such as dependent and independent t-test, arithmetic mean, standard deviation, frequency and percentages were used to analyse the data. The collected data were tested at a significance level of 0,05. As a result of the study, a significant difference was determined in favour of the experiment group in terms of the post-test success levels. At the end of the study, experiment group students stated that they found the cooperative learning method beneficial and it helped improve sharing, communication, responsibility, and feelings of belonging and confidence.

Keywords: Cooperative learning, triangles, academic success, student opinions

1. INTRODUCTION

In the wake of an exponential increase in knowledge in parallel with the rapid progress in science and technology, societal expectations from education have changed. In this process, the society has begun to care about raising individuals who can learn to learn, produce and process information, work in cooperation, play an active role in social and economic activities, and interact positively with their environment. To ensure that Turkey reaches the level of contemporary civilization, it is essential to raise generations that have cognitive, social, and personal skills such as using communication technologies effectively, possessing advanced high-level thinking skills, being curious about questioning and research and sociable, being able to empathize and lead, and possessing a high sense of self-efficacy and problem solving (Atav, Akkoyunlu & Sağlam 2006).

Studies have shown that the Traditional Teaching Method (TTM) has failed to satisfy the expectations of the society and has led students to memorize information instead of thinking freely and scientifically, resulting in consumer individuals rather than productive individuals with limited problem solving ability, who focus on the result rather than the process in the face of events and have no ability to use information and communication tools effectively (Çelen & Seferoğlu, 2016). As a

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result of these inadequicies, taking into consideration the unsuccessful results in tests such as the Program for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) organized internationally (Türkmen, 2016); the Ministry of National Education (MoNE) has adopted a constructivist education approach by changing its understanding of education. This approach, which advocates that the student is the organizer, interpreter, and reconstructor of knowledge, has put forward five basic assumptions by considering the cognitive, affective, and physical development of individuals; 1) Knowledge is obtained through personal contribution; 2) Knowledge is formed as a result of adaptation; 3) Knowledge is the individual interpretation of what is seen or felt; 4) Conceptual progress emerges from the sharing of different perspectives; 5) Information should be organized in a rational way (Pehlivan, 2010).

There are a myriad of courses taught to improve students' cognitive, affective, and motor skills. One of the most important of these courses is mathematics. Mathematics is usually described as a science that investigates abstract structures that it created itself by logical definitions using logic for their properties and patterns (Ziegler & Loss, 2017). It is known that thousands of students in Turkey and around the world do not like mathematics, have anxiety about mathematics or are afraid of mathematics (Katipoğlu & Öncü, 2015). It has been demonstrated by many studies (Dursun & Bindak, 2011; Ünlü & Aydıntan, 2011) that mathematical knowledge is quickly forgotten, causing prejudice, fear, and anxiety.

The interests and abilities of the students in the schools are different, but their goals are common. One of the difficult tasks of teachers is to predict which teaching method is suitable for students to achieve shared goals (Johnsen, 2009). Using a teaching method suitable for the subject facilitates the reconciliation of concepts, process steps, and results, increases success and interest, and develops a positive attitude (Aktepe, Tahiroğlu, & Acer, 2015). In addition, it reduces fear and anxiety and makes learning permanent by saving effort and time. One of the most preferred teaching methods in today's contemporary education system is the Cooperative Learning Method (CoP). CoP is a teaching method that involves students working together in groups of 2-6 people for a certain period of time in order to achieve shared learning goals and complete certain tasks and assignments together (Johnson, Johnson, & Holubec, 2008). CoP is a contemporary form of teaching that increases students' sense of responsibility, improves their social interactions, and is heterogeneous in terms of factors such as academic achievement, gender, and ability, in which small groups work together to achieve a shared goal (Slavin, 1990). CoP is a teaching strategy that encourages students to assist each other in a small group to achieve a common goal (Chan & Noraini, 2017).

A review on the national and international literature reveals that CoP is used in mathematics education as in many other fields. Examining the effect of CoP on mathematics success and permenance, Yıldız (2001) found that CoP has a significant effect on 7th-grade students' mathematics achievement. Bilgin (2004) used CoP on "polygons" and concluded that CoP was significantly effective in the experimental group. Kuzucuoğlu (2006) found that CoP is significantly effective on 5^{th}-grade students' mathematics achievement. Zakaria, Chin, and Daud (2010) found that CoP positively affects 6^{th}-grade students' mathematics successand attitudes towards mathematics. Efe (2011) used CoP in the 7^{th}-grade "statistics and probability" unit, concluding that CoP is effective on achievement, attitude, and motivation. Ünlü and Aydıntan (2011) used CoP on 8^{th}-grade "permutation and probability", concluding that CoP has a positive effect on achievement and permanence as a result of the study. Timayi, Bolaji, and Kajuru (2015) used CoP in secondary school geometry subjects and found that CoP is effective on achievement. Pesen and Bakır (2016) used CoP in the 6^{th}-grade subject of "field", concluding that CoP increases success and helps students understand the importance of cooperation with friends and activities such as tournaments are exciting and fun. Çiftçi (2018) identified 22 difficulties in a study designed to identify learning difficulties on "triangles" and to

examine technology-supported CoP environments, concluding that such difficulties are likely to be reduced with technology-supported CoP.

Triangles, the first sub-learning area in the field of geometry and measurement learning, include algebraic symbols as well as visual elements such as line, line segment, angle, side length, and height. 8th-grade students, who have difficulties in abstract thinking in terms of age range, have difficulty in establishing a relationship between these two and have problems in later geometry subjects. The main purpose of this study is to investigate the effect of studying the triangles subject with CoP on academic success so that students can overcome these problems and avoid experiencing any negative feelings towards mathematics in their later education life. It is expected that determining the effectiveness of CoP in teaching different subjects of mathematics will guide the studies in the literature and the teachers of mathematics lessons.

For this purpose, the following questions were addressed:

1. Is there a significant difference between the academic success scores of the experimental group, in which CoP was used and the control group in which TTM was used?
2. What are the opinions of the students in the experimental group about CoP?

2. METHOD

2.1. Research Design

Combining qualitative and quantitative methods in a study helps to provide a holistic understanding, create well-structured education policies, and explain various aspects of the researched subject (Baki & Gökçek, 2012). Based on this assumption, a mixed method was used in this research with a combination of quantitative and qualitative data. The mixed method involves collecting, analyzing, and interpreting quantitative and qualitative data in a single study or in a series of studies (Leech & Onwuegbuzie, 2009). To test the hypotheses in this method, firstly, quantitative data are collected and analyzed, then qualitative data are collected to make these data more meaningful and interpretations are made by using both types of data together (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz, & Demirel, 2016). In addition, since quantitative data will be insufficient to reveal individual differences among students, the use of qualitative data allows more detailed information to be collected.

A quasi-experimental design with a pretest-posttest control group was used to collect the quantitative data of the study. The design used in the study is given in Table 1.

Table 1. Research design

Groups	Pre-test	Experimental Study	Post-test
Experimental	Mathematics Success Test	X	Mathematics Success Test
Control	Mathematics Success Test		Mathematics Success Test

In addition, the semi-structured interview technique was used to determine the opinions and thoughts of the students on CoP. Due to the flexibility of semi-structured interviews; it removes the limitations of writing and filling-based tests and questionnaires and helps to gain in-depth information on a specific subject (Yıldırım & Şimşek, 2006).

2.2. Study Group

The study group consists of 8th-grade students who continue their education in a public school in the city center of Siirt which in Turkey during the 2017-2018 academic year. In the research, 8/B branch was determined as the experimental group and 8/A branch was determined as the control group

by simple random sampling method. The chances of choosing the research units are equal to each other in the simple random sampling method (Kılıç, 2013). The frequencies and percentages of the students included in the study group are shown in Table 2.

Table 2. Frequency and percentage table of student numbers

Groups	Classes	Frequency	%
Experimental	8/B	42	50
Control	8/A	42	50

Table 2 highlights that 42 students are avialble in both classes and their frequency is 50%.

Before the application started, the results of the independent groups t-test regarding the pre-test scores were examined to understand whether the experimental and control groups were equivalent to each other. The results obtained are shown in Table 3.

Table 3. Independent groups t-test pre-test scores of experimental and control groups

Groups	Tests	N	$\bar{X}$	SD	df	t	p
Experimental	Pre-test	42	5,10	2,31	82	- 1,23	0,22
Control	Pre-test	42	5,95	3,87			

Table 3 highlights that there is no significant difference (p>0,05) between the pre-test mean score of the experimental group ($\bar{X}$=5,10) and the pre-test mean score of the control group ($\bar{X}$=5,95). According to this finding, it can be inferred that the experimental and control groups were academically equivalent to each other prior to the study.

2.3. Data Collection Tools

2.3.1. Mathematics Success Test

Taking into account the annual plan of the 8th grade mathematics course of the 2017-2018 academic year, which includes units, a draft success test of 30 questions was prepared on triangles. In order to ensure the content validity of the Draft Test, a table of specifications (target-content chart) was prepared. Displaying the test content on a two-dimensional chart with the target successes in a test is called a table of specifications (Demirel, 2006). Before the draft success test was used, it was applied to 92 9th-grade students at two different high schools in Siirt city center for preliminary evaluation. After the application, item analysis was performed on the items separately and as a result of the analysis, the items with an item difficulty (p) 0,40 and the item's discrimination power coefficient (r) 0,30 were included in the test without changing, while those ranging between 0,20-0,30 were developed and corrected in line with the option analysis and expert opinions and included in the success test. Thus, a mathematics success test consisting of 22 items with a high item difficulty and item discrimination power was created. For the reliability of the final version of the test, it was applied to 50 9th-grade students at another high school in the city center of Siirt, and the KR-20 reliability coefficient of the test was calculated as 0,87. Since this coefficient is over 0,80, it indicates that the test is highly reliable (Özdamar, 1999).

2.3.2. Interview Form

The interview form was developed by the researchers to determine the opinions, thoughts, and suggestions of the students in the experimental group about CoP. While developing the form, a comprehensive field search was made on the subject, and the draft form was presented to the opinion of two instructors who are experts in the field. As a result of the feedback received from the experts, a draft interview form consisting of nine semi-structured open-ended questions was developed. The draft form was applied to eight students for preliminary evaluation, and as a result of the application, necessary examinations were made with two instructors and three questions were removed from the form. The final interview form, which was created with the remaining six questions, was applied only to the experimental group students. The students were asked to evaluate the positive and negative aspects of CoP, the effect of working with the group on active participation and retention in the lesson, and the activities performed.

2.4. Data Analysis

The quantitative and qualitative data of the study were analyzed in two parts. The quantitative data of the study were analyzed with the Statical Package for the Social Sciences 24.0 (SPSS) package program, the results were analyzed at the 0,05 significance level, and descriptive statistics, t-test, were used. To reveal the change in the success of the students after the application, the difference between the pre-test and post-test of the mathematics success test is shown with This difference facilitated the analysis and interpretation of the data.

Demographics was analyzed via frequency and percentage values, and after the pre-application of the mathematics success test, item difficulty index (p), item discrimination power index (r), mean, standard deviation, and internal consistency reliability coefficient were calculated. Five categories were determined for the educational status of parents in the interview form. However, in practice, due to the fact that the frequencies of some categories were very low, the category was combined, and the educational status of the father was analysed in three categories and the educational status of the mother in two categories.

The qualitative data of the study were analyzed with the classical content analysis method. In classical content analysis, coding categories derived directly or inductively are used to make intercorrelated inferences about the content of the textual document in the theoretical framework (Berg & Lune, 2015). In direct quotation, the criteria of being striking (different opinion), expository (suitability to the theme), and diverse were taken into consideration (Ünver, Bümen & Başbay, 2010). It has been stated that volunteering is essential in filling out the interview form, the opinions received will be strictly confidential, and the collected data will not affect their grades and will only be used for scientific research.

2.5. Aplication Process

The study, which lasted for 4 weeks in accordance with the annual plan of the mathematics course including units, was carried out with the "Student Teams Success Sections (STSS)" technique of CoP. While Küçükilhan (2013) emphasized that the STSS technique is easy to implement in crowded classrooms, Bilgin (2004) stated that the team rewards obtained by the team members when they reach the intended achievements ensure cooperation, teamwork, and acting in unison. In the study, the researchers did not intervene in the course and guided the course teacher who would carry out the applications. Before the application, the course teacher was interviewed one-on-one, and information was given about the planned study and his opinion was taken. In line with the positive opinion of the teacher, details such as how the application would be carried out, the basic aspects of the STAD technique to be used, the activities and materials to be used, the creation of groups, and the

evaluation were shared with him. In addition, the STAD handbook, which was prepared separately for teachers and students, was given to him following a literature review. The materials of the activities to be done prior to the course were prepared and their applications were made by the researchers and the teacher, and not only preliminary preparations were made for the course but also potential problems were prevented. At the end of the course, monitoring tests were applied to the students and the data obtained were transferred to the case summary sheets and evaluated. As a result of the evaluation, the first team of the week was rewarded and the team's name was announced on the class board. After all the acquirements were completed, the final test was applied and the team reward was given according to this test.

3. FINDINGS

Findings related to the sub-problems of the study are given under the headings of findings related to quantitative and qualitative data.

3.1. Findings related to Quantitative Data

As part of the first sub-problem of the study, whether CoP significantly differs on students' mathematics success was examined with the dependent group t-test. The results are shown in Table 4.

Table 4. Dependent groups t-test results of mathematics success scores of experimental and control groups

Groups	Tests	N	$\overline{X}$	SD	df	t	p
Experimental	Pre-test	42	5,10	2,31	41	-8,99	0,00
	Post-test		12,48	4,86			
Control	Pre-test	42	5,95	3,87	41	-3,91	0,00
	Post-test		9,62	5,54			

Table 4 highlights that the pretest mean score of the experimental group was ($\overline{X}$=5,10) and the posttest mean score was ($\overline{X}$=12,48). While the pretest mean score of the control group was ($\overline{X}$=5,95) and the posttest mean score was ($\overline{X}$=9,62). Besides, a significant difference ($p<0,05$) was observed between the pretest-posttest mean scores of the groups.

To understand the difference between the success of the experimental and control groups after the application, the independent group t-test was conducted between the scores of the groups in the post-tests. The results are shown in Table 5.

Table 5. Independent groups t-test results of post-test success scores of experimental and control groups

Groups	Test	N	$\overline{X}$	SD	df	t	p
Experimental	Post-test	42	12,48	4,86	82	2,512	0,014
Control	Post-test	42	9,62	3,87			

Table 5 highlights that a significant difference ($p<0,05$) was observed between the posttest mean score of the experimental group ($\overline{X}$=12,48) and the posttest mean score of the control group ($\overline{X}$=9,62). This indicates that the students in the experimental group learned the subject of triangles better than the students in the control group with higher mathematics success and more effective results of CoP.

3.2. Findings Related to Qualitative Data

Six questions in the interview form were asked to understand the opinions of the students on CoP. Main and sub-themes related to CoP were created. The data are shown in Table 6 below.

Table 6. Main and sub-themes in students' opinions on CoP

Main Themes	Sub-themes	F	%
Working with a group	Allows face-to-face communication	9	21
	Creates student teams	19	45
	Creates an obligation to work together	29	69
	Allows sharing and communication	17	40
	Allows ingroup communication	13	30
	Provides opportunity for striving for a shared goal	16	38
	Activities are held with materials and materials	26	62
	Improves intergroup competition	8	19
Effect on learning	Provides quick feedback	8	19
	Allows students to learn from each other	14	33
	Provides a huge amount of knowledge with little effort	23	54
	Provides active participation in the course	28	66
	Provides permenant learning	32	76
Motivation	Increases interest in the course	10	23
	Increases course success	24	57
	Provides cooperation, solidarity, self-confidence, communication, and socialization	32	76
	Allows class participation	23	55
	Makes the course fun	24	57
	Gives a sense of accomplishment together	30	71
	Develops a sense of responsibility	18	42
	Helps build positive relationships	17	40
	Sometimes causes noise in the class	8	19

Table 6 highlights that three main themes were formed as "*working with a group*", "*effect on learning*", and "*motivation*". In the main theme of "working with a group", 69% of the students state that CoP creates an obligation to work together and 62% of them state that courses are held with activities while 19% of them state that it creates intergroup competition. In the main theme of "*effect on learning*", 72% of the students state that CoP provides permanent learning and 66% of them state that it provides active participation in the course while 19% of them state that it provides quick feedback. Finally, in the main theme of "*motivation*", 76% of the students state that CoP provides cooperation, solidarity, self-confidence, communication, and socialization and 71% of them state that it gives them a sense of accomplishment together while 23% of them state that it increases their interest in the course.

The students stated that working with the group facilitates communication, encourages cooperation, and the lesson is taught with different materials. Some of the students' opinions that can be evaluated within the framework of the "*group work*" theme are as follows:

> *I think we can get immediate help from our friends because we have face to face communication with the team in the seating arrangement (S33).*

When we work as a team, my friends help me to correct my mistakes and learn better. While we only benefit from our teacher in our regular courses, we also get help from our team in cooperative learning (S14).

Teams do different activities with their own materials. Courses are held using different tools such as scissors, compasses, rulers, cardboard and interactive whiteboard (S17).

The students stated that CoP increased their participation in the course, provided permanent learning, and was effective in their learning by improving the sense of belonging. Some of the students' opinions that can be evaluated within the framework of the "*effect on learning*" theme are as follows:

Working with a group enhances my desire for participation in the course as my friends in the group make some points clear for me if I fail to understand to make sure I fully understand those points (S33).

I think it is good to have exams at short intervals. We both work regularly and find out what we have missed (S8).

I ask for help from my friedns when I have no idea about a topic. It is also very nice to choose the team name and team motto. Also, I am very happy that we were the best team of the second week (S6).

With this method, I had the opportunity to ask my friends questions that I did not understand. My grades increased slightly (S28).

Students stated that CoP contributed to the development of sense of responsibility, sharing, active participation, permanent learning, and self-confidence. Some of the students' opinions that can be evaluated within the framework of the "*Motivation*" theme are as follows:

While working with a group, everyone is trying to learn the subject. That's why courses are effective. I follow the course until the end without getting bored (S39).

I also help my teammates because I love helping people. I realized that I learned very well myself after explaining some topics to my friends. That's why, even when I work alone, I imagine that there is someone in front of me and I begin to explain the subject to that someone. Thus, permenant learning occurs (S23).

Normally I get bored with math quickly. But since my friends in the gorup are studying hard, this makes me study, too. If I fail to study, this is kind of being unfair to my friends (S12).

I think working with a group would be both more fun and more educational. One can get bored of studying alone, but teamwork helps students get rid of boringness and cooperate with each other (S40).

Some of the students stated that working in groups was not good for them as it caused noise in the classroom, and changing the classroom seating arrangement was not good for them. Some student opinions that can be evaluated in this context are as follows:

I didn't like working with a group at all. I didn't even understand the triangle thing at all. I study better myself. There is a lot of noise. Nobody is listening to others. I didn't want to come to class at all because there were people in my team that I didn't like (S41).

It was nice that everyone worked hard for the team to be successful. The noise in the class and the change of place were not good (S5).

Considering the students' opinions, it was observed that CoP increases the interest and success in the course, reinforces the feelings of cooperation, solidarity, active participation, belonging, responsibility, communication, and self-confidence, which are considered as positive aspects. However, some students mention about negative aspects such as overcrowded classes, the constant change in the seating arrangement, disagreements among the team members, and noise.

4. DISCUSSION and CONCLUSION

Throughout the application, the students' general knowledge levels before the application, their progress during the application, and their general knowledge levels after the application were

measured. The results based on the quantitative and qualitative data obtained from the tests and forms applied before, during, and after the study are discussed below. The data obtained from the pre-test of the study showed that the readiness levels of the groups were equal. In order for the results to be reliable, it is important that the prior knowledge of the groups is close.

At the end of the application, a significant difference was found between the post-test scores applied to the experimental and control groups as a result of the independent group t-test. This result shows that CoP is more effective in increasing students' mathematics success than TTM. While this result is in line with the results obtained in the studies of Efe (2011), Timayi, Bolaji and Kajuru (2015), Pesen and Bakır (2016) and Çiftçi (2018), it conflicts with the results in the studies of Gelici (2008). Studies revealing that CoP does not make a significant difference compared to TTM (Tanışlı & Sağlam, 2006) have shown that cooperative learning practices are more effective in providing permanent learning. From this point of view, it can be inferred that cooperative learning affects success positively, but it cannot be concluded that it provides this effect in all cases. This may be due to the large class size, the inconvenience of the subject, or the teacher's lack of experience in applying this method.

Experimental group students state that CoP increases the interest and success in the course, provides cooperation, solidarity, and socialization and ensures active participation in the course for everyone while claiming that it is also useful to use this method in different courses and toğics. This result overlaps with the studies of Ural and Argün (2010), Macit and Aslaner (2019), The positive perceptions of the students about CoP may arise from factors such as being included in a team, studying on the subject in depth and by understanding the logic behind it, and creating an environment where team members could easily express their every definite opinion, with motivating suggestions and immediate feedback. Students' feeling of belonging to a team and the sense of confidence that this feeling gives improve motivation, success, creativity, and understanding in students (Angell, 2014).

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5. REFERENCES

Aktepe, V., Tahiroğlu, M., & Acer, T. (2015). Matematik öğretiminde kullanılan öğretim yöntemlerine ilişkin öğrenci görüşleri [Student opinions on methods used in mathematics education]. *Nevşehir Hacı Bektaş Veli University Journal of Social Sciences 4*(2015), 127-143.

Angell, C. (2014). *Cooperative learning in the classroom*. The Graduate Faculty and the College of Education, Eastern Oregon University.

Atav, E., Akkoyunlu, B., & Sağlam, N. (2006). Öğretmen adaylarının internete erişim olanakları ve kullanım amaçları [Prospective teachers' internet access facilities and their internet usage]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 30*(30), 37-44.

Baki, A., & Gökçek, T. (2012). Karma yöntem araştırmalarına genel bir bakış [A general overview of mixed method researches]. *Electronic Journal of Social Sciences, 11*(42), 1-21.

Berg, L. B. & Lune, H. (2011). *Qualitative research methods for the social sciences*, Boston, USA.

Bilgin, T. (2004). İlköğretim yedinci sinif matematik dersinde (çokgenler konusunda) öğrenci takimlari başari bölümleri tekniğinin kullanimi ve uygulama sonuçlari [Use of student teams and success sections (STAV) technique in seventh grade mathematics lesson (on polygons) and application results]. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, *17*(1), 19-28.

Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2016). *Bilimsel araştırma yöntemleri [Scientific research methods]*. Ankara: Pegem Akademi Publishing.

Chan, L. L., & Noraini, İ. (2017). Cooperative learning in mathematics education. *International Journal of Academic Research in Business and Social Sciences, 7*(3), 539-553.

Çelen, F.K. & Seferoğlu, S.S. (2016). Bilgi ve iletişim teknolojilerinin kullanımı ve etik olmayan davranışlar: sorunlar, araştırmalar ve değerlendirmeler. *Journal of Computer and Education Research, 4* (8), 124-153. https://doi.org/10.18009/jcer.37546

Çiftçi, O. (2018). *Üçgenler konusundaki öğrenme güçlüklerinin belirlenerek önlenmesine yönelik tasarlanan teknoloji destekli işbirlikli öğrenme ortamının incelenmesi [The investıgation of the technology supported cooperative* learning environment designed for the prevention of learning dıfficulties in triangles]. Doktora Tezi, Atatürk Üniversitesi, Erzurum [Doctoral dissertation, Atatürk University, Erzurum, Turkey].

Demirel, Ö., (2006). *Eğitimde program geliştirme [Programme development in education]*. Ankara: Pegem Akademi Yayınları [Ankara: Pegem Akademi Publishing].

Dursun, Ş. & Bindak, R. (2011). İlköğretim II. kademe öğrencilerinin matematik kaygılarının incelenmesi [The investigation of elementary school students' mathematics anxiety]. *Cumhuriyet Üniversitesi, Edebiyat Fakültesi Sosyal Bilimler Dergisi, 35* (1), 18-21.

Efe, M. (2011). *İşbirlikli öğrenme yönteminin ilköğretim 7. sınıf öğrencilerinin matematik dersi "istatistik ve olasılık" ünitesindeki başarılarına, tutumlarına ve motivasyonlarına etkisi* [The effects of cooperative learning method of students? teams- achievement divisions and team assisted individualization instructions on students? attitudes, achievement and motivation at primary 7th grade `statistics and probability? units on mathematics course]. (Master's thesis, Mustafa Kemal University, Hatay, Turkey).

Gelici, Ö. (2008). *İşbirlikli öğrenme tekniklerinin ilköğretim 7. sınıf öğrencilerinin matematik dersi cebir öğrenme alanındaki başarı, tutum ve eleştirel düşünme becerilerine etkileri* [The effects of cooperative learning techniques on the stidents' achievement in algebra learning, their attitudes, and on their critical thinking skills]. *(*Master's thesis, Mustafa Kemal University, Hatay, Turkey).

Johnsen, S. (2009). *Improving achievement and attitude through cooperative learning in math class action research projects*, Lincoln Unıversty, Nebraska, USA.

Johnson, D. W., Johnson, R. T. & Holubec, E. J. (2008). *Cooperation in the classroom* (8th Ed.). Edina, MN: Interaction Book Company.

Katipoğlu, M., & Öncü, B. (2015). Sosyal bilgiler öğretmeni adaylarına göre matematik dersinin neden zor algılandığına yönelik öğrenci görüşleri [Students' views towards the reason why mathematics is hardly being perceived according to social studies teacher candidates]. *International Journal of Social Sciences and Education Research. 1*(4), 1120-1131.

Kılıç, S. (2013). Örnekleme yöntemleri [sampling methods], *Journal of Mood Disorders*, *3*(1), 44-46.

Küçükilhan, S. (2013). *ÖTBB tekniğinin sosyal bilgiler dersindeki akademik başarıya ve kalıcılığa etkisi [The effects of students teams-achievement divisions method on academic success and permanence in social sciences les]*. (Master's thesis, Afyon Kocatepe University, Turkey).

Kuzucuoğlu, G. (2006). *İşbirlikli öğrenme yönteminin ilköğretim beşinci sınıf öğrencilerinin matematik dersindeki başarılarına etkisi [The effect of cooperative learning methods on the success of the 5th class's students in primary school in the mathematic lesson]*. (Master's thesis, Afyon Kocatepe University, Afyonkarahisar, Turkey).

Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Qual Quant, 43,* 265–275.

Macit, E. & Aslaner, R. (2019). Ortaokul matematik derslerinde işbirlikli öğrenmenin kullanılmasına ilişkin öğretmen görüşleri [Views of teacher on using cooperative learning in math lessons at primary school]. *Journal of Science, Mathematics, Entrepreneurship and Technology Education*, *2*(2), 134-157.

Özdamar, K. (1999). *Paket programlar ile istatistiksel veri analizi 1 [Data analysis I with package programs]*, Eskişehir: Kaan Kitabevi, [Eskişehir: Kaan Publishing].

Pehlivan, H., (2010, May). *Eğitimde yapılandırmacı yaklaşım [Constructivist approach in education],* 1. Ulusal Eğitim Programları ve Öğretim Kongresi,13-15 Mayıs, Balıkesir.

Pesen, A. & Bakır, B. (2016). İşbirliğine dayalı öğrenme yaklaşımının 6. sınıf öğrencilerinin matematik dersi alan konusundaki başarılarına etkisi [The effect of cooperative learning approach on 6th grade students' success in the 'field' subject in mathematics]. *Uluslararası Eğitim Programları ve Öğretim Çalışmaları Dergisi, 6*(11), 71-84.

Slavin, R. E. (1990). *Comprehensive cooperative learning methods: embedding cooperative learning in the curriculum and school, cooperative learning*, In S. Sahran (Ed.), NY: Theory and Research Slavin.

Tanışlı, D., & Sağlam, M. (2006). Matematik öğretiminde işbirlikli öğrenmede bilgi değişme tekniğinin etkililiği [Effectiveness of the exchange of knowledge method ın cooperative learning in mathematics teaching]. *Journal of Theory and Practice in Education, 2*(2), 47-67.

Timayi, J. M., Bolaji, C., & Kajuru, Y. K. (2015). Effects of jigsaw IV cooperative learning strategy (J4CLS) on academic performance of secondary school students in geometry. *International Journal of Mathematics Trends and Technology, 28*(1), 12-18.

Türkmen, H. (2016). İşbirlikli öğrenme sürecinde öğretmen bakış açıları ve öğretmen yönlendirmelerinin değerlendirilmesi, [Assessment of teacher perspectives and directions on the collaborative learning process]. *Journal of European Education, 6*(1), 60-72.

Ünlü, M., & Aydıntan, S. (2011). İşbirlikli öğrenme yönteminin 8. sınıf öğrencilerinin matematik dersi "permütasyon ve olasılık" konusunda akademik başarı ve kalıcılık düzeylerine etkisi [The effect of cooperative learning method on the student's success and recall levels of the 8 th grade students learning in permutation and probability subject]. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi,12*(3), 1-16.

Ünver, G., Bümen, N. T., & Başbay, M. (2010). Ortaöğretim alan öğretmenliği tezsiz yüksek lisans derslerine öğretim elemanı bakışı: Ege üniversitesi örneği [Faculty members' perspectives towards secondary teacher education graduate courses at Ege university]. *Eğitim ve Bilim Dergisi, 155* (35), 63-77.

Ural, A., & Argün, Z. (2010). İşbirlikli öğrenmenin matematik mantığı ve tutuma etkisi [The effect of cooperative learning on mathematics achievement and attitudes]. *Türk Eğitim Bilimleri Dergisi, 8*(2), 489-516.

Yıldırım, A. & Şimşek, H., (2006*). Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences]*. Ankara: Seçkin Yayıncılık [Ankara: Seçkin Publishing].

Yıldız, N. (2001). *İşbirlikli öğrenme yönteminin ilköğretim 7. sınıf matematik öğretiminde öğrenci başarısı üzerine etkisi [The effect of learning method on student achievement in mathematics teaching of primary school 7th class]. (*Master's thesis, Balıkesir University, Turkey).

Zakaria, E., Chin, L. C., & Daud, Y. (2010). The effects of cooperative learning on students' mathematics success and attitude towards mathematics. *Journal of Social Sciences, 6*(2), 272-275.

Ziegler, G. M., & Loss, A. (2017). "What is mathematics?" and why we should ask, where one should experience and learn that, and how to teach it, *Proceedings of the 13th International Congress on Mathematical Education,* 63-77, Hamburg, Germany.

Research Article

Effects of Different Teaching Methods on Nursing Students' Motivations and Critical Thinking Disposition: A quasi-experimental Study*

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Abstract

It is important to replace the traditional teacher-centered teaching approach with other different teaching methods. The present study aimed to determine the influence of different teaching methods used in the course of infertility nursing on students' motivation and on their critical thinking disposition. The study was conducted as a quasi-experimental study using the one-group pretest-posttest design. The optional course of infertility nursing was taken by a total of 113 students. The results demonstrated that the different teaching methods applied in the study led to a statistically significant difference in the students' their critical thinking dispositions and in their levels of motivation. It was also found that watching movies, technical visits and doing research were more influential on increasing the students' motivations than other teaching methods. The results revealed the importance of using different active teaching methods for the development of students' motivations and critical thinking skills in nursing education.

Keywords: Active learning, teaching methods, nursing education, infertility nursing

1. INTRODUCTION

Infertility is among the most important health-related problems influential on couples both in our country and in other countries in the world (American College of Obstetricians and Gynecologists [ACOG] 2017; Kırca & Pasinoğlu, 2013; World Health Organization [WHO] 2017). Nurses working in the field of infertility are expected to learn their roles and responsibilities during their undergraduate education, to plan the caring given to infertile couples, to be knowledgeable about maintaining the care and to raise their awareness of the related skills. Within the scope of infertility nursing course, trainers of nurses should use teaching methods different from traditional ones to increase students' active participation, to improve the quality of learning and to achieve the goals of the education process (Biggs et al., 2011). In literature, various methods have been suggested to increase students' participation in lessons. Examples of these methods include portfolio development, clinical journals, clinical reaction paper (reflection paper on clinical experience), group presentation, case studies and cooperative learning (Saeedi et al., 2021). The effective teaching methods described in literature that led to an improvement in academic motivation were simulation, case-based learning, cooperative learning, learning contract, peer assessment, and self-assessment using video typing (Saeedi et al., 2021). New methods apart from the traditional teacher-centered approach not only allow students to take active part in the learning process but also increase their motivation. In a qualitative study using different teaching methods to examine the experiences of students from the department of nursing and

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midwifery regarding the course of infertility, it was found that these methods helped the students understand the subjects better, increased the permanency of their knowledge, contributed to their social and cultural developments, allowed them to evaluate themselves, developed their communication, interaction and leadership skills and most importantly increased the students' satisfaction with and motivation in the course (Gokce-Isbir & Durgun-Ozan, 2018).

Motivation is an important factor in the learning process of individuals (Kutu & Sozbilir, 2011). Since motivation makes individuals more energetic and increases their desire to learn, it regarded as one of the most important factors in the teaching and learning process (Kutu & Sozbilir, 2011). In literature, there are a number of studies demonstrating that motivation is influential on students' academic achievements and performances (Kosgeroglu et al., 2009; Rose, 2011). Motivation decreases students' stress, increases their creativity and facilitates their learning in the learning process (Hassankhani, Aghdam, Rahmani, & Mohammadpoorfard, 2015). Students who get motivated to learn view learning as an opportunity to satisfy their own curiosity and willingness to reach the information (Rose, 2011). Academic motivation in nursing education is as important as or even more important than that in other fields of studies. The provision of quality nursing services entails training nursing students with enough motivation to receive a great volume of information and skills, as well as a will to continuously learn and re-learn as the field develops. It is possible to improve motivation in nursing students through proper interventions. One of the main roles played by instructors is to motivate students through the design and presentation of education contents. (Saeedi et al., 2021). Infertility nurses should have the critical thinking skills necessary to meet the needs of infertile couples who have complicated health problems and to make rational decisions for their caring. Critical thinking is a basic skill which should be acquired in the education process for use in professional nursing practices (Amorim & Silva, 2014). It is a well-known fact that the critical thinking skill increases academic achievement (Ip et al., 2000; Tümkaya, 2011) and that students with higher scores of critical thinking are more successful in professional practices (Bowles, 2000). Active learning methods contribute to the development of students' critical thinking skills (Chi & Wylie, 2014; Gokce-Isbir & Durgun-Ozan, 2018; Lee et al., 2016).

Studies on active teaching methods used in our study could not be found in the literature. In literature, it is pointed out that traditional methods are not sufficient in encouraging motivation and critical thinking (Carter, 2016). Although the importance of methods provoking motivation and critical thinking is apparent in the undergraduate curricula of nursing, there is not enough research on the effectiveness of teaching methods used for the development of these skills (Carter, 2016). Implementation of applied and participatory methods in teaching process improved the academic motivation of nursing students. Therefore, using such methods, nursing instructors can improve the academic motivation of their students (Saeedi et al., 2021). We think that this study will contribute to the literature with the different applied and participatory methods used. The purpose of the present study was to examine the influence of different teaching methods used in the course of infertility nursing on students' motivation and on their critical thinking dispositions. In research articles, method should be placed here and the above mentioned principles should be considered.

1.1. Researh Question

Are different teaching methods effective on nursing students' motivation and critical thinking dispositions?

2. METHOD

2.1. Research Design

The study was carried out using the one-group pretest-posttest design quasi-experimental research design with a single group. A quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. Quasi-experimental design is a useful tool in situations where true experiments cannot be used for ethical or practical reasons. Therefore, quasi-experimental research design was used in our study (Gopalan, Rosinger & Ahn, 2020; Siedlecki, 2020).

2.2. Study Group

The study was conducted with third grade students attending the department of Nursing at a university in the East of Turkey between February and June in 2018. Infertility Nursing is optional course. Students have to select optional courses each academic term, and one academic term lasts 15 weeks. At the time of the study, the course of Infertility Nursing was taken by 113 students, all of whom were invited to take part in the study. However, 10 of them refused to participate in the study, and 16 students were excluded as they missed some of the classes. As a result, the study was conducted with a total of 87 students, and 76,9% of the whole research universe was reached in the study.

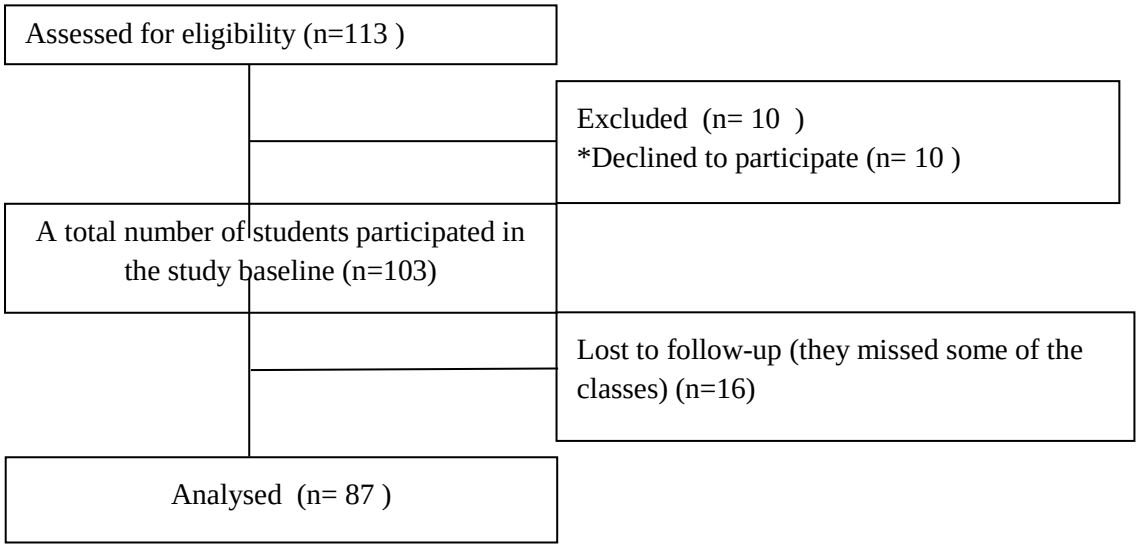

Figure 1. Study diagram

Course content and the teaching process: In line with its objectives, the course focuses on comprehensive physical and psychological evaluation of couples with the infertility problem, treatment methods, up-to-date developments and the problems likely to be encountered by the health team members. For this purpose, different teaching methods were used to increase the students' motivation and active participation in the course. Table 1 presents the course content and the related teaching process.

2.3. Data Collection

In the study, as the data collection tool, a socio-demographic information form, Critical Thinking Disposition Scale and Adaptation of Instructional Materials Motivation Survey were used. Students are divided into eight groups. Seven groups consist of 11 students and one group consists of 10 students. The subjects were given to the students as indicated in Table 1 and it was determined which group would teach in which week. And there was a group discussion each week. At the beginning and end of the study, the critical thinking disposition scale was applied, and after each group work, the adaptation of instructional materials motivation survey was conducted.

Table 1. Content of the course of infertility nursing and different teaching methods applied

Week	Content	Method of teaching	Learning activity
Week 1	Introduction Course objectives Introduction to the sources Introduction to the course and teaching activities	Lecturing by the faculty member	The faculty member and the students introduced each other. The students were informed about the course objectives, about the learning activities and about how to reach and use the course materials The groups were determined for each learning activity.
Week 2	Factors influential on fertility	Phenomena-based group discussion	The group was divided into two. The two groups of participants prepared a discussion and presentation regarding the factors in influential on fertility using the sources available. One group focused on the fertility of men, and the other focused on that of women.
Week 3	Methods of diagnosis of infertility, role of nurses, nursing approaches to assisted reproductive techniques	Group discussion	The students got prepared for the subject in advance. Under the guidance of the faculty member, they discussed the subject as a whole group.
Week 4	Infertility and media	Poster presentation using newspaper extracts	Every day for six weeks, he students followed the newspapers they determined in the first week and gathered the news about infertility. In the first class hour, the students in their own groups prepared a poster using the news they had gathered. In the second class hour, they presented their posters to the other groups.
Week 5	Traditional practices in infertility	Research	The students were asked to do research on traditional practices.
Week 6 **Week 7**	MID-TERM EXAM		The mid-term exams last two weeks at the school where the study was conducted. In this period of time, a break to the lessons is given due to the insufficient number of classrooms at the school.
Week 8	Infertility and discussion on the triangle of woman, culture and religion	Group discussion	The students got prepared for the subject in advance. Under the guidance of the faculty member, they discussed the subject as a whole group.
Week 9	Discussion on the psychosocial and psychosexual effects of infertility	Reading a book, doing analysis-synthesis related to the subject	At the beginning of the academic term, every student selected and read a different book determined in relation to infertility. They were asked to make a presentation evaluating the events and characters in the book with respect to the psychosocial and psychosexual effects of infertility.
Week 10	Visit to infertility clinic	Technical visit	A visit was organized to the infertility unit of a health institution determined at the beginning of the academic term. The students were expected to communicate with the patients, to direct questions to their colleagues working there about the functioning of the clinic and to observe certain practices there. Following this, they shared their experiences in class.
Week 11	-Surrogate motherhood -Effects of the infertility process on couples	Debate	The students discussed the subjects obeying the rules of debating in groups determined at the beginning of the academic term
Week 12	Infertility and the ethical problems experienced in the treatment process	Debate	The students discussed the subjects obeying the rules of debating in groups determined at the beginning of the academic term
Week 13	Infertility, family process and surrogate motherhood	Watching a movie	The students watched a movie titled "Juno", which was directed by Jason Reitman and which received a total of 39 awards including Oscar.
Week 14	Legal regulations regarding the assisted reproductive techniques	Group discussion	The students got prepared for the subject in advance. Under the guidance of the faculty member, they discussed the subject as a whole group.
Week 15	Evaluation of the course	Group evaluation	Data collection using the focus-group method

*Gökçe-İsbir and Durgun-Ozan, 2018

2.3.1. Socio-demographic Information Form: This form was developed by the researchers. The form was made up of eight questions related to the participants' socio-demographic backgrounds. The students were directed questions regarding their ages, gender, marital status, financial state, birth of place and their place of accommodation.

2.3.2. Critical Thinking Disposition Scale: The scale was developed by Semerci in 2016 (Semerci, 2016), and it was made up of five sub-dimensions: metacognition, flexibility, systematicity, tenacity-patience and open-mindedness. The scale included a total of 49 items: 14 items in the sub-dimension of metacognition (Item numbers 1 to 14), 11 items in flexibility (item numbers 15 to 25), 13 items in systematicity (item numbers 26 to 38), eight items in tenacity-patience (item numbers 38 to 46) and three items in open-mindedness (item numbers 47 to 49). The internal consistency coefficients for the five sub-dimension of the scale were found to be 89, .89, .90, .83 and .67, respectively. The Cronbach's alpha was calculated as .96 for the whole scale.

2.3.3. Adaptation of Instructional Materials Motivation Survey: The Adaptation of Instructional Materials Motivation Survey was developed by Keller in 1987, and Kutu and Sözbilir adapted the scale into Turkish in 2011 conducting the related validity and reliability studies (Kutu & Sozbilir, 2011). The scale was made up of two sub-dimensions: "attention-relevance" and "confidence-satisfaction". In the phase of attention, students' attention is drawn into the lesson and maintained till the end of the lesson.

In the phase of relevance, students are made aware of the relevance of the subject to their personal needs and purposes. In the phase of confidence, students are made aware that they can be successful with the help of their personal efforts. Lastly, in the phase of satisfaction, students' achievements are awarded with various reinforcers to help them feel internal satisfaction. In the dimension of attention-relevance, there were 11 items (item numbers 1 to 11), and in the dimension of confidence-satisfaction, there were 13 items (item numbers 12 to 24). The items numbered 3, 12, 14, 16 and 18 in the scale included negative statements. For the whole scale, Cronbach's alpha was calculated as .83.

2.4. Statistical Analysis

The research data were analyzed using the statistical package software of IBM SPSS Statistics 25.0 (IBM Corp., Armonk, New York, USA). The descriptive statistics included numbers (*n*), percentage (%), mean ± standard deviation. In order to see whether the sub-scale scores demonstrated a normal distribution or not, Shapiro Wilk normality test and *Q-Q* graphs were used. As different methods were applied to the same students, the scale scores were compared in terms of different methods with the help of one-way analysis of variance in repeated measures. As for the multiple-comparisons, As for the multiple-comparisons, Bonferoni correction test was applied to reveal which groups caused the difference. The statistical significance value was taken as $p<0.05$.

2.5. Ethical Considerations

For the study, the consent of the ethics council of a university hospital in the East of Turkey was taken (Number: 2018/97). Also, the consents of the students and of the Directory of Health School, where the present study was conducted, were taken.

3. FINDINGS

Of all the students, their average age was 21.5; 56.6% of them were female; 62.1% of them were living in the city centre; and 55.2% of them had an income equal to their expenses. Among all the students, 89.7% of them had a nuclear family; 94.3% of them had an unemployed mother; and 67.8% of them had an employed father.

Table 2. Influence of use of different teaching methods on the attention-relevance sub-dimension of the motivation scale (n=87)

	Descriptive Statistics			
Methods	***Mean ± Standard Deviation***		**Methods found different ****	
Phenomena-based group discussion (1)	3,13±0,84		2, 3, 5, 6, 7, 8	
Poster presentation (2)	3,99±0,66		1, 4, 8	
Research (3)	4,17±0,75		1, 4, 5	
Group discussion (4)	3,36±0,78		2, 3, 6, 8	
Reading a book (5)	3,58±0,99		1, 3, 6, 8	
Technical visit (6)	4,24±0,68		1, 4, 5, 7	
Debate (7)	3,75±1,04		1, 6, 8	
Watching a movie (8)	4,32±0,74		1, 2, 4, 5, 7	
	Model Statistics*			
	F	***p***	***Effect Size***	***Statistical Power***
Influence of Methods	25,481	<0,001	0,690	1,000

* **:** One-way analysis of variance in repeated measures
**: Comparisons between the methods were done using the Bonferroni correction test for multiple comparisons.

According to Table 2, the attention-relevance sub-scale scores differed depending on the methods (F=25,481; p<0,001). In relation to the difference between the methods, the effect size was calculated as 0,690, and the statistical power was found to be 100%. The scores related to the phenomena-based group discussions were found to be statistically lower than the scores related to poster presentation, research, reading a book, technical visit, debate and watching a movie. Also, it was revealed that the poster presentation scale scores were higher than the group discussion scores and lower than the scores related to watching a movie. The research method scale scores were found to be higher than the scores related to group discussion and reading a book. In addition, the scores related to group discussion and reading a book were statistically lower than the scores related to technical visit and watching a movie. The technical visit scores were statistically higher than the debate scores. Also, the debate scores were found to be statistically lower than the scores related to watching a movie. All these results demonstrated that the highest mean score belonged to the method of watching a movie. Lastly, no statistically significant difference was found between the scores related to the method of watching a movie and the scores related to research and technical visit.

Table 3. Influence of use of different teaching methods on the confidence-satisfaction sub-dimension of the motivation scale (N=87)

	Descriptive Statistics			
Methods	***Mean ± Standard Deviation***		**Methods found different ****	
Phenomena-based group discussion (1)	3,36±0,70		2, 3, 6, 7, 8	
Poster presentation (2)	3,96±0,79		1, 4	
Research (3)	3,86±0,67		1, 4	
Group discussion (4)	3,46±0,76		2, 3, 6, 8	
Reading a book (5)	3,66±0,84		6, 8	
Technical visit (6)	4,15±0,67		1, 4, 5	
Debate (7)	3,84±0,86		1	
Watching a movie (8)	4,16±0,77		1, 4, 5	
	Model Statistics*			
	F	***p***	***Effect Size***	***Statistical Power***
Influence of Methods	15,650	<0,001	0,578	1,000

* **:** One-way analysis of variance in repeated measures
**: Comparisons between the methods were done using the Bonferroni correction test for multiple comparisons.

According to Table 3, the confidence-satisfaction sub-scale scores did not differ depending on the weeks (F=15,650; p<0,001). In relation to the difference between the methods, the effect size was calculated as 0,578, and the statistical power was found to be 100%.

The scores related to the phenomena-based group discussions were found to be statistically significantly lower than the scores related to poster presentation, research, technical visit, debate and watching a movie. The confidence-satisfaction sub-scale scores related to poster presentation and research were significantly higher than the group discussion sub-scale scores. The sub-scale scores related to group discussion and reading a book were significantly lower than the scores related to technical visit and watching a movie. According to these results, the highest mean score belonged to the method of watching a movie. It was found that the scores related to the method of watching a movie did not statistically differ from the scores related to the methods of poster presentation, research, technical visit and debate.

Table 4. Comparison of the students' critical thinking dispositions (n=87)

Critical thinking disposition	Pre-test *M (SD)*	Post-test *M (SD)*	t	*p
Metacognition	3.84 (.57)	4.07 (.52)	-3.78	.000
Flexibility	3.83 (.54)	4.05 (.54)	-4.24	.000
Systematicity	3.69 (.58)	3.92 (.57)	-3.97	.000
Tenacity and patience	3.76 (.62)	3.92 (.58)	-2.80	.006
Open-mindedness	3.66 (.72)	4.03 (.66)	-4.36	.000

Note. t test independent groups*p< .05

Table 4 presents the pretest and posttest results regarding the influence of different teaching methods used in the course of infertility nursing on the students' critical thinking dispositions. It was found that use of different teaching methods lead to a statistically significant difference in the students' critical thinking dispositions (metacognition, flexibility, systematicity, tenacity-patience and open-mindedness) (p< .05).

4. DISCUSSION and CONCLUSION

In the presents study, different active teaching methods were applied in the course of infertility nursing rather than the traditional teacher-centered approach. The findings revealed that the teaching methods applied within the scope of the study were influential on the students' motivation and on their critical thinking dispositions. Learners' preferences of educational materials change in line with the development of technology. Use of teaching methods in line with these changes will allow using the sources appropriately (Diekelmann & Ironside, 2002 ; Groccia & Buskist, 2011). National League for Nursing reported that it is necessary to make research-based decisions for the purpose of determining the teaching/learning strategies of nurses' trainers (NLN, 2005). Although the increasing knowledge of how to increase the effectiveness of the course, it is a well-known fact that the traditional methods are still popular (Whitehurst, 2012).

Infertility nurses work as a member of an interdisciplinary team. While nurses have a role in the process of diagnosis and treatment of the couples they give care to, they are also supposed to take care of couples' psychological and sociological states and to pay attention to ethical and legal issues. In one study carried out by Stamatis (2010) to determine the educational needs of students and midwifes regarding the assisted reproductive techniques, the researcher pointed out that the midwives had lack of knowledge in the field and that they did not know their professional roles and responsibilities. It is necessary to enhance the curricula for nurse/midwife training programs and to meet the needs of midwives/nurses who take an active role in the developing sector of reproduction health. In studies carried out in our country, it is reported that nursing students do not have sufficient knowledge and awareness although they take a course in the field of infertility (Kılıç et al., 2009). In courses regarding infertility covered in related curricula, the primary focus should be on drawing students' attention to the lesson subject and on raising their awareness to increase their motivation. It is though that motivation in a course is increased using active learning methods (Rose 2011). Motivation is an internal process that directs students' behaviours and energies. These internal processes include a person's goals, beliefs, perceptions and expectations (Dembo, 2000). Motivation also contributes to learning (Köşgeroğlu, 2009). Motivated students view learning as an opportunity to satisfy their curiosity and their desire to obtain information (Rose, 2011). Gökçe-İsbir and Durgun-Ozan (2018), in their qualitative study, used different teaching methods in the course of infertility and assisted reproductive techniques and examined students' experiences. At the end of their study, the researchers found that use of active learning methods were influential on increasing students' motivation and satisfaction. Similarly, in the present study, different active learning methods increased

the students' motivation in the course. It was revealed that among the methods, "watching a movie" was the most influential on motivation. In another study, Kontaş (2016) found that movies used for educational purposes increased internal and external. In this respect, movies related to a lesson subject could be used to draw students' attention and to increase their motivation. However, today, there are no movies related to many of the subjects included in the curricula. For the purpose of enriching this method, short movies whose scenarios are created by the lecturer of the course could be prepared together with real patients and students in cooperation with external stakeholders. Students' involvement in the process could contribute to their motivation as well. It is quite important to develop the critical thinking skills of nurses working in cooperation with different disciplines (Castledine, 2010; Muoni, 2012). Students should develop these skills with the help of courses they take during their undergraduate education as well as with the methods applied while teaching these courses. It is reported that students with a high level of motivation in a course and with the necessary critical thinking skills are more successful in academic terms (Bowles, 2000; Ip et al., 2000; Rose, 2011; Tümkaya, 2011). In a study comparing lecture and Jigsaw teaching (cooperative learning) methods, it was found that The Jigsaw teaching method increased the self-regulated learning and academic motivation of nursing students (Sanaie et al., 2019). As a result of this study, students cooperated with each other by using different education methods and their motivation increased.

Critical thinking refers to defining and analysing problems attentively in the sense of questioning (Castledine, 2010). In studies, it is pointed out that active learning methods used in courses develop students' critical thinking skills (Carter, 2016; da Costa Carbogim et al., 2018; Lee et al., 2016). On the other hand, in a systematic review made by Carter et al., (2016) to examine the effectiveness of methods used to develop nursing/midwifery students' critical thinking skills, it is reported that the most popular active learning method was the problem-based teaching method and that there is little evidence regarding the effectiveness of the methods, though. In the present study, it was found that use of different active teaching methods increased the students' critical thinking skills. Students have different learning styles. Therefore, some students may get motivated with the help of teaching methods, while some may not. For this reason, it is inevitable to use different learning methods appropriate to the subject included in the curriculum. However, lack of evidence regarding the methods makes it difficult for the lecturer to determine the teaching method he or she will apply and causes the lecturer to make experience-based decisions. In the present study, a number of different methods were used, and it was revealed that the methods holistically increased the students' motivation and their critical thinking skills. For the purpose of achieving the goals determined based on efficacy in the curriculum of nursing/midwifery, holistic models involving the use of different teaching methods could be formed, and evidence-based knowledge should be increased. This study revealed the teaching methods effective in academic motivation of nursing students. The majority of such methods focused on applicability of the contents and participation of the students. As the results recommended, the instructors can use this student-centered approaches based on the capabilities of the leaners to motivate and activate the students in the learning process and improve self-guided learning.

Limitations of this study: In the study, there were several limitations. First of all, more than one different active teaching method were applied, and after each application, the students were asked to evaluate the method. The students had to fill in a scale in almost every lesson. In order to avoid this problem, fewer methods could be applied together. Secondly, at our school, students have the right to miss 20% of the classes in theoretical courses. Not all the students attended all the classes. This situation resulted in losses in terms of sampling. Another limitation of our study is that it was measured in a single group and there was no control group.

Impact statement: In the study, for the students with different learning styles who took education together, use of multiple active learning methods increased the effectiveness of their learning. The results obtained in the present study revealed that use of different active teaching

methods increased the students' motivation and critical thinking skills during their nursing education. Therefore, there is a need for high-quality studies to form holistic models involving se of multiple teaching strategies within the scope of the nursing/midwifery curriculum, to evaluate the effectiveness of these models and to provide evidence-based information for the evaluation of new teaching methods. In addition, preparing guides for evidence-based teaching methods could be beneficial for trainers. There is a need for further research on the effectiveness of different teaching methods on other branches of nursing.

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5. REFERENCES

American College of Obstetricians and Gynecologists (ACOG) (2017). Treating infertility. https://www.acog.org/Patients/FAQs/Treating-Infertility#treatment. Available date: 10.12.2017.

Biggs, J. B. (2011). *Teaching for quality learning at university: What the student does.* McGraw-hill education (UK).

Bowles, K. (2000). The relationship of critical-thinking skill and the clinical judgment skills of baccalaureate nursing students. *Journal of Nursing Education*, *39*(8), 373-376.

Carter, A.G., Creedy, D.K., & Sidebotham, M. (2016). Efficacy of teaching methods used to develop critical thinking in nursing and midwifery undergraduate students: A systematic review of the literature. *Nurse Education Today*, 40, 209-218.

Castledine, G., (2010). Critical thinking is crucial. *British Journal of Nursing, 19*(4), 271-271.

Chi, M. T., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist, 49*(4), 219-243.

da Costa Carbogim, F., Barbosa, A. C. S., de Oliviera, L. B., de Sá Diaz, F. B. B., Toledo, L. V., Alves, K. R., & de Araújo Püschel, V. A. (2018). Educational intervention to improve critical thinking for undergraduate nursing students: A randomized clinical trial. *Nurse Education in Practice*, 33, 121-126.

Gopalan, M., Rosinger, K., & Ahn, J. B. (2020). Use of quasi-experimental research designs in education research: Growth, promise, and challenges. *Review of Research in Education*, *44*(1), 218-243.

Gökçe-Isbir, G., & Ozan, Y. D. (2018). Nursing and midwifery students' experiences with the course of infertility and assisted reproductive techniques: A focus group study from Turkey. *Nurse Education in Practice*, *28*, 235-241.

Groccia, J.E., & Buskist, W. (2011). Need for evidence-based teaching. *New Directions for Teaching and Learning*, 128, 5-11.

Hassankhani, H., Aghdam, A. M., Rahmani, A., & Mohammadpoorfard, Z. (2015). The relationship between learning motivation and self-efficacy among nursing students. *Research and Development in Medical Education*, *4*(1), 97-101.

Ip, W.Y., Lee, D.T.F., Lee, I.F.K., & Chau, J.P.C. (2000). Disposition towards critical thinking: A study of chinese undergraduate nursing students. *Journal of Advenced Nurse, 32*(1), 84-90.

Kırca, N., & Pasinoğlu T. (2013). Psychosocial problems during infertility treatment. *Current Approaches in Psychiatry, 5*(2), 162-178.

Kutu, H., & Sözbilir, M. (2011). Öğretim materyalleri motivasyon anketinin Türkçeye uyarlanması: Güvenirlik ve geçerlik çalışması. [Adaptation of instructional materials motivation survey to turkish: a validity and reliability study]. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, 5*(1), 292-312.

Kosgeroglu, N., Acat, M. B., Ayranci, U., Ozabaci, N., & Erkal, S. (2009). An investigation on nursing, midwifery and health care students' learning motivation in Turkey. *Nurse Education in Practice, 9*(5), 331-339.

Lee, J., Lee, Y., Gong, S., Bae, J., & Choi, M. (2016). A meta-analysis of the effects of non-traditional teaching methods on the critical thinking abilities of nursing students. *BMC Medical Education*, *16*(1), 240.

Nilsson, K.E., & Stomberg, M.I.W. (2008). Nursing students motivation toward their studies–a survey study. *BMC Nursing*, *7*(1), 1-7.

Muoni, T. (2012). Decision-making, intuition, and the midwife: understanding heuristics. *British Journal of Midwifery*, *20*(1), 52-56.

Rose, S. (2011). Academic success of nursing students: Does motivation matter?. *Teaching and Learning in Nursing*, *6*(4), 181-184.

Saeedi, M., Ghafouri, R., Tehrani, F. J., & Abedini, Z. (2021). The effects of teaching methods on academic motivation in nursing students: A systematic review. *Journal of Education and Health Promotion*, *10*.

Sanaie, N., Vasli, P., Sedighi, L., & Sadeghi, B. (2019). Comparing the effect of lecture and Jigsaw teaching strategies on the nursing students' self-regulated learning and academic motivation: A quasi-experimental study. *Nurse Education Today*, *79*, 35-40.

Siedlecki, S. L. (2020). Quasi-experimental research designs. *Clinical Nurse Specialist*, *34*(5), 198-202.

Tümkaya, S. (2011). Fen bilimleri öğrencilerinin eleştirel düşünme eğilimleri ve öğrenme stillerinin incelenmesi [Comparison of college science major students' learning styles and critical thinking disposition]. *Ahi Evran Üniversitesi Eğitim Fakültesi Dergisi*, *12*(3), 215-234.

Whitehurst Diekelmann, N., & Ironside, P.M. (2002). Developing a science of nursing education: Innovation with research. *Journal of Nursing Education, 41*(9), 379-380.

World Health Organization (WHO). Mother or nothing: the agony of infertilityn WHO bulletin. http://www.who.int/bulletin/volumes/88/12/10.011210. pdf?ua=1 Available date: 10.12.2017.

Opinion Article

Continuous Assessment in Malawian Primary Schools: An Effective Policy on Paper *

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Abstract

Education reform is a catchword in academia particularly now that the world is becoming more complex. The Ministry of Education in Malawi revised its primary school curriculum in the early 2000 to address educational challenges. Two key aspects of the reform were a paradigm shift from teacher to learner-centered teaching approaches and the integration of continuous assessment in the teaching and learning process. The obvious anticipation of the primary curriculum and assessment reform (PCAR) was that the education challenges facing the primary school sector would be addressed. This paper argues that the emphasis on the use of CA to address the learning challenges in primary education remains a far-fetched dream if there is no radical reform in the system and operating context.

Keywords: Continuous assessment, outcome-based education, continuous testing

1. INTRODUCTION

1.1. Conceptualization of the Primary Curriculum and Assessment Reform (PCAR)

The deterioration of the Malawi education system characterized by high dropout rates, repetition, and general apathy in schooling led to the conceptualization of the primary school curriculum and assessment reform (Kambankadzanja, 2005; MoEST, 2006). It was further revealed that the curriculum was characterized by teaching for examination, hence the need for a new curriculum and a new approach to teaching and learning (Chakwera, Khembo, & Sireci, 2004). A national consultation process began leading to the conceptualization of the national curriculum and assessment framework in 2003. Having considered input from various stakeholders and experiences from other countries, Malawi considered the adoption of Outcome-Based Education (OBE) as the main reform. The key feature in the PCAR is the paradigm shift from teacher to learner-centred approach to teaching, and the introduction of continuous assessment as an integral element in the teaching and learning process.

However, before embracing the use of continuous assessment in primary school, there was a feasibility study conducted on the Improving Educational Quality Project (IEQ) funded by USAID (IEQ, 2003). The results of the longitudinal study by IEQ revealed that there was an improvement in the performance of the majority of pupils who were initially unable to read, write or perform simple mathematical tasks. In the year 2000, a team of IEQ project members started meeting education officials in Malawi to devise classroom based intervention in order to improve the teaching and learning. This led to the launch of continuous assessment feasibility study in 21 primary schools of Ntcheu district in 2002.

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The findings of the feasibility study were positive for both teachers and learners. It was revealed that pupils who were not literate coming to standard 3 learned how to read and write, and their achievement in mathematics improved. Teachers were reported to have gained new skills and new knowledge which made them better teachers. Among the skills teachers gained was the creative use of locally available resources (TALULAR) to support learning. In addition, teachers were said to have learned new concepts such as remediation, enrichment, and curriculum-based assessment. Teachers realized that assessment is no longer meant to test. Further, it was observed that teachers used CA to inform their teaching. This is a departure from the way assessment was perceived in traditional education.

The positive lights provided by the feasibility study conducted by IEQ provided a ray of hope to the challenges of the education system. This was manifested by the eventual conceptualization of the national curriculum and assessment framework in 2003 (Mchazime, 2003). The introduction of CA in primary education was with a purpose. One important element was to use CA to support learning. The previous assessment regime was dominantly summative which did not give room for any support. CA, therefore, was meant to address the learning gaps of learners by providing an avenue for a support system during the teaching and learning process. CA had a dual purpose of assisting teachers in improving their teaching on one hand and learners in addressing gaps based on feedback, on the other hand. Subsequently, the introduction of CA was meant to suppress the high stakes of national examination which bred undesirable results. But how sure are we that CA would result in improvement in teaching and learning? Will the introduction of CA bring meaningful change? Will the implementation context be favorable for CA? these were some of the unanswered or unattended questions that probably lingered in the minds of curriculum specialists. This paper attempts to show that the implementation of CA in primary school is fruitless as it is still operating in a hostile environment.

1.2. Critical Examinatıon of CA in Malawian Context

The National Education Standards (NES) highlight the importance of constructive use of assessment to achieve excellence in the teaching and learning process (MoE, 2020). The effective practice portrays the ability of the teacher to use formative assessment to monitor the learning process and be able to help learners improve their work. Another important aspect is the provision of constructive feedback so that they improve their work. But the assessment practice in Malawian schools is characterized by periodical administration of tests made every fortnight or monthly to have two continuous assessment grades as a requirement (Chiziwa, & Kunkwenzu, 2021). These practices do not represent the change from continuous testing to assessment that informs learning (Susuwele-Banda 2005). These continuous assessment practices do not serve the purpose of either assisting to fill the learner's gap or enrich their potentialities but to portray to the authorities that they carry out a continuous assessment by having records available for supervisory services.

Another critical element in the PCAR is the need to provide feedback after assessing learners. It is envisaged that once feedback is provided to learners, there could be an associated desire to close the learning gaps. Despite the instrumental role of feedback towards learning, teacher's feedback in primary school is found wanting. Teachers are interested in providing numerical grades and statements of either approval or disapproval with no effort of explaining why they are wrong and what they can do to improve their learning gaps (Chiziwa, & Kunkwenzu, 2022). Such feedback is meaningless as it does not inform learning (Sadler, 1989). Feedback must be able to explain to the learners why they are wrong and possible suggestion for improvement (Fautly & Savage 2008; Vu, & Dall'Alba, 2007). The unproductive feedback prevailing in primary education is very disturbing as it does not support the aspiration of the integration of assessment in the teaching and learning process.

Furthermore, the challenge to the effective implementation of CA in Malawian primary school is large pupil-qualified teacher ratio. Although there has been a tremendous improvement in the number of pupil-qualified teacher ratio in primary school (PQTR) from 92:1 in 2009 to 70:1 in 2018 against the target PQTR of 60:1 (MoE, 2020), this change is not meaningful to bring any desirable change. This only shows that the primary school sector is still grappling with shortage of qualified teachers to effectively support the emerging educational reforms, implying that there is still a shortage of qualified teachers in primary schools. Even if Malawi attained the 60:1 pupil-teacher ratio, the numbers cannot drive effective continuous assessment agenda. Worse still primary education is still reeling with high Pupil Permanent Classroom Ratio (PCR) of 120.9:1 in 2018 from 124:1 in 2014 (MoE, 2020). This shows that improvement is at a very snail's pace to support any significant change.

While the emphasis on CA was considered as an instrument to promote quality learning, to the contrary, the state of affairs has worsened. The 2018 figures showed that there were 5,187,634 learners in primary school representing a Net Enrolment Rate (NER) of 90% in that year. However, the primary completion rates were as low as 51% and 53% from 2014 to 2018 respectively (MoE, 2020). The monitoring of the learning achievement survey undertaken by MoE in 2015 revealed that the majority of learners failed to reach the threshold of 40% mark in the national primary curriculum performance standard. This is a revelation that the primary education system is still suffering from systemic challenges unlikely to be addressed in the short term. Therefore, the contribution of CA towards improvement remains a daunting endeavor.

Among the reasons for the dismal performance are inadequate teaching and learning materials (TLM) with the learner textbook ratio per subject reaching as high as 10:1 in some schools; Underutilization of learning materials with books locked up as a care measure; The curriculum is not designed for the large numbers of students who leave for whatever reason or are pushed out due to low performance; High absenteeism by both learners and teachers; among others. Ironically low quality of teaching and assessment is among the challenges (MoE, 2020). Assessment which was supposed to enhance quality is to the contrary experiencing gaps in the implementation context.

The new assessment culture introduced in the primary school education system requires teachers to change their assessment practices. Calderhead and Shorrock (1997) argue that new ideas introduced in the education system need to have a framework to support long-term teachers learning, otherwise the absence of such efforts tends to reinforce the status quo. In this regard, teachers are supposed to be assessment literate in line with the current demands of the curriculum. However, a study done by Chulu (2013) observed that most teachers in Malawi lack the ability to formulate valid assessment tasks. In a study on primary school assessment practices, it was found that teachers dominantly carried out continuous testing with questions aimed at eliciting correct responses with little or no effort in cultivating critical thinking skills (Chiziwa, & Kunkwenzu, 2021).

Traditionally, teachers used questions intending to elicit the correct responses from learners. The new era of assessment with constructivist approaches provides many opportunities of assessment that are collaborative as well as centred on problem-solving (Fautly & Savage, 2008; James, 2006). This shift calls for change in the form and content of assessment to reflect the new thinking (Shepard, 2009). Assessment must reflect problem-solving skills that apply to the real-world situations (Shepard, 2009). The present education reform is aimed at creating a generation of critical thinkers to suit with ways of the 21st-century context. The main pillars of the 21st-century knowledge are critical thinking and problem solving, collaboration, creativity and communication (Kivunja, 2015). This calls for the migration of the traditional assessment practices to suit the present thinking. While CA is being emphasized in the PCAR, it has not been followed up with the re-education process of the paradigm shift. The current teacher assessment practices in Malawi primary school renders the effort of CA to address learning challenges meaningless.

1.3. Way Forward

Given the confounding factors in implementing CA in schools, this paper suggests three key aspects that the Ministry of Education and other stakeholders need to consider to bring about meaningful use of CA;

1.3.1. Assessment Literacy

MIE and MoEST need to advance CA literacy programs in schools so that implementers are conversant with the demand of the curriculum regarding CA. Assessment literacy programs should focus on the development of quality assessment tasks that are beyond memorization. In addition, teacher education institutions need to emphasize assessment literacy in their teacher education programs to ensure that prospective teachers are well grounded in matters of assessment, both formative and summative.

1.3.1.1. Workload and Class Size

The context of implementing CA is shrouded by a high workload in terms of the number of learners in class and subjects allocated to teachers. This situation impedes the administration of a variety of CA tasks. This climate diverts teachers from providing the necessary support to learners as they are tempted to cover content. The overall effect of large class sizes is that few or not all learners benefit from individual support that is expected as a result of CA. This implies that there is a need to deploy more teachers to reduce teacher class size.

1.3.1.2. Support System

While supervision is an important aspect in trying to address the implementation gaps, sometimes these supervisory activities are done superficially. Complementing supervisory activities, there is a need to develop channels of deliberate peer networking as it is very crucial in sharing experiences on how to resolve professional challenges. Schools should therefore facilitate meetings that should provide an avenue for interaction among teachers from the same school and other schools.

2. CONCLUSION

The primary education system in Malawi is still having an unresolved constellation of issues making it impossible for a meaningful realization of the reform goals. In the current education state, the use of CA remains a good policy on paper. It remains a farfetched dream to assume that an introduction of CA into the system will automatically bring improvements in terms of learning outcomes. It is only when a favorable context has been established that learners may reap the benefits of continuous assessment. Comprehensive teacher re-education in CA and resolving issues which prevent the implemenation process in the education system would result in narrowing the gap between the intended and the actual implementation of the education reform in Malawi. The Ministry of education must therefore come up with both short and long terms strategies to meaningfully benefit from continuous assessment.

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3. REFERENCES

Calderhead Teacher, J. & Shorrock, S.B. (1997). *Understanding teacher education*. London: The Falmer Press.

Chakwera, E., Khembo, D., & Sireci, S.. (2004). *High-stakes testing in the warm heart of Africa: The challenges and successes of the Malawi national examinations analysis archives*. Retrieved [20th October 2021] from http://epaa.asu.edu/epaa/v12n29

Chiziwa, W. K.M.C., & Kunkwenzu, E. D. (2022). Feedback amidst new assessment culture in Malawian primary schools. *Open Journal of Social Sciences,* 10, 100-116. https://doi.org/10.4236/jss.2022.101008

Chiziwa, W. K.M.C., & Kunkwenzu, E. D. (2021). Investigating teacher assessment practices in the teaching of social studies in Malawian primary schools. *Open Journal of Social Sciences*, 9, 480-495. https://doi.org/10.4236/jss.2021.97035

Chulu, B. W. (2013). Institutionalisation of assessment capacity in developing nations: the case of Malawi. *Assessment in Education: Principles, Policy & Practice*, *20*(4), 407-423. http://doi.org/10.1080/0969594X.2013.843505

Fautly, M. & Savage, J. (2008). *Assessment for learning and teaching in secondary schools*. 33 Southern hay East: Learning Matters Ltd.

James, M. (2006). Assessment teaching and theories of learning. In *Assessment and learning*. Gardner, J. (Ed). London: SAGE Publications. Ltd 51-60.

Kaambankadzanja, D. (2005, April). The primary curriculum and assessment reform (PCAR): The process, the challenges and the way forward. *Paper presented at National Education Conference.* March 29- April 1.

Kivunja, C. (2015). Why students don't like assessment and how to change their perceptions in 21st century pedagogies. *Creative Education, 6,* 2117-2126. http://doi.org/10.4236/ce.2015.620215

Mchazime, H. (2003). 'Integrating primary school curriculum and continuous assessment in Malawi', Improving Educational Quality Report [online]. Available at: http://edumalawi.cc.ac.mw/jspui/bitstream/123456789/126/1/Intergrating%20continuous%20assessmnet%20into%20the%20Primary%20School%20Curriculum%20in%20Malawi.pdf (Accessed: 10th November 2016)

MoE. (2020). *National education sector investment plan 2020-2030*. Lilongwe: Ministry of Education.

MoEST. (2014). *Orientation manual for junior secondary school curriculum generic issues.* Lilongwe: MoEST.

MoEST. (2015). *National education standards, primary and secondary education*. Lilongwe: Ministry of Education Science and Technology

Sadler, D.R. (1989). Formative assessment and the design of instructional systems. *Instructional Science. 18*(2), 119–144.

Shepard, L.A. (2009). The role of assessment in learning culture. *The Journal of Education. 189*(1)

Susuwele-Banda, W.J. (2005). *Classroom assessment in Malawi: teachers' perceptions and practices in mathematics.* Unpublished Doctoral Thesis: Virginia Polytechnic Institute and State University.

Vu, T. T., & Dall'Alba, G. (2007). Students' experience of peer assessment in a professional course. *Assessment and Evaluation in Higher Education*, 32, 541-556. https://doi.org/10.1080/02602930601116896

Research Article

Information Processing Ability and its Implications for Teaching and Learning *

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Abstract

The aim of this paper is to explore how the brain processes information, and which factors affect the information processing ability of learners in the classroom. From the hierarchical linear modelling (HLM) analysis, it is evident that the independent variables age, home language, language of learning and teaching (LOLT), and average class size affect the information processing ability of learners in the classroom. The process by which the brain acquires, use, and think about knowledge is known as cognition. Cognition are those intellectual or perceptual processes occurring within us that the typical individual would describe as thinking, rational processing, or the mind. Through learning, an individual's cognition develops long-term changes in mental representations or associations because of environmental learning and experiences. A quantitative design was followed to gather data from Grade 11 learners by means of a questionnaire. The results revealed that information processing ability of learners as a dependent variable was significantly influenced by the following independent variables: age, home language, language of learning and teaching, and average class size. Recommendations to teachers on how to facilitate efficient information processing are made, which could result in meaningful learning and understanding by the learners. It is hoped by the researchers that, employing these tactics, will render valid results that are consistent with the need to enhance learners' depth and breadth of processing information, and thereby become sophisticated and complex producers of knowledge.

Keywords: Cognition, hierarchical linear modelling, human memory model, information processing ability, teaching and learning

1. INTRODUCTION

Laxman and Chin (2010) state that the brain is an organ of learning, designed to gather and store an infinite amount of information, and then put it to use. In turn, Fuchs (2011) comment that the brain appears to be the creator of the mind and the experienced world of the learner. Krause, Bochner, Duchesne and McMaugh (2009) refer to the process by which the brain acquires and use knowledge as cognition**.** Cognition encompasses many aspects of intellectual functions and processes to utilise existing knowledge to create new knowledge. Eggen and Kauchak (2014) assert that through learning, an individual's cognition develops long-term changes in mental representations or associations because of environmental learning and experiences. The developmental changes that occur include the construction of thought processes (i.e., thinking, rational processing, or the mind) such as the mental processes of perception, memory, judgment, and reasoning, as contrasted with emotional and volitional processes from childhood through adolescence to adulthood. Ormrod (2008) clarifies that learning, including classroom learning, is largely a mental phenomenon that undoubtedly has its basis in the brain.

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Hurley (2012) says that researchers and psychologists have attempted to search for the engram, the physical trace of memory. Mastin (2018) explains that three brain areas play significant roles in the processing and storage of different types of memories: cerebellum, hippocampus, and amygdala. The cerebellum processes procedural memories; the hippocampus is where new memories are encoded; and the amygdala helps determine what memories to store, and also plays a part in determining where the memories are stored based on whether we have a strong or weak emotional response to the event. Strong emotional experiences can trigger the release of neurotransmitters, as well as hormones, which strengthen memory, so that memory of an emotional event is usually stronger than memories of a non-emotional event (Spielman, Dumper, Jenkins, Lacombe, Lovett, & Perlmutter, 2016). Kim and Lee (2014) state that learners should possess more than simply a quantity of knowledge, i.e., how much they know, instead, learners should possess the abilities to assimilate or accommodate incoming information to existing knowledge in the schemata. The new knowledge would then be constructed, and inadvertently excite teachers' commitment to create an environment that enables the development of information-processing abilities of learners. Information processing ability refers to the ability of learners to process information through the learning process. For meaningful learning to take place, where information is transferred from the working memory to the long-term memory, information processing has to occur (Van der Merwe, 2013). Krause et al. (2009) agrees by adding that the process of brain development is important in the teaching and learning process.

1.1 Learning in an Interactive Teaching-Learning Environment

In a classroom, an effective and knowledgeable teacher is an important school-related factor that facilitates the learning process, and who is responsible for learning (Schacter & Thum, 2004). Sousa (2011) contends that teachers try to change the human brain every day and the more they know how it learns, the more successful they can be. Teachers are in the only profession in which their job is to change the human brain every day. Jensen (2008) postulates that as the brain continues to be the new frontier, the old way of schooling is fading as fast as our understanding of the brain increases, and it is the most relevant understanding for teachers to have.

Grösser (2007) is of the opinion that effective teachers regard how learners learn and subsequently carefully plan instruction towards creating a successful learning environment. Grösser promotes the important role that the teacher plays in developing certain learning functions, which in turn assist the learner in the learning process and in the ideal realisation of learning goals and learning outcomes. These learning functions refer to the manner in which new information is linked to prior knowledge, how to organise information effectively, and how to acquire cognitive learning strategies as well as metacognitive learning abilities. As Kandarakis and Poulos (2008) explain, in terms of the information-processing model, and how learners learn, learning presents the process of gathering information (retrieving it from the environment) and organising it into mental schema. Jensen (2008) explains that brain-based learning or education is best understood in three words: engagement, strategies, and principles; and encapsulates that brain-based education is the engagement of strategies based on principles derived from an understanding of the brain. Teachers who understand how this theory contributes to learners' information-processing ability and that the learning environment has specific effects on academic achievement, select appropriate learning strategies to improve retention and retrieval of learning.

1.2 The Human Memory Model

The structure of human memory was initially proposed by Atkinson and Shiffrin (1968) and is often described in the framework of information processing theory (Eggen & Kauchak, 2014). Woolfolk (2007) elaborates on the information-processing theory by mentioning that processing involves encoding (gathering information and organising it in relation to what is already known), storage (holding information), and retrieval (getting the information when needed). The information processing theory describes how information is perceived from the environment and processed accordingly. Kandarakis and Poulos (2008) assert that learning is defined as the process of acquiring new information, while memory is defined as the persistence of learning that can be accessed later. Consistent with Atkinson and Shiffrin's theory, Hedge (2013) concedes that the memory stores can be functionally divided into three systems, namely: sensory memory (SM), working memory (WM) and long-term memory (LTM).

1.2.1 Sensory Memory (SM)

Eggen and Kauchak (2014) state that SM is important due to the fact that it is the starting point for further processing, where SM holds the information until we attach meaning to it and transfer it to WM. Thus, learning and development depend on experience, and it is a principle of cognitive learning theory, as we acquire experience through our SM. Cherry (2019a) explains that the senses are consistently taking information from the environment and while this information is important, one could simply not remember each and every detail about your experiences. Instead, your SM creates a snapshot of the world around you, allowing you to focus your attention on relevant details briefly. Marchetti (2014) adds that SM is affected by attention and that attention causes information to be transferred to the WM. Different senses have different types of sensory memory. The different types of sensory memory have also been shown to have slightly different durations.

According to Cherry (2019a), in explaining the various types of SM, reference is made to the following.

- Iconic memory is perceived as visual sensory memory and involves a very brief image and lasts for about one-quarter to one-half of a second.
- Echoic memory, also known as auditory sensory memory, involves a very brief memory of sound, almost like an echo. This type of sensory memory can last for up to three to four seconds.
- Haptic memory, known as tactile memory, involves the very brief memory of a touch. This type of sensory memory lasts for approximately two seconds.

The importance of SM and attention in the classroom cannot be overstated. By understanding that certain sensory stimulus has a longer duration than others, teachers can easier select a combination of appropriate content so that learners can draw attention to it. Without attention, teachers cannot teach, as learners will not be able to store information in their working memory (Jaeger, Shipley & Reynolds, 2017).

1.2.2 Working Memory (WM)

Malamed (2010) describes WM as being mentally online. Similarly, Eggen and Kauchak (2014) explain that WM is the workbench of the memory system, the conscious component where our thinking occurs and where we try to make sense of our experiences by linking it to our existing understanding. The working memory applies to real-life tasks inclusive of reading (phonological loop), problem solving (central executive), and navigation (visual and spatial processing) of which all function on a conscious level of information processing. These processes work together in order to be

able to process information in the prefrontal cortex (PFC) area of the brain. Eggen and Kauchak (2014) explain that the most important process in learning is to construct meaningful knowledge and it takes place in the memory component that is the most limited. This limitation of the WM is explained by the concept 'cognitive load'. Paas and Ayres (2014) add that cognitive load has certain assumptions, which indicate that human memory is divided into WM and LTM. Schemas represent how information is stored in LTM, and that processing new information results in cognitive load on the WM which affects learning outcomes.

Cognitive load theory (CLT), originally developed by educational psychologist John Sweller in the 1980s, explains the cognitive processes related to learning and strategies that could increase the likelihood of teachers to teach more effectively (Paterson, 2017). CLT identifies three broad categories of thinking, or cognitive loads, (i) intrinsic thinking that derives meaning from new information and how it is connected. Dealing with information not related to what you are learning is called (ii) extraneous thinking. Finally, (iii) germane thinking is building mental models (or schema) that encode the meaning of the information and how it is connected. Hall (2016) contends that teachers should not overlook the role of learning in the classroom and cognitive load could be effectively managed in terms of working memory to aid learning. Similarly, Heick (2017) postulates that learning experiences should be designed in a manner that reduce WM load to promote schema acquisition by being specific, not only about the 'what' and sequence of learning, but also the nature of what is being learned. When, for example teachers effectively interact with learners, questioning skills should be a by-product of automaticity. When employing distributed processing, Eggen and Kauchak (2014) provide the example related to the phonological loop and the visual-spatial sketchpad in WM, whereby they operate independently, meaning that each can perform mental work without taxing the resources of the other. In doing so, distribution of the processing load across the two components takes place, and it suggests that learners could learn more if verbal explanation and visual representation are combined. The visual processor supplements the verbal processor and vice versa. Willis (2012) explains that for young brains to retain information, they need to apply the information. Information learned by rote memorisation will not enter the sturdy long-term neural networks in the prefrontal cortex unless learners can actively recognise relationships to their prior knowledge and/or apply new learning to new situations. According to Willis (2012), teachers should employ brain-based teaching strategies to build executive function in learners which includes providing learners the opportunities to apply learning, introduce activities to support the development of the executive function, and to model higher thinking skills inclusive of judgement, prioritising, setting goals, providing self-feedback, and monitoring progress, prior knowledge activation and transfer opportunities, and metacognition.

1.2.3 Long-term Memory (LTM)

McLeod (2010) explains that long-term memory (LTM) is the final stage of the information processing model proposed by Atkinson and Shiffrin (1968) and provides the lasting retention of information and skills. Krause et al. (2009) further explain that the LTM takes on many forms and is broadly divided into explicit (or declarative) and implicit (or procedural) knowledge. Mastin (2018) explains that declarative memory ('knowing what') is memory of facts and events and refers to those memories that can be consciously recalled (or 'declared'). It is sometimes called explicit memory, since it consists of information that is explicitly stored and retrieved, although it is more properly a subset of explicit memory. Procedural memory is referred to as implicit memory because previous experiences aid in the performance of a task without explicit and conscious awareness of these previous experiences, although it is more properly a subset of implicit memory. According to Reisberg (2013), cognitive psychologists, as well as teachers have a shared goal in understanding how to promote long-term learning and memory. Reisberg (2013) further asserts that performance during

learning is a poor predictor of future performance because it reflects the momentary accessibility of knowledge (i.e., retrieval strength) rather than how well it has been stored in memory (i.e., storage strength). Learners simultaneously process information on many different levels. At the most basic level, incoming information is processed by the nervous system to organise and understand sensory input. At higher levels, the information is processed with respect to existing knowledge in order to extract meaning. Busch (2017) avers that the ability to retain and recall information is central to improving memory, knowledge, and learning. He postulates that the main findings in a study conducted by researchers from various international universities revealed that practice testing and distributed practice were rated as being very effective for improving LTM (Busch, 2017).

1.3 Cognitive Processes as a Component of Human Memory

In view of the reciprocal relations between cognitive neuroscience and cognitive models, cognitive neuroscientists study how the brain implements cognitive processes, such as learning and understanding neural mechanisms could provide insight into models of cognition (Forstmann, Wagenmakers, Eichele, Brown, & Serences, 2011). Visser (2018) agrees that teachers need to teach for engagement and from education literature it becomes evident that learner engagement is a prerequisite of learning, and for learning to be truly meaningful, learners have to be cognitively engaged. Van Amburgh, Delvin, Kirwin and Qualters (2007) postulate that the concept of learner engagement and active learning is becoming more than just educational rhetoric. Active learning techniques have emerged as strategies for teachers to promote engagement with both discipline material and learning. Cognition is central to the development of psychology as a scientific discipline (Huitt, 2006). Cognition is a rather general term that refers to all mental processes, such as perception, thinking, memory, motivation, attention, emotions, the ability to understand the intentions and thoughts of other people, decision-making, and self-awareness (Cherry, 2019b). Mastin (2018) avers that the overall process involved in the different stages of memory formation is referred to as cognitive processes of attention, perception, encoding, storage, and retrieval.

1.3.1 Attention

The process of memory formation starts with attention that is regulated by the thalamus (Mastin, 2018). Nketsia (2013) defines attention as a cognitive process referred to as an awareness in a perceptive manner as well as the ability to choose and concentrate on relevant stimuli adapted from the environment. When regarding the neuroanatomy of attention. Cherry (2018) further explains that attention is limited, selective and a basic part of the cognitive system. When discussing the neuroanatomy of attentional systems, Petersen and Posner (2012) distinguish between three systems, the RAS, PAS and AAS.

- Reticular Activating System (RAS) or Alert System: this system is mainly in charge of arousal and sustained attention. It is closely related to the reticular formation and some of its connections, like the frontal areas, limbic systems, the thalamus, and the basal ganglia. Gupta (2017) explains that your RAS, actually located in the brain stem, takes a leading role in determining what is important and what is not when it comes to paying attention to various stimulations.
- Posterior Attentional System (PAS) or Orientation System: this system is in charge of focused attention and selective attention of visual stimuli. The brain areas related to this system are the posterior parietal cortex, the lateral pulvinar nucleus of the thalamus, and the superior colliculus.

- Anterior Attentional System (AAS) or Execution System: this system is in charge of selective attention, sustained attention, and divided attention. It is closely related to the prefrontal dorsolateral cortex, the orbitofrontal cortex, the anterior cingulate cortex, the supplementary motor area, and the neostriatum (striate nucleus).

Attention is limited in both capacity and duration and attention is easily distracted. Attention is considered as a departure point of learning, and therefore attracting and maintaining learners' attention is essential for effective information processing (Curtindale, Laurie-Rose, Bennet-Murphy, & Hull, 2007). Rather than engaging learners through passive listening during a presentation, active involvement in learning activities is therefore essential. Some researchers claim that attention precedes perception, and that attention is necessary for perception. This entails that without attention, a human has no conscious awareness of sensory information (Bridewell & Bello, 2016).

1.3.2 Perception

The perceived sensations from environmental stimuli are decoded in the various sensory areas of the cortex, where the hippocampus is responsible for the combination of these into one single experience and the transferral into the LTM (Mastin, 2018). The hippocampus is the regulator where these experiences are compared and associated with prior knowledge or experiences and memory consolidation takes place. Accurate perception in learning activities are essential due to the fact that learners' perception of what they see and hear enter the working memory which implies that if these perceptions are inaccurate, the information ultimately stored in the long-term memory will also be inaccurate (Eggen & Kauchak, 2014). To ensure that learners accurately perceive the information, which is presented to them during a lesson presentation, teachers should establish prior knowledge and actively engage learners in the learning process.

1.3.3 Encoding

After learners attend to and perceive information, having information organised in the working memory as to make sense of it, the next step involves the encoding of information (Eggen & Kauchak, 2014). Encoding refers to the representation of information in the long-term memory. Encoding is a biological event, and it begins with perception through the senses. Meaningful encoding connects new information to information already stored in the long-term memory and to enhance encoding successfully, teachers should carefully organise the information presented to learners together with cognitive activity with interactive teaching strategies. Schellenberg, Negishi, and Eggen (2011) explain that encoding strategies refer to learners' conscious attempts to encode information into long-term memory in ways that are meaningful to the individual. Four encoding strategies include:

- *Organisation:* an encoding strategy that involves the clustering of related items of content into categories that illustrate relationships (Mayer, 2008).
- *Schema activation:* a strategy that involves activating relevant prior knowledge so that new information can be connected to it (Mayer & Wittrock, 2006).
- *Elaboration:* the process of increasing the number of connections among items of existing knowledge (Terry, 2006).
- *Imagery:* the process of forming mental pictures (Schwartz & Heiser, 2006). Learners who consciously use encoding strategies are mentally (cognitively) active as they make decisions about how to make the information they are studying as meaningful as possible.

In contrast, simply reading a textbook, or memorizing information can be a passive process.

1.3.4 Rehearsal

Snowman and McCown (2015) contend that a severe limitation of WM means that information is quickly forgotten in the absence of further processing. Learners can only assign meaning to new learning if adequate time is allowed for processing and re-processing of new information, a process that is referred to as rehearsal (Sousa, 2011). There is almost no long-term retention of cognitive concepts without rehearsal as it is a critical component in the transference of information from WM to LTM. Cognitive psychologists have found it useful and necessary to distinguish between two types of rehearsal: maintenance rehearsal and elaborative rehearsal (Snowman & McCown, 2015). Maintenance rehearsal is mostly effective at placing information in your short-term memory (such as a phone number) while elaborative rehearsal may be more effective at encoding it into your LTM (Heerema, 2018). Sousa (2011) elucidates that maintenance rehearsal or rote rehearsal is the process that is used when the learner needs to remember information exactly as it is entered into WM. This is not a complex strategy, yet necessary to learn information or a cognitive skill in a specific form or sequence, e.g., remembering a poem, the melody of a song, multiplication tables and telephone numbers – all steps and procedures. Elaborative rehearsal is a method to encode information into your LTM by requiring the brain to process it in a more in-depth way. Elaborative rehearsal consists of making an association between the new information you are trying to learn and the information you already know (Heerema, 2018). Elaborative rehearsal can involve organising the information, thinking of examples, creating an image in your head of the information, and developing a way to remember the information through a mnemonic device. Several mnemonic devices can facilitate elaborative rehearsal, such as using the first letter of a list of words to make a new word.

1.3.5 Retrieval

Wolfe (2018) explains that learning is the act of making (and strengthening) connections between thousands of neurons forming neural networks or maps, while memory is the ability to reconstruct or reactivate the previously made connections. So, when we learn something new, we are actually creating new connections between our neurons. And when we want to remember something, we call on those neurons to become activated so we can recall what we have learned before. Without retrieval, a stored memory would have no useful purpose. Sousa (2011) postulates that the brain uses two methods to retrieve information from the LTM, referred to as recognition and recall. Recognition matches an outside stimulus with stored information, e.g., multiple-choice questions. Recall on the other hand describes the process whereby cues of hints are sent to the LTM, which must search and retrieve information from the long-term memory, then consolidate and decode it back again to WM.

Cherry (2018) further explains that the process of retrieval involves accessing stored memories by means of a retrieval clue. She further elaborates that there are four basic ways to retrieve information from LTM and they include recall, recollection, recognition, and relearning. Stanfield (2018) highlights that in order to strengthen memories, they must be accessed repeatedly. Memory is constructive, therefore each time you access and bring out a memory, the easier it becomes to access it in the future as more neural pathways are created and the memory becomes stronger. As teachers, we can encourage our learners to access memories by guiding them to actively recall or retrieve information. This can be done in various ways, including assessment discussion and feedback.

1.4 Metacognitive Processes as a Component of Human Memory

The human information-processing model is regarded as logical, sequential, and largely governed by metacognition (Eggen & Kauchak, 2014). Metacognition refers to a person's awareness of and control over the way information is processed (Meltzer, Pollica, & Barzillai, 2007), and

encoding is the process of representing information in long-term memory (Anderson, 2007). Research indicates that metacognition has an important influence on the way learners learn, in general, and encode information, in particular (Pressley & Hilden, 2006). Learners who make conscious attempts to encode information consistently achieve higher than those who are less metacognitively aware (Kuhn & Dean, 2004). Bada (2015) suggests that new, innovative, and creative ways are needed to engage learners in active and meaningful learning experiences to foster and promote the development of critical thinking skills. Wilson and Conyers (2016) assert that teaching learners to become more metacognitive, equips them with skills to drive their own brains and become self-directed learners. Haukas, Bjorke, and Dypedahl (2018) confirm that many studies recently indicated the benefits and effectiveness of metacognition in education, which implies the psychological study of the essence of the mind, form a scientific point of view. According to neuroscience, metacognitive functions are located in the most modern part of the brain: the cerebral cortex. Blake (2016) asserts that learners receiving instruction on metacognition develop skills that will make them more successful in their academic and professional careers.

2. METHOD

2.1 Research Type

The study resided within the post-positivist research paradigm, which Creswell (2013) defines as the successor of 'positivism' theory. Positivism contests the traditional notion of the absolute truth of knowledge. Post-positivism recognises that we cannot be positive about the claims of knowledge when studying the behaviour and actions of human beings. The study followed a quantitative design, investigating the relationship among dependent and independent variables. The dependent variables were measured, typically on instruments, so that empirical data could be analysed using statistical procedures. The purpose of using a quantitative design in this study is mainly to have gained an understanding of the underlying perceptions of respondents, getting insights into how positive psychology could contribute to learner well-being in the classroom, and formulating hypotheses to uncover the prevalent trends, ideas and opinions of respondents. The quantitative research instrument (questionnaire employed), ensured objectivity, generalisability and reliability, as well as ensuring that the researchers became external factors to the actual study. A non-experimental design (survey method) investigating complex relationships among variables by applying techniques of Hierarchical Linear Modelling (HLM) was employed.

2.2 Population and Sample

The target population of this study was Grade 11 learners in the Fezile Dabi Education District, Free State province. A probability, multi-stage cluster sampling procedure was conducted to select a sample for the study. The sample consisted of 650 Grade 11 learners that represented 20 of the 65 schools in the district.

2.3 Data Collection

A questionnaire was employed for data collection. The questionnaire consisted of two sections. Section A contained the demographic variables of the sample (consisting of 20 questions) and section B comprised 80 questions ranging on a four-point Likert-type scale from 'strongly disagree' to 'strongly agree'. The demographic variables also represented some of the independent variables of the study reported on in this article and inlcude age, home language, language of learning and teaching (LOLT), learners' average obtained, and average class size. Section B of the questionnaire was further divided into sections representing the dependent variables (DVs) of the study as confirmed by exploratory factor analysis. These dependent variables inlcude the information processing ability of earners, cognitive engagement, metacognitive engagement, and conscious

awareness (i.e., focused attention) during the learning process. For this paper, the researchers only reported on information processing ability as a dependent variable.

2.4 Data Analysis

Issues pertaining to the validity and reliability of the questionnaire were addressed during the research. The validity of the questionnaire was ensured by conducting an exploratory factor analysis. Only items that had a regression weight of above 0.3 were selected for the final questionnaire. The reliability of the questionnaire items was measured conducting a Cronbach's alpha with software program SPSS Statistics. Frequency tables and graphs were drawn with SPSS Statistics software to project the pictorial version of the data using descriptive statistics to obtain measures of central tendencies such as frequency distributions, means, standard deviations and percentages. A quantitative data analysis was done by computing inferential statistics. Hierarchical Linear Modelling analysis was part of the inferential statistics done in the SPSS statistics package. Null-hypotheses were formulated to test statistical relationships between the independent and dependent variables of the study.

The researchers employed hierarchical linear modelling (HLM) to test the relative influence of the independent variables on the dependent variables. The HLM is defined as a generalisation and extensions of regression analysis model. HLM is also developed from Analysis of Variance (ANOVA) inferential statistics. It is in this regard that the HLM model explains variability across levels (Raudenbush & Bryk, 2002). HLM was employed because of its advanced computational capability to handle the nested nature of the data with learners nested in schools. These ANOVA-type HLMs were performed using IPA as dependent variable to assess whether the scores predict unique variance following the hierarchical nature of the data.

Each analysis took the same form, with school (independent variable) entered as subject (school) and biographical variables as factors. The HLM test indicated *statistically significant differences* in the dependent variables IPA across the specified levels of the independent variables. The respondents indicated their agreement with the items using a four-point Likert-type scale ranging from 1 (strongly disagree) to 4 (strongly agree). The independent variables for the study were age, home language, language of learning and teaching (LOLT), average obtained, and average class size. The dependent variable for the study included information processing ability (IPA). The HLM null hypothesis formulated refer to:

- There is no significant statistical difference between age and IPA
- There is no significant statistical difference between home language and IPA
- There is no significant statistical difference between LOLT and IPA
- There is no significant statistical difference between average obtained and IPA
- There is no significant statistical difference between learners' average class size and IPA

3. FINDINGS

This section discusses the results of the HLM null hypothesis.

3.1. Results of the Hierarchical Linear Modelling (HLM) null-hypotheses

Hypothesis 1

There is no statistically significant difference between ***age*** and IPA. Age was a significant predictor of IPA as obvious from F (635) = 2.681, p < 0.05 (0.031), *d* = 0.378. ***Therefore, the null hypothesis can be rejected.*** As identified during the *post hoc* test and testing the ES, the difference is evident between ages 17 and 19, with a small to medium ES (*d*) of 0.378. The highest level of agreement was reported for the age group 15 (M=3.454, SD=0.196), followed by the 19+ age group (M=3.419, SD=0.105); and the lowest level agreement was reported for the age group 16 (M=3.127, SD=0.082).

Hypothesis 2

There is no statistically significant difference between ***home language*** and IPA. Home language was a significant predictor of IPA as obvious from F (541) = 5.098, p < 0.05 (0.001), *d* = 0.354; 0.590; 0.601. ***Therefore, the null hypothesis can be rejected.*** As identified during the *post hoc* test and testing the ES, the difference is evident between the languages Afrikaans and Sesotho (*d* = 0.354), Afrikaans and IsiZulu (*d* = 0.590), and Afrikaans and English (*d = 0.601)*. This implies that learners speaking Afrikaans at home compared to learners speaking Sesotho at home differ significantly whereas the effect/strength of the difference reported 0.354 (small to medium effect). The respective effect/strengths of the difference between Afrikaans and IsiZulu is 0.590 (medium effect), and between Afrikaans and English 0.601 (medium to large effect). The highest level of agreement was reported for the home language group English (M=3.458, SD=0.146), followed by the IsiZulu group (M=3.444, SD=0.120); and the lowest level of agreement was reported for the Afrikaans group (M=3.000, SD=0.075).

Hypothesis 3

There is no statistically significant difference between ***LOLT*** and IPA. LOLT was a significant predictor of IPA as obvious from F (234) = 17.177, p < 0.05 (0.001), *d* = 0.440. ***Therefore, the null hypothesis can be rejected.*** The strength of the difference between learners with English as LOLT and Afrikaans as LOLT measured 0.440 which indicate a medium ES (*d*). The highest level of agreement was reported for the English LOLT group (M=3.308, SD=0.067), and the lowest level of agreement was reported for the Afrikaans LOLT group (M=2.977, SD=0.078).

Hypothesis 4

There is no statistically significant difference between ***average class size*** and IPA. Average class size was a significant predictor of IPA as obvious from F (322) = 4.028, p < 0.05 (0.008), *d* = 0.800; 0.720; 0.902. ***Therefore, the null hypothesis can be rejected.*** As identified during the *post hoc* test and testing the ES, the difference is evident between the below 20 and 20-30 class size (*d* = 0.800), below 20 and 30–40 (*d* = 0.720), and below 20 and 40+ (*d* = 0.902). This implies that learners in classes below 20 learners and learners in classes of between 20–30 differ significantly whereas the effect/strength of the difference reported 0.800 (large effect). The respective effect/strengths of the difference between classes below 20 and classes between 30–40 is 0.720 (large effect), and between classes below 20 and classes of 40+ is 0.902 (very large effect). The highest level of agreement was reported for the 40 + group (M=3.334, SD=0.117), followed by the 20–30 group (M=3.236, SD=0.091); and the lowest level of agreement was reported for the below 20 group (M=2.625, SD=0.190).

4. DISCUSSION and CONCLUSION

The aim of this paper was to explore how the brain processes information, and which factors affect the information processing ability of learners in the classroom. From the hierarchical linear modelling (HLM) analysis, it is evident that the independent variables age, home language, language of learning and teaching (LOLT), and average class size affected the information processing ability of learners in the classroom. As derived from the above hypothesis testing, IPA as a DV was significantly influenced by the following IVs: Age, Home Language, LOLT, and Average Class Size. Learners were of the opinion that Age was a significant predictor of IPA. This entails that learners felt that their information processing ability is strongly influenced by their age. The post hoc test revealed a medium strength difference between the learners aged 17 and 19. In discussing Age, 34% of learners were older than 17, which imply that these learners had repeated a grade at some stage in their high school career. The significance test further revealed that Home Language was a significant predictor of IPA. This means that learners are of the opinion that their home language influences their information processing cognitive engagement in the classroom. The post hoc and Cohen's d tests indicated that

there was a relatively large difference evident between Sesotho-speaking learners and Afrikaans-speaking learners.The hypothesis testing indicated that LOLT, as an independent variable, had a significant influence on IPA, which implies that learners feel that their information-processing ability in the classroom is greatly affected by their LOLT. The post hoc test revealed that a relatively large difference was evident between learners who have English as their LOLT in comparison to learners who have Afrikaans as their LOLT. According to learners, IPA is greatly influenced by their average class size. This means that learners attribute their information processing ability in class to how many learners are present in the class. The post hoc test revealed that learners in classes of less than 20 learners in the class differ significantly from learners in classes with over 30 and 40 learners.

Over the years of teaching and the concomitant experience that has evolved into ideas and compounded into an ideology about teaching and learning; the researchers tenaciously hold the view that education is not a neutral phenomenon. It is an ideology, with ideology conceived as a terrain on which people move and acquire consciousness of their position. It is proper to indicate that, precisely because education is ideological and an important mechanism for shaping societal values; teachers should not be left out but be at the front and centre of educational diffusion in schools as the vital part of teaching and learning. Whitman and Kelleher (2016) aver that teachers are brain changers. The researchers agree with the postulation of Whitman and Kelleher and are further of the opinion that teachers are indeed not neuroscientists, but surely regarded as brain changers. The researchers base their opinion on the fact that teachers are in one of the few professions that are responsible to change the brain daily and should therefore perhaps have a basic understanding of how the brain learns. This agrees with the statement of Tokuhama-Espinosa (2018) 'Teachers do more experiments in a day than a neuroscientist does in a lifetime'.

This paper conceptualised information processing ability of learners as the ability to learn. Efficient information processing would result in meaningful learning and understanding by the learners. Since various factors affect the learning ability of learners, recommendations to teachers on how to facilitate efficient information processing first and foremost include having a basic understanding of how humans learn, i.e., how the brain process information. Secondly, the researchers argue for a neuropedagogical approach to teaching and learning. Neuropedagogy is explained by Betts and Fourie (Fourie et.al., 2019) as 'an interactive and transdisciplinary approach to art of teaching and science of learning that builds upon the learning sciences, Mind, Brain, and Education science, and the concepts of neuroplasticity and neurodiversity; targeting and facilitating educational and real-world experiences through responsive curricula, instructional practices and design, active learning, assessment, and feedback to support comprehension, application, and transfer of learning across educational modalities (classroom, hybrid/blended, online) to meet the needs of all learners'. A neuropedagogical approach to teaching and learning could result in meaningful learning and understanding by the learners. It is hoped by the researchers that, employing these tactics, will render valid results that are consistent with the need to enhance learners' depth and breadth of processing information, and thereby become sophisticated and complex producers of knowledge. As Blakemore and Frith (2008:118) explain "We know a little of what goes on in the brain when we learn, but hardly anything about what goes on in the brain when we teach."

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5. REFERENCES

Anderson, J. R. (2007). Information processing modules and their relative modality specificity. *Cognitive Psychology*, 54, 185–217.

Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence, & J. T. Spence (Eds.), *The psychology of learning and motivation* (Volume 2) (pp. 89–195). New York: Academic press.

Bada, S. O. (2015). Constructivism learning theory: a paradigm for teaching and learning. *IOSR Journal of Research & Method in Education*, *5*(6), 66–70.

Blake, C. (2016). Metacognition in the classroom. Concordia university-Portland. Retrieved from: https://education.cu-portland.edu/blog/classroom-resources/classroom-metacognition/

Blakemore, S. & Frith, U. (2005). *The learning brain, lessons for education*. Australia: Blackwell Publishing.

Bridewell, W., & Bello, P. (2016). A theory of attention for cognitive systems. *Advances in Cognitive Systems*, *4*(1), 1–16.

Busch, B. (2017). What every teacher should know about memory. The Guardian. Retrieved from: https://www.theguardian.com/teacher-network/2017/oct/06/what-every-teacher-should-know-about-memory

Cherry, K. (2018). 11 methods for improving your memory. Verywell Mind. Retrieved from: https://www.verywellmind.com/great-ways-to-improve-your-memory-2795356

Cherry, K. (2019a). What is memory and how does it work? An overview of memory and how it works. VerywellMind. Retrieved from: https://www.verywellmind.com/what-is-memory-2795006

Cherry, K. (2019b). Cognitive psychology. Verywell Mind. Retrieved from: https://www.verywellmind.com/cognitive-psychology-4157181

Curtindale, L., Laurie-Rose, C., Bennett-Murphey, L., & Hull, S. (2007). Sensory modality, temperament, and the development of sustained attention: A vigilance study in children and adults. *Developmental Psychology*, *43*(3), 576–589.

Eggen, P., & Kauchak, D. (2014). *Educational psychology: Windows on classrooms* (9th ed.). New Jersey: Pearson Education Inc.

Fourie, M., Betts, K. & Miller, M. (2019). *The fish that climbs a tree: Pedagogies in context through the art and science of teaching*. Higher Education Learning and Teaching Association of South Africa (HELTASA) 2018 Conference.

Grahamstown.Fuchs, T. (2011). The brain – a mediating organ. *Journal of Consciousness Studies, 18*(7-8), 196–221.

Grösser, M. (2007). Effective teaching: linking teaching to learning functions. *South African Journal of Education, 27*(1), 37–52.

Gupta, A. (2017). How your brain's reticular activating system (RAS) determines your success. Retrieved from: https://www.fearlessmotivation.com/2017/10/16/reticular-activating-system/

Hall, A. (2016). The impact of cognitive load on working memory. Allen Hall EDU. Retrieved from: http://allenhalledu.com/2016/12/22/the-impact-of-cognitive-load-on-working-memory/

Haukas, A., Bjorke, C., & Dypedahl, M. (2018). *Metacognition in language learning and teaching*. New York: Routledge

Hedge, A. (2013). Human Information Processing – II. [PowerPoint slides]. Presented at the Cornell University, New York.

Heick, T. (2017). What is the cognitive load theory? A definition for teachers. TeachThought. Retrieved from: https://www.teachthought.com/learning/cognitive-load-theory-definition-teachers /

Heerema, E. (2018). Elaborative rehearsal: a better way to memorize. VerywellHealth. Retrieved from: https://www.verywellhealth.com/elaborative-rehearsal-a-better-way-to-memorize-98694

Huitt, W. (2006). The cognitive system. Educational Psychology Interactive. Valdosta, GA: Valdosta State University. Retrieved from: http://www.edpsycinteractive.org/topics/cognition/cogsys.html

Hurley, D. (2012). Science's long and successful search for where memory lives. Discover. Retrieved from: http://discovermagazine.com/2012/apr/13-long-successful-search-where-memory-lives

Jaeger, A., Shipley, T. F., & Reynolds, S. J. (2017). The roles of working memory and cognitive load in Geoscience learning. *Journal of Geoscience in Education*, *65*(4), 506–518.
Jensen, E. (2008). *Brain-based learning. The new paradigm of teaching* (2nd ed.). California: Corwin.
Kandarakis, A. G., & Poulos, M. S. (2008). Teaching implications of information processing theory and evaluation approach of learning strategies using LVQ neural network. *WSEAS Transactions on Advances in Engineering Education*, *3*(5), 111–119.
Kim, D. G., & Lee, J. (2014). A study on improving information processing abilities based on problem-based learning. *Turkish Online Journal of Distance Education, 15*(2), 41–52.
Krause, K. L., Bochner, S., Duchesne, S., & McMaugh, A. (2009). *Educational psychology: For learning and teaching* (3rd ed.). United Kingdom: Cengage Learning.
Kuhn, D., & Dean, D. (2004). Metacognition: A bridge between cognitive psychology and educational practice. *Theory into Practice*, 43, 268–273.
Laxman, K., & Chin, Y. K. (2010). Brain-based education: its pedagogical implications and research relevance. *Journal on Educational Psychology*, *4*(2), 1–5.
Malamed, C. (2010). 20 Facts you must know about working memory. The eLearning Coach. Retrieved from: http://theelearningcoach.com/learning/20-facts-about-working-memory/
Marchetti, G. 2014. Attention and working memory: two basic mechanisms for constructing temporal experiences. *Frontiers in Psychology*, *5*(880), 1–15.
Mastin, L. (2018). The human memory. Retrieved from: http://www.human-memory.net/types_sensory.html
Mayer, R. E. (2008). *Learning and instruction* (2nd ed.). Upper Saddle River, NJ: Pearson.
Mayer, R. E., & Wittrock, M. C. (2006). Problem solving. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 287– 303). Mahwah, NJ: Erlbaum
McLeod, S. A. (2010). Long-term memory. Simply Psychology. Retrieved from: https://www.simplypsychology.org/long-term-memory.html
Meltzer, L., Pollica, L. S., & Barzillai, M. (2007). Executive function in the classroom: Embedding strategy instruction into daily teaching practices. In L. Meltzer (Ed.), *Executive function in education from theory to practice* (pp. 165-193). New York: Guiford.
Nketsia, J. E. (2013). Influence of parental styles on adolescents' self-esteem. University of Ghana. Retrieved from: https://www.academia.edu/5105903/The_Influence_of_parental_style_on_Adolescents_self_esteem
Ormrod, J. E. (2008). *Educational psychology: Developing learners* (6th ed.). New Jersey: Pearson Education Inc.
Paas, F., & Ayres, P. (2014). Cognitive load theory: a broader view on the role of memory in learning and education. *Educational Psychology Review, 26*(2), 191–195.
Paterson, D. (2017). Making practical work more effective. Education in Chemistry. Retrieved from: https://eic.rsc.org/feature/making-practical-work-more-effective/3008027.article
Petersen, S. E., & Posner, M. I. (2012). The attention system of the human brain: 20 years after. *Annual Review of Neuroscience*, *35*(1), 73–89.
Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks. CA: Sage.
Reisberg, D. (2013). *The oxford handbook of cognitive psychology*. New York: Oxford University press.
Schacter, J., & Thum, Y. M. (2004). Paying for high-and-low-quality teaching. *Economics of Education Review*, *23*(1), 411–430.
Schellenberg, S., Negishi, M., & Eggen, P. (2011). The effects of metacognition and concrete encoding strategies on depth of understanding in educational psychology. *Teaching Educational Psychology, 7*(2), 17–24.
Schwartz, D., & Heiser, J. (2006). Spatial representations and imagery in learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 283–298). New York, NY: Cambridge University press
Snowman, J., & McCown, R. (2015). *Psychology applied to teaching* (14th ed.). USA: Cengage Learning.
Sousa, D. A. (2011). *How the brain learns* (4th ed.). California: Corwin.

Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M. (2016). *Psychology*. Houston, TX: Open Stax, Rice University.

Stanfield, J. 2018. The role of memory in learning: increasing the impact of education. Ausmed Education. Retrieved from: https://www.ausmedcorporate.com/memory-and-learning/

Terry, S. (2006). *Learning and memory: Basic principles, process, and procedures* (3rd ed.). Boston, MA: Allyn & Bacon.

Van Amburgh, J. A., Delvin, J. W., Kirwin, J. L., & Qualters, D. M. (2007). A tool for measuring active learning in the classroom. *American Journal of Pharmaceutical Education, 71*(5), 85.

Van der Merwe, M. (2013). *Perceived levels of teacher efficacy and locus of control at secondary schools in Lejweleputswa school district*. (Unpublished master's dissertation). Bloemfontein: Central University of Technology, Free State.

Visser, M. (2018). *The influence of a flipped classroom on the learning approaches of first-year speech-language and hearing therapy students*. Stellenbosch University. Research Assignment.

Willis, J. (2012). A neurologist makes the case for teaching teachers about the brain. Edutopia. Retrieved from: https://www.edutopia.org/blog/neuroscience-higher-ed-judy-willis

Wilson, D., & Conyers, M. (2016). *Teaching students to drive their brains*. USA: ASCD.

Whitman, G. & Kelleher, I. (2016). *Neuroteach, brain science and the future of education*. London, UK: Rowman & Littlefield.

Wolfe, P. (2018). *The neuroscience of teaching and learning: A trainers' manual*. Orlando,FL: ASCD.

Woolfolk, A. (2007). *Educational psychology* (10th ed.). United States: Pearson Education Inc.

Review Article

Management of Students in Islamic Boarding Schools *

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Abstract

This article describes the management of Islamic boarding school students in the context of School Based Management (SBM). This study uses a qualitative research approach with a single case study method. Daarul Rahman Islamic Boarding School was chosen as a place of research because it is the oldest Islamic boarding school in Jakarta. This research data collection technique uses observation, interviews and documentation studies. Interviews were conducted with the Boarding School Board of Trustees, Principals, Teachers, students and graduated. The research procedure used in this study consists of several steps of research with case study methods namely research planning, research data collection, research data analysis, and making research reports. The analysis of research is done through pairing patterns. Testing the validity of the data through triangulation of data sources and triangulation of techniques. The results showed: student management in terms of acceptance, learning process, and evaluation of learning as well as graduated ties that helped in organizing education. Islamic boarding schools applied the principles of SBM namely partnership, openness, participation, independence and accountability.

Keywords: School-based management, islamic boarding schools, management students

1. INTRODUCTION

Islamic boarding schools are educational institutions that have been developing for a very long time in Indonesia. Boarding schools is an educational institution especially in the field of Islamic Religion. According to the large Indonesian dictionary namely Boarding schools is a dormitory where students or students learn to recite. Islamic boarding schools are places of education and teaching that emphasize Islamic religious instruction and are supported by dormitories as permanent residences for students (Hanisy, Anam, Arifin, & Syaikhotin, 2016; Patoni, 2007). Education boarding schools are considered capable of combining general education and morals of students (Arifin, 2012; Rochayati, Zamroni, & Sudira, 2018; Rouf, 2016). With its own uniqueness and uniqueness, boarding schools have values that are not found in public schools. The values owned by boarding schools in the presence of Kiai in a boarding schools add to the characteristics of a boarding schools in applying its learning.

School-based management is considered capable of facilitating students in their educational needs because it is more autonomous. The importance of student management in order to find out how students return to helping the school in the development of the school. Community support with the autonomy and flexibility of the SBM system will be able to implement programs that are better and faster in accordance with the needs of students. With the existence of very strong community support in the SBM system it will influence the decision making that the boarding schools will take to meet the

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primary needs of students (Arar & Abu-Romi, 2016; Bulut, 2020; Susilo, Kartowagiran, & Vehachart, 2018). With the basic autonomy given to boarding schools, the administrative authority of the central government will be displaced by seeing the boarding schools needs for the students themselves. As well as the results of Makmun's research stating that: Islamic boarding school education is easier to shape the character of its students because this educational institution uses a dormitory system that allows it to apply the values and worldviews it holds in the daily lives of students (Makmun, 2014). Besides that, one of the characters built by Islamic boarding school in learning is independence. The independence of students is seen in life in Islamic boarding schools which relates to how independent students are to eat, drink, wash clothes to independence in learning (Sanusi, 2012). because everything that is done by students, will always be covered by the value of faith (Chotimah, 2013). In fact, students who have graduated and returned to society, when their teacher has died, there is a moral obligation to pray for him through a pilgrimage to the grave. This bond of moral and emotional values is very important so that Muslims are always in bond (Kahar, Barus, & Wijaya, 2019).

The reason behind decentralization is by giving administrative authority and educational activities from the central government to schools that the school leadership knows what the school needs so it will make the right decision. SBM is considered able to improve the quality of schools, improve the quality of teaching programs and support the quality of the work environment within the school itself (Akçetin, Çelik, Yaldır & Keleş, 2017; Çakır & Özkan, 2019; Raynolds, 2004). This is stated in Law Number 20 of 2003 concerning the National Education System, Article 51 paragraph 1 which states that: Management of early childhood education units, basic education and secondary education is carried out based on minimum service standards with the principles of School. Indonesian Government Regulation No.13 Year 2015 concerning the second amendment to Government Regulation No.19 of 2005 Article 49 Paragraph (1) concerning National Education Standards Chapter VIII Standards for Management of Education Units which states: Management of educational units at the level of primary and secondary education applies based management schools that are shown by independence, partnership, participation, openness, and accountability (Regulation, 2015).

2. METHOD

The data of this study were collected during the implementation of the grand tour observation, mini tour observation and participant observation. Research data is the raw material collected by researchers from the research location carried out, so that the data becomes the basic material for researchers to conduct data analysis. The data in this study, including things that were actively recorded by researchers during the research process, including field notes from observations and field notes from interviews. Then the results of the interviews were analyzed with the results of observations and documents. The research procedure used by the case study method research from Robert K. Yin research steps with the case study method namely:

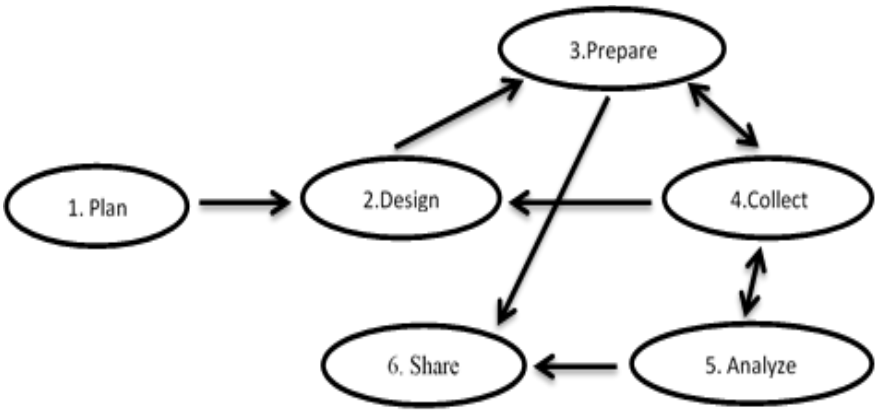

Figure 1. Steps of the case study research method (Yin, 2009)

The subjects of this research are people who know at the same time become the perpetrators of the activities about the management of students at Daarul Rahman Islamic Boarding School. The selection of informants is done purposively, that is based on the intent and purpose, including: Guidance, School Principal, Teacher Board, Graduated, Students, Community.

Determination of the informants in this study was done by purposive sampling and snow ball sampling, which is asking the informant to appoint other people who can provide information. Informants who enter the school management organizational structure is people who are directly involved in the management of students in Islamic boarding schools. While the document data is often referred to as secondary data in the form of documents related to graduated empowerment management, guidebooks, vision and mission Daarul Rahman until the end of the research.

Qualitative research method is a research whose benchmark is not a number but a descriptive one. Data analysis includes: testing, grouping, inserting into tables, testing, or recombining evidence/data, to draw data-based conclusions. The instrument of this study was the researcher, so the previous researcher had possessed a broad theory and insight, so that he was able to ask questions, analyze, photograph, and construct the object under study to be clearer and more meaningful

3. FINDINGS and DISCUSSION

In research findings that the management of students in Islamic boarding schools is applied to the cultural values of Islamic boarding schools. This can be seen in the compliance with all the rules that apply in Islamic boarding schools. This discipline aims to shape the character of students to be able to face the real life after graduating from school. This research is seen from the management of students based on student acceptance, the learning process, learning evaluation and alumni ties as seen from the principles of applying school-based management.

3.1 Management of Student Acceptance

The management of Daarul Rahman Islamic Boarding School students is seen from the new student admission system, learning activities, learning evaluation and management of graduated ties. In terms of acceptance of new students, Daarul Rahman Islamic boarding school opens new student admissions before students of the Elementary School (SD) school exams or the National Examination (UN). Based on the new student admission brochure usually Daarul Rahman Islamic boarding school opens registration for the first wave to enter the beginning of the second semester, around April. It aims to see the seriousness of prospective students to study in Islamic boarding schools, not as a final choice if not accepted in public schools. The second wave was opened in May, while the third wave was intended for prospective students from outside the island of Java and abroad. Students who register at Boarding schools do not only come from Indonesia but also from abroad. At present the number of students coming from outside Java is 10%. While from abroad numbered 4 people. This shows the existence of a high level of trust from parents or the community to entrust their children in studying at the Daarul Rahman Islamic Boarding School (Nadinloyi, Hajloo, Garamaleki, & Sadeghi, 2013).

Like other schools prospective students also have to go through an entrance test. The test given is in the form of a written test, an interview test and an understanding of the book. The different thing is the term "dropping out of class" during the test. Based on research data triangulation, namely:

> *The new student admission system adopted by the Daarul Rahman Islamic Boarding School, namely by means of tests according to the ability of the students themselves. Students must be able to take all the tests given by the Islamic boarding school. If it does not meet the criteria, students will go to class.*

Dropping the class is intended if prospective students test for the fourth level (one high school), but are unable to answer the fourth grade test questions, it will be accepted in third or second

class, according to their ability. The ability of students can be seen from the results of acceptance tests. Based the student admission test sheet this means students must be able to complete tests in terms of reading the Al-Qur'an, writing Arabic, oral tests and book tests. At least prospective students are able to pass the Insha test which is a composing test, there is also a Tamrin Lughoh test which is an Arabic learning method or often called Arabic training. In addition, prospective students are also required to be able to use Shorof and Nahwu in Arabic. Based on observation This test is the basis for the acceptance of new students that must be passed by students.

Admission of new students at the Daarul Rahman Islamic Boarding School is done online and offline. Admission of new students online has become a necessity today according to the times. Ardhi's research results state that in terms of student acceptance of the real time online system produces: 1) the level of achievement of the PPDB program online real time system is in accordance with the plan that is 94.6%; 2) the objective of the PPDB online real time system program is 97.4% with the appropriate category; 3) the service quality of the PPDB committee is 93.9%, which shows that the service quality of the PPDB committee is in the appropriate category; 4) the benefits of the PPDB online real time system program by 98% (Ardhi, 2015). This shows that the benefits of new student enrollment online real time system increases public confidence and increases the effectiveness of the implementation of new student admissions. Student acceptance through online shows the principle of transparency or openness to increase public confidence in schools (Cornell, 1989; Zimmerman, 2000). This community trust has an impact on the reputation of Islamic boarding schools in the eyes of the community (Nadinloyi et al., 2013).

The use of student acceptance methods online and tests are able to make students in one class have almost equal understanding. Such understanding will certainly facilitate teaching and learning activities. Besides selection in this way will be able to see the potential of students who will be developed in teaching and learning activities. This certainly can help students in learning, because an individual needs help and help each other to become someone professional (Zimmerman, 2000). This principle of openness is used by Islamic boarding schools in the acceptance of new students. As well as accountability Islamic boarding schools that have data online that can be accessed at any time with data that can be accounted for and able to use the principle of openness.

3.2 Management of Learning Process

The learning activities of Daarul Rahman Islamic Boarding School students begin at 3 am to 10 or 11 at night. A busy schedule every day must be able to be passed by students in learning activities in Islamic boarding schools. In organizing the Daarul Rahman Islamic Boarding School education, graduated share in helping learning activities in Islamic boarding schools. This is based on the analysis of HKP-02-02 namely:

> *Student learning activities begin from before dawn until night every day. Learning activities carried out on a family-based basis. The existence of graduated to contribute in helping the implementation of education in Islamic boarding schools.*

Habituation of time in learning will increase discipline in students. Setting the learning time applied Islamic boarding school is a principle of independence. Like the concept of time management associated with students namely: Keeping a good time will make you more successful in the future (Nadinloyi et al., 2013). This pattern of learning activities can foster an attitude of self-discipline. Each student is responsible for themselves and hones their independence for their future life.

With two learning systems used by Daarul Rahman Islamic Boarding School, this learning pattern distinguishes Islamic boarding school learning from general learning. Study Al-Qur'an after evening prayer. This is a characteristic of learning at Daarul Rahman. Students are provided with book material so that they are accustomed to understanding the book and practicing it in everyday life. With the traditional teaching and learning methods that are still being used by Daarul Rahman Islamic

Boarding School, the Islamic Boarding School is still in great demand by parents to include their children to study in the oldest Islamic boarding school in Jakarta.

Learning patterns like this can also make students able to manage time well. Students who violate the above provisions will be subject to sanctions by the board. This obedience is the values instilled in each student that is a true Muslim personality trait (Kahar et al., 2019). Stated that with good time management, it means that a student spends enough time for his academic progress (Nadinloyi et al., 2013). This habituation in learning revealed that states that learning activities will go well if all steakholders support the needs of students (Mc Combs, & Miller, 2007). This proves that the concept of SBM provides space for educational institutions and students to determine their own destiny in the principles given about independence in determining the learning process undertaken. The principles of SBM that are used in Islamic boarding schools in accepting students are also the participation of graduated who have a positive impact on society.

With such a large number of students at around 3000 students, Islamic boarding schools have formed student management or organizations to assist in the process of providing education. The organization, the male student organization, is called IP3DR (Daarul Rahman Islamic Boarding School Student Association), while the female student organization is called IP4DR (Daarul Rahman Islamic Boarding School Student Association). Change of management is done every mid-school year. Management is carried out by students in class 5. The task of the administrators is to help the teachers to discipline students. The administrators helped remind the juniors in carrying out the applicable regulations in Islamic boarding schools. At this time, the students learn to organize and get to know their juniors. In this way it will foster the family attitude of the seniors to their juniors. In the case of disciplining a junior who does not comply with the rules, the senior may only record and have no right to punish him. The formation of this organization also forms a pattern of developing the culture of Islamic boarding schools through organizational skills. This will create a sense of responsibility and kinship (Borges, Ferreira, Borges de Oliveira, Macini, & Caldana, 2017; Cahyono, 2016; Widodo, 2016).

With the formation of student organizations, students are trained to have a sense of solidarity, strong kinship, mutual communication between fellow students and students to educators and scholars. This is in line with what Clark expressed: That the most extracurricular activities can develop the most employability skills but that not each activity Affects each skill equally (Clark, Marsden, & Whyatt, 2015). Extracurricular activities are expected to improve the skills of students in useful things (Clark et al., 2015; Thompson, Clark, Walker, & Whyatt, 2013). With extracurricular activities students are trained to learn to live in a community, lead and be led. Learners who are required to carry out instructions given by educators and other boarding school administrators. This has an impact on the cultural values of the boarding school that are implanted. This reinforces the emotional bond between the teacher and students. Causing the relationship between the two to last for life. In fact, students who have graduated and returned to the community, when their teacher has died, there is a moral obligation to pray through the grave pilgrimage. This is in line with what Kahar said: The bond of moral and emotional values is very important so that Muslims are always in bond (Kahar et al., 2019). Among the ideals of boarding schools education is to produce students who are independent and foster themselves so as not to depend their lives on others (Rahim & Mochtar, 2001). For this reason, students in running a business always feel that he is supervised by Allah and instilled the values of sincerity in doing something.

3.3 Management of Learning Evaluation

The results of student learning evaluation in Daarul Rahman Islamic boarding school are in the form of report cards. Based on research data triangulation: The results of student learning evaluations are carried out through cottage tests and report cards. The students must complete 42 subjects consisting of 12 general subjects which will be tested nationally and 30 Islamic subjects. Islamic

subjects study Arabic learning methods and books. The results of the evaluation in report cards are in the form of numbers and are ranked. Report cards are written by the homeroom teacher based on grades from the subject teacher. Exams are conducted twice a year. Students who move up the class must have an average value of 6.5 and have a good attitude. The use of report cards with 42 subjects makes students have varying abilities based on subjects. The large number of subjects makes students trained in many fields of ability. This will make enough provision for students to face life's challenges later. This is in accordance with Government Regulation number 32 year 2013 concerning Educational Assessment Standards which includes criteria regarding the mechanisms, procedures, and instruments for assessing student learning outcomes (Regulation, 2013).

Forty-two subjects in report cards represent the difference between the evaluation of other schools with Daarul Rahman. Students must pass all subjects with an average grade of at least 6.5. In addition, attitude is the main supporting factor for a student to graduate or not. No matter how good the grades obtained by students, but does not show good morals will still not go up in class. Because Daarul Rahman Islamic Boarding School is an Muadalah education unit, it refers to the Regulation of the Minister of Religion Number 18 of 2014 concerning Assessment and Graduation Article 24 paragraphs 1 to 3 states:

(1) Educational assessment in muadalah education unit is carried out by educators and education units.
(2) Assessment by the educator as referred to in paragraph (1) is carried out on an ongoing basis aimed at monitoring the learning process and progress of students.
(3) The assessment by the education unit as referred to in paragraph (1) is carried out to assess the achievement of the competencies of all subjects and the competencies of the graduate students at each level of the muadalah education unit (Religion, 2014).

From this basis, the evaluation of learning conducted by Islamic boarding schools in assessing student learning outcomes. If viewed from the context of SBM, the results of this evaluation are the principle of independence implemented by Islamic boarding schools. With that, the boarding school accountability can be accounted for, because this has a basis or reference in assessing the learning process.

For high school level equivalent, it is necessary to make students know the direction after graduating. The direction can be in the form of vacancies or job opportunities, can also see the purpose of further study. When students know their direction, they will be able to increase student awareness for their future. The important role of student work placement and appreciation in learning is the main thing for students (Hawley & Whitman, 2019; Jackson & Wilton, 2016). A clear understanding of job opportunities further study will help in producing graduates who are aware of their career aspirations.

This has basically been done by the Daarul Rahman Islamic Boarding School. Islamic boarding schools in helping graduates always hold seminars or workshops in dissecting the direction of students. With the training or seminar held by Daarul Rahman Islamic Boarding School graduated, students will increasingly understand the direction they are studying. Daarul Rahman Islamic Boarding School graduated association is very strong. Graduated work together in building Islamic boarding schools. Graduated assist in financial and ideas for the better implementation of Islamic boarding school activities. Religious events are fully funded by graduated. The high participation of graduated is inseparable from the family values that have been embedded in the graduated since hospitalization. These family values come from the dorm life together. This is based on HKP-02-04 states: Daarul Rahman Islamic Boarding School graduated association is helping to organize education in Daarul Rahman Islamic Boarding School in terms of finance, teacher development, and Islamic boarding school events.

3.4 The Role of Graduated Association

Association activities that support Islamic boarding schools such as the development of teachers by making training that adds skills. The graduated association also funds the pilgrimage of Islamic boarding school teachers at least two people a year. In addition, the graduated association also built a new boarding school building. Graduated development is in accordance with the needs of the boarding schools itself (Fathorrazi & Rifqi, 2017). The high participation of graduated in Daarul Rahman proves that Islamic boarding schools have strong graduated ties. This shows the principle of participation and partnership. Graduated participate in every cottage activity, and even take the initiative to do their own activities that have a positive impact on the cottage. Strength like this is not found in other Islamic boarding school ties. Graduated associations are very active in contributing to advancing Islamic boarding schools. The system adopted by the boarding schools has an influence on the character it forms. Therefore, an boarding schools graduated has an attitude and character that is different from other boarding schools graduated, because he is influenced and shaped by the style of the boarding schools where he studied (Makmun, 2014).

Graduated participation is one of the real ways to improve students' skills in the world of work. This is done by the graduated in helping Daarul Rahman Islamic Boarding School graduated who already have jobs or businesses by recruiting graduated who have finished studying. This is intended so that the love of students to return to devote themselves to Islamic boarding schools does not just disappear by continuing to uphold the values of religious life that had been built while studying at Daarul Rahman Islamic boarding school.

The graduated activities above illustrate the high participation of graduated of Daarul Rahman in developing Islamic boarding schools. States that the position of graduated is an intangible asset in building universities, one of the greatest potential to donate to his alma mater (Li, 2014). This is an important role in education funding, so the role of graduated is an important concern in helping universities. Activities - activities outside the lessons Daarul Rahman Islamic boarding school is certainly considered to be able to help students in determining work up to 30% (Elert, Andersson, & Wennberg, 2015).

For example, at Havard University Graduated contributions reach 40-50%. This fact explains that the fundraising of graduated associations in America has become an important role in Higher Education (Li, 2014). In this case, the graduated of Daarul Rahman Islamic Boarding School also did the same thing with the graduated in America in assisting the administration of education in the Daarul Rahman Islamic boarding school, so that the Daarul Rahman Islamic Boarding School still maintains its existence in the education world today. Management of Islamic education must be able to be a change in the management of education, by inspiring, influencing, mobilizing through exemplary values, and the nature of divinity and prophethood, namely; siddiq (integrity), trust, fathanah (working) so that it can influence people's actions by inspiring without indoctrinating, awakening without hurting, awakening without coercing and inviting without governing (Fauzi, 2017). The psychological approach developed by Islamic boarding school leaders with graduated in increasing the commitment of graduated will mutually benefit Islamic boarding schools and graduated who have an interest.

Someone can commit to an institution has three stages namely: The first stage of the commitment of graduated in helping boarding schools is the most basic, because of a sense of compliance, in this case because someone expects rewards or fear of punishment. Then proceed to the next stage of the identification or self-introduction stage into an organization or boarding school which provides an opportunity to establish relationships with other graduated. The last stage is the stage of direct involvement between graduated and Islamic boarding schools by maintaining good relationships and ownership (O'Reilly & Chatman, 1986). This attitude of commitment that is maintained by the leadership of Islamic boarding schools in the concept of empowering graduated at the Daarul Rahman

Islamic boarding school is a strength that is the key to an organization that can continue to achieve its goals.

Kiai's empowerment of graduated in managing Daarul Rahman Islamic boarding school students. The Kiai immediately provides role models to students and graduated in their daily lives. So that what is embedded in the students is the sincerity and family values that have been presented in the boarding school's happiness. If the value system in an organization can be understood, it will increase the productivity of performance and commitment to the institution (Wibowo, 2006). Students to comply according to the laws of Islamic boarding school is none other than the advice of the Kiai, then the figure of a Kiai in raising up his students is the main thing in moving and advancing Islamic educational institutions in the form of Islamic boarding schools (Wesarat et al., 2015). This linkage makes a wider internal network with various fields that have been occupied by the graduated at this time to jointly help each other fellow graduated Daarul Rahman Islamic boarding school.

From the explanation above, it can be described school-based management in managing students at Daarul Rahman Islamic Boarding School as follows:

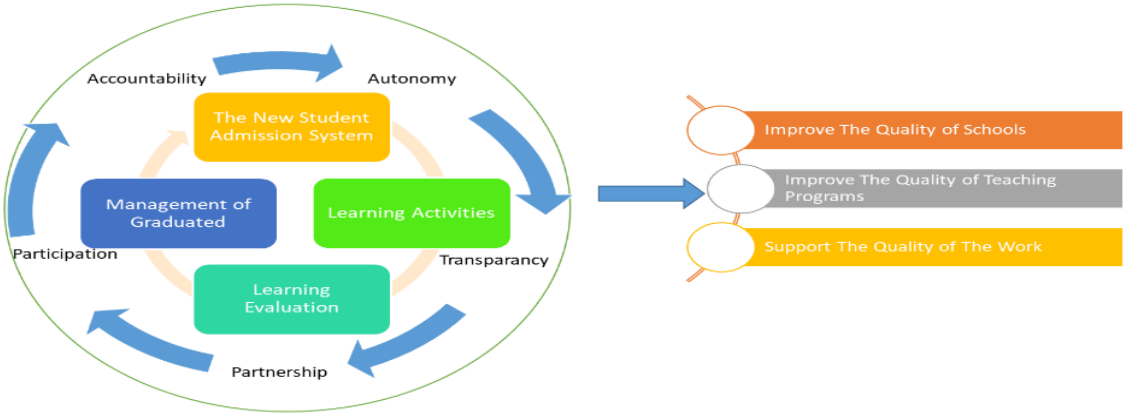

Figure 2. School based management in the management of students

So, the management of students in Daarul Rahman Islamic Boarding School from the admission stage of new students using conventional and online methods. Admission of students early registration from public schools makes its own advantages for Daarul Rahman Islamic boarding school. This method is considered effective in increasing the number of students. Learning activities of students are accustomed to living with an atmosphere of independence and are based on sincerity in Islamic boarding schools. If the student test results are not in accordance with the passing standards of the class, the students will go down the class.

The results of the evaluation of student learning with the assessment in the form of report cards for grade. The increase in class is determined from the results of the report card grades. Students who have graduated from Islamic boarding schools form associations and help organize education in the Daarul Rahman boarding school. Viewed from the side of school-based management that prioritizes flexibility and efficiency, the flexibility of the students is done by adjusting quickly in learning and flexibility in the learning time in Daarul Rahman Islamic boarding school. While the efficiency of graduated ties is done in helping the organization of education in accordance with the needs of students. So that students are able to position themselves or position themselves in social interaction between students and the community. Students are given responsibility for themselves in studying in Islamic boarding schools.

This learning pattern is expected for students to be able to manage time well. Students who violate the above provisions will be subject to sanctions by the administrator. This obedience is the values instilled in every student which is a true Muslim personality trait (Kahar et al., 2019). This is

also in line who stated that good time management means that a student spends enough time for his academic progress (Nadinloyi et al., 2013). This habituation in learning is in line with what Combs said which states that learning activities will run well if all stakeholders support the needs of students (Mc Combs, & Miller, 2007). That most extracurricular activities can develop most employability skills but that not each activity affects each skill equally (Clark et al., 2015). Extracurricular activities are expected to improve the skills of students in useful things (Thompson et al., 2013). This proves that the SBM concept provides space for educational institutions and students to determine their own destiny. The principle of independence in determining the learning process undertaken by the students.

That the alumni are part of the community who have a special attachment to an organization because the people who follow from a school or college for life are people who have completed their education at school or college. This linkage creates a wider internal network with various fields that the current alumni have engaged in to help each other together. In this case, boarding school connects alumni to continue to be able to contribute to helping students who will graduate from boarding school. The alumni help in terms of promotion to continue their education to a higher level. This is intended to foster the commitment of boarding school graduates so that in the future Daarul Rahman Islamic Boarding School alumni will return to jointly promote Islamic Boarding Schools.

4. CONCLUSION

The management of students in Daarul Rahman Islamic boarding school in the context of SBM is seen from the aspect of acceptance in the form of an entrance test, evaluation in the form of report cards and the presence of graduated ties. (a) If seen from the principle of independence in the aspect of student acceptance, it can be seen from the opening of the registration of new students before the National Examination (UN) is conducted in elementary schools. With the opening of acceptance earlier than public schools or other boarding schools this will impact the appearance of students who really intend to enter the boarding school. Judging from the principle of partnership in the aspect of acceptance of new students by Islamic boarding schools, it can be seen from the graduated who have children or relatives to return to boarding schools. This continues to be forged between Islamic boarding schools and graduated and the community. This also had an impact on the high participation of the community and graduated to send their children to Islamic boarding schools.

This shows a high level of trust in the community to include their sons and daughters in Daarul Rahman Islamic boarding school. The principle of openness used by Islamic boarding schools in accepting students to enter boarding schools with the existence of tests conducted openly in accordance with the level of students. The principle of accountability seen from the Daarul Rahman Islamic Boarding School by providing entrance tests in accordance with the level of the students' class, which if unable to take a series of tests conducted will drop in class in accordance with the test ability of the students. (b) The aspect of evaluating learners' learning from the principle of independence seen from the form of a boarding school report card that the contents of the subject matter can be developed according to the needs of students and the times that continue to develop. In the evaluation of learning conducted by Daarul Rahman Islamic Boarding School, the principle of partnership between modern Islamic boarding school and the development of subjects continued to be seen. This is due to the participation of graduated and the community who actively participated in the evaluation of the Daarul Rahman Islamic Boarding School learning. The principle of openness of subjects with the evaluation conducted by the Islamic boarding school is recorded in all report cards from grade 1 to grade 6. If the student enters not from grade 1 or the equivalent of junior high school, this can also be seen from the results of the tests that students do during registration. The principle of accountability has become very important in the evaluation of learning conducted by Daarul Rahman Islamic Boarding School by using tests at the beginning of the entry until after completing learning in the form of a Islamic boarding school report card. (c) The aspect in the management of the next student is the graduated

association in the Daarul Rahman Islamic boarding school. Judging from the principle of independence, it is clear that the ties of the Daarul Rahman Islamic Boarding School graduated have their own legality. From the principle of partnership carried out by Islamic boarding schools with graduated ties, it can also be seen from the assistance of graduated in organizing Daarul Rahman's Islamic boarding school education. This also has an impact on the existence of graduated association forum for graduated participation which has an influence on the management of students in Daarul Rahman Islamic Boarding School. The openness of the graduated association program in helping students to continue their higher education levels is an added value for the Daarul Rahman Islamic Boarding School. The principle of accountability can be seen by the existence of SK notary ties of graduated who have legal force who are partners of Islamic boarding schools in supervising and assisting the implementation of education. The management of students in Daarul Rahman Islamic boarding school has used the principles of school-based management and is based on government regulations that still maintain the quality of education in Islamic boarding schools.

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5. REFERENCES

Akçetin, E., Çelik, U., Yaldır, A. & Keleş, A. (2017). Designing undergraduate curriculum for management information systems (MIS) education: A comparison of the MIS programs of Turkish universities with those of global universities. *Journal of Computer and Education Research, 5* (9), 50- 60. https://doi.org/10.18009/jcer.90803

Arar, K., & Abu-Romi, A. (2016). School-based management: Arab education system in Israel. *Journal of Educational Administration*, *54*(2), 191-208. https://doi.org/10.1108/JEA-09-2014-0118

Ardhi, M. I. (2015). Evaluasi manajemen penerimaan peserta didik baru sistem real time online dinas pendidikan kota yogyakarta. *Jurnal Penelitian Ilmu Pendidikan*, *8*(1), 80-94.

Arifin, Z. (2012). Perkembangan pesantren di Indonesia. *Pendidikan Agama Islam*, *9*(1).

Borges, J. C., Ferreira, T. C., Borges de Oliveira, M. S., Macini, N., & Caldana, A. C. F. (2017). Hidden curriculum in student organizations: Learning, practice, socialization and responsible management in a business school. *International Journal of Management Education*, *15*(2), 153-161. https://doi.org/10.1016/j.ijme.2017.03.003

Bulut, A. (2020). Sınıf yönetimi becerisinin ölçümü: okul öncesi öğretmenleri üzerine kesitsel bir tarama [Measurement of classroom management skills: A cross sectional study on preschool teachers]. *Journal of Computer and Education Research, 8* (16), 590-607. https://doi.org/10.18009/jcer.741388

Cahyono, A. E. (2016). Penanaman karakter kewirausahaan di pondok pesantren nurul islam jember sebagai upaya mempersiapkan santri menghadapi MEA. In Prosiding Seminar Nasional dan Call for Paper ke-2 Pengintegrasian Nilai Karakter dalam Pembelajaran Kreatif di Era Masyarakat Ekonomi ASEAN.

Chotimah, C. (2013). Pendidikan kewirausahaan di pondok pesantren sidogiri pasuruan. INFERENSI, *Jurnal Penelitian Sosial Keagamaan*, *8(*1), 115–136. https://doi.org/10.18326/infsl3.v8i1.114-136

Clark, G., Marsden, R., & Whyatt, J. D. (2015). 'It's everything else you do …': Alumni views on extracurricular activities and employability. https://doi.org/10.1177/1469787415574050

Cornell, G. E. (1989). Empowennent and family support. *Networking Bulletin*, 1, 1-24.

Çakır, Ç. & Özkan, M. (2019). Investigation of inschool factors affecting distributed leadership practices. *Journal of Computer and Education Research, 7*(14), 383-417. https://doi.org/10.18009/jcer.584459

Elert, N., Andersson, F. W., & Wennberg, K. (2015). The impact of entrepreneurship education in high school on long-term entrepreneurial performance. *Journal of Economic Behavior and Organization*, 111, 209-223. https://doi.org/10.1016/j.jebo.2014.12.020

Fathorrazi, A., & Rifqi, A. (2017). Alumni management at islamic boarding school (Case study at pondok pesantren nurul jadid). *International Research-Based Education Journal*, *1*(1), 2-5.

Fauzi, A. (2017). *Manajemen pendidikan ıslam di pesantren; berbasis kearifan lokal kajian fenomenologis*. Seminar Nasional Pendidikan, Fakultas Ilmu Pendidikan Universitas Negeri Malang, 51-62.

Hanisy, A., Anam, N., Arifin, Z., & Syaikhotin, S. (2016). Pengembangan pondok pesantren sebagai subkulutur di tengah arus globalisasi [Studi Multikasus di Pondok Pesantren Raudlatul Ulum dan Nurul Islam I Jember Tahun 2016], 186–200.

Hawley, T. S., & Whitman, G. M. (2019). Fear and learning in student teaching: Accountability as gatekeeper in social studies. *Journal of Social Studies Research, 44*(1), 105-115. https://doi.org/10.1016/j.jssr.2019.04.003

Jackson, D., & Wilton, N. (2016). Developing career management competencies among undergraduates and the role of work-integrated learning. *Teaching in Higher Education*, *21*(3), 266-286.

Kahar, S., Barus, M. I., & Wijaya, C. (2019). Peran pesantren dalam membentuk karakter santri. *ANTHROPOS : Jurnal Antropologi Sosial dan Budaya*, *4*(2), 170-178. https://doi.org/https://doi.org/10.24114/antro.v4i2.11949

Li, Y. (2014). Financing, management, and public relations at the university of houston and ıts ımplications for China. *Chinese Education & Society*, *47*(2), 56-70. https://doi.org/10.2753/CED1061-1932470204

Makmun, H. A. R. (2014). Pembentukan karakter berbasis pendidikan pesantren. *Cendikia, 12*(2), 212–238.

Mc Combs, B. L., & Miller, L. (2007). *Learner-centered classroom practices and assessments: Maximizing student motivation, learning, and achievement*. Corwin Press.

Nadinloyi, K. B., Hajloo, N., Garamaleki, N. S., & Sadeghi, H. (2013). The study efficacy of time management training on ıncrease academic time management of students. *Procedia - Social and Behavioral Sciences*, 84, 134-138. https://doi.org/10.1016/j.sbspro.2013.06.523

O'Reilly, C., & Chatman, J. (1986). Organizational commitment and psychological attachment: The effects of compliance, identification, and internalization on prosocial behavior. *Journal of Applied Psychology*, *71*(3), 492-499.

Patoni, A. (2007). *Peran kyai pesantren dalam partai politik*. Yogyakarta: Pustaka Pelajar.

Rahim, H., & Mochtar, E. (2001). *Arah baru pendidikan islam di Indonesia*. Logos Wacana Ilmu.

Raynolds, L. J. (2004). Kiat sukses manajemen berbasis sekolah, pedoman bagi praktisi pendidikan. In T. Budiharso (Ed.), *Terjemahan teguh budiharsono*. Samarinda: LeKDIS.

Regulation, I. G. Indonesian Government Regulation number 32 Year 2013 (2013).

Regulation, I. G. Indonesian Government Regulation No.13 Year 2015 (2015). Diambil dari https://www.jogloabang.com/pendidikan/pp-19-2005-standar-nasional-pendidikan

Religion, R. of the M. of. Regulation of the Minister of Religion Number 18 of 2014 (2014).

Rochayati, U., Zamroni, Z., & Sudira, P. (2018). Islamic boarding school based vocational education: A case study on SMK syubbanul wathon tegalrejo magelang. *Jurnal Pendidikan Vokasi*, *7*(3), 262. https://doi.org/10.21831/jpv.v7i3.12450

Rouf, M. (2016). Memahami tipologi pesantren dan madrasah sebagai lembaga pendidikan islam Indonesia. *Tadarus*, *5*(1), 68-92. http://journal.um-surabaya.ac.id/index.php/Tadarus/article/view/345

Sanusi, U. (2012). Pendidikan kemandirian di pondok pesantren (Studi mengenai realitas kemandirian santri di pondok pesantren al-istiqlal cianjur dan pondok pesantren bahrul ulum tasikmalaya). *Pendidikan Agama Islam -Ta'lim, 10*(2), 123-139.

Susilo, M. J., Kartowagiran, B., & Vehachart, R. (2018). Modeling of cultural effect on school autonomy at religion-based school in Indonesia. *Jurnal Pendidikan IPA Indonesia*, *7*(3), 365-375. https://doi.org/10.15294/jpii.v7i3.12445

Thompson, L. J., Clark, G., Walker, M., & Whyatt, J. D. (2013). "It's just like an extra string to your bow": Exploring higher education students' perceptions and experiences of extracurricular activity and employability. *Active Learning in Higher Education*, *14*(2), 135-147. https://doi.org/10.1177/1469787413481129

Wesarat, P. O., Sharif, M. Y., & Majid, A. H. A. (2015). A conceptual framework of happiness at the workplace. *Asian Social Science*, *11*(2), 78-88. https://doi.org/10.5539/ass.v11n2p78

Wibowo, M. C. (2006). *Pengantar manajemen perubahan*. Bandung: Alfabeta.

Widodo, S. (2016). Model pemberdayaan pondok pesantren dalam pengembangan budaya kewirausahaan. In Pengembangan Kompetensi Fasilitator dan Kelembagaan Pemberdayaan Masyarakat di Era MEA (Vol. 53, hal. 182-190). Surakarta: Program Studi Magister dan Doktor Penyuluhan Pembangunan/ Pemberdayaan Masyarakat Pascasarjana Universitas Sebelas Maret Surakarta. https://doi.org/10.1017/CBO9781107415324.004

Yin, R. K. (2009). *Study research design and methods* (Fourth edi). Thousand Oak: Sage Pub.

Zimmerman, M. A. (2000). Empowerment theory. *Psychological*, *2*(1984), 43-63.

Research Article

An Investigation of Middle School Students' Views on the Contributions of Dioramas to Biodiversity Education *

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Abstract

Dioramas are seen as unique teaching tools for environmental education in general and biodiversity education in particular as they present realistic learning environments that can reflect the components of the biodiversity, relationships among these components and changes occur over time. The aim of this study is to examine middle school students' views on diorama supported biodiversity education. A phenomenological approach based on student experiences were employed for the study. The study group of the research consists of twenty-four 7th grade students studying during the 2021-2022 academic year. Students participated in an 8 hours experimental process included diorama supported 5E constructivist teaching model. Interviews were used as the data collection tool. The analysis of data revealed that dioramas contribute positively to biodiversity education as they enhance learning, mitigate the effects of misconceptions, increase students' awareness to protect biodiversity and of biodiversity sustainability. Therefore, including and using dioramas in learning environments for biodiversity education can mediate learning as well as help students to benefit from a realistic environment that include living things, the ecosystems they form and the places they live in.

Keywords: Environmental education, biodiversity, middle school science, dioramas, 5E

1. INTRODUCTION

The quality of life maintained by human beings has been possible largely due to the opportunities offered by the biodiversity of resources in nature. Ensuring the continuation of this life depends on the sustainable use of consumed and distorted natural resources. The OECD Environmental Outlook 2030 has identified several issues such as climate change, the biodiversity loss crisis, water supply and sanitation and the reduction in the health impacts of environmental degradation as key challenges for the global environment (OECD, 2008). The loss of biodiversity is often seen as the most pressing global environmental problem of our time (Convention on Biological Diversity, 2010; Menzel & Bogeholz, 2010). There have are around 785 documented extinctions worldwide (IUCN, 2020; Sax & Gaines, 2008), but undocumented extinction estimates are often well above these numbers, up to 27,000 per year (IUCN, 2020). Increasingly strong evidence show that biodiversity has crucial effects on different aspects of our lives, including our health, well-being, food supply, wealth and security. Therefore, protecting biodiversity is essential in order to maintain human being's need today and carrying this diversity to the future generations. Increasing public awareness is one of essential ways to preserve the richness of life forms and conserve biodiversity. Environmental

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education programs that include biodiversity education for all levels of both formal and non-formal education come to the forefront in this respect (UNESCO, 1977). In times of climate change and the dramatic loss of biodiversity, there is a potential risk of raising a generation that do not pay enough attention for protecting animals, plants and landscapes. Nature plays a minor role in the daily life of the younger generation; their free time is often spent in front of computers by playing games, watching television and other multimedia (Kaşıkçı et al., 2014). Subjects related to nature education had for many years been a low priority in school curricula. Despite offering a wide range of topics in biology curriculum, biodiversity education does not get as much enough space within this scope considering its vitality for humans. Also teaching strategies for environmental education are often criticised as being too theory laden and lacking practice (Ulbrich, 2010). The main purpose of environmental education is "to provide every person with opportunities to acquire the knowledge, values, attitudes, commitments and skills necessary to protect and improve the environment" (UNESCO, 1977). These aims are closely related to biodiversity education since it has the potential to connect environmental education with nature conservation education (Gayford, 2000; Kassas, 2002). Therefore, the aim of basic biological diversity education is; to raise awareness of people about biodiversity and to provide them with the responsibility and ability to protect biodiversity (Mayer, 1996). Kassas (2002) discussed the purpose of biodiversity education in four dimensions: affective, ecological, ethical and political. There are a wide variety of elements involved in biodiversity, from environmental affiliations to individual sensitivities, values, moral norms, and social dilemmas. In this context, Gayford (2000) pointed out the importance of teaching biological diversity with its ecological, economic and social dimensions. "Human" comes first among the factors that threaten biodiversity. Therefore, reintegrating conscious individuals who have received biodiversity education into society would probably have a positive effect on preventing the reduction of biodiversity significantly. Biodiversity education should be given from the first stages of education, and students should be raised as individuals who are sensitive to the environment and have awareness from a young age. With this regard, biodiversity is seen in the centre of discussions for science, local- global challenges and often controversial socio-scientific topics (Menzel & Bögeholz, 2006). However, some researchers have highlighted that humans are increasingly disconnected from nature and biodiversity (Pyle, 2003). Lack of appropriate attention for the ordinary plants and animals in everyday life as seen as a possible reason for this disconnection (Miller, 2005), especially in urban areas (Turner et al., 2004). It is important, therefore, to investigate factors that increase public awareness for biodiversity in order to increase public participation in biodiversity related conservation activities (Miller, 2006). Unfortunately, species loss is thought to be between 10 and 30,000 species per year (Leakey & Lewin, 1996; Meffe & Carroll, 1997). Reports suggest that we are likely to lose most of the world's biodiversity in the next century, including species that are so far not discovered (Leakey & Lewin, 1996). Indeed, the rate of species extinction today exceeds the extinction rate that followed the meteor impact that led to the extinction of the dinosaurs (Leakey & Lewin, 1996).

There are various reasons that count for protection biodiversity. According to (Mayer, 1996) there are at least three major factors that affect human need for protecting biodiversity. First, human beings have natural affinity for living things. Second, the extinction of species leads to losing knowledge. And, finally, species provide irreplaceable goods and services. Humans are grateful to the nature for a wide range of resources from basic needs such as food, water and shelter to ideas in the forms of biomimicry (Mayer, 1996). Unfortunately, this value is often ignored, particularly, by students in our classroom when they do not have desired life experiences with nature. The importance of biodiversity education is underlined in the National Science Education Standards (NSES) as a strong component of "biodiversity" related concepts. Importantly, biodiversity and related concepts are mainly seen as teachable only in the field trips (Beiersdorfer & Davis, 1994).

The main purpose of biodiversity education is to raise awareness of individuals about the importance of biological diversity and to help students acquire them the responsibility and competences to protect biological diversity (Mayer, 1996). In order to achieve this goal, there is a need for biodiversity education that is an active process and students are able to observe plants and animals directly, and have knowledge about local species (Tunnicliffe & Scheersoi, 2010). Therefore, it is necessary to create educational environments where the opportunities for students to interact with the environment are not limited, where students can interact with nature, and where they can examine living things and interactions between living things through their own observations. One of the teaching materials used for this purpose is dioramas. A diorama can be defined as a scene from a certain time period. This definition covers a wide scope due to the nature of dioramas. Because dioramas are designed to capture any moment from a certain period of time, every detail of a certain moment captured is revealed with the help of different objects used (Assa & Wolf, 2007). Additionally, the relations of objects with each other and with their surroundings are described. These depicted elements are perfectly rendered in dioramas, which are the depiction of reality. Also, dioramas specifically can be used to show subjects and themes in achieving goals in teaching. For example, in biological dioramas, the real habitat of an animal species can be easily shown to students with real factors such as vegetation and soil structure (Tunnicliffe & Scheersoi, 2010). In addition to this, dioramas also provide benefits in the visualization of concepts such as prey-prey and symbiotic life, without using real animal examples. Moreover, it helps to define past biodiversity, including endangered species (Marandino et al., 2009). Likewise, dioramas are very suitable for displaying vital events that require long-term observation, such as the life cycle of the silkworm (Mifsud & Tunnicliffe, 2016). Therefore, it is a very facilitating factor in showing the changes in the habitats of living things from past to present and in transferring this knowledge to students. All these features of dioramas make it very useful tools to use them to achieve teaching goals. Various researchers have recently documented the educational potential of dioramas and their role in learning biodiversity (Peart & Kool, 1998). Since dioramas provide an important opportunity for achieving science learning outcomes (Stern, 2009), they are seen as a teaching tool with a strong potential in science teaching (Tunnicliffe, 2009).

While the concepts in science curricula are transformed into learning outcomes down to the smallest detail, the superficial handling of the learning outcomes for biodiversity creates an obstacle to the formation of cognitive and affective learning of the subject (Ulbrich 2010). This is reflected in biodiversity studies that has become the focus of educational research in recent years (Dikmenli, 2010). Various studies have reflected secondary and high school students' inadequacy in terms of knowledge related to biodiversity in their environment (Shepardson, 2005; Tunnicliffe & Reiss, 2000) and studying plants and animals in their immediate surroundings helps students to make better sense of biodiversity (Lindemann-Mathies & Bose, 2008). Although dioramas are an effective tool for biodiversity teaching, the scarcity of studies on this subject draws attention (Misfud & Tunnicliffe, 2018). This study investigates the effects of diorama supported biodiversity education based the participant students' reflections after eight hours of teaching.

2. METHODOLOGY

In this study, phenomenology, one of the qualitative research methods, was used. Phenomenology is the study of the individual universe and its basis consists of individual experiences. In this approach, the researcher deals with the participant's personal experiences, and examines the perception of the individual and the meanings attributed to events (Johnson & Christensen, 2020).

2.1. Participants

Students participated in the study were 24 (Girl: 10 Boy: 14) 7th grade students studying at a public school during 2021-2022 academic year.

2.2. Data Collection Tool

Focus group interviews and "reflection on the experience" forms were used to collect students' opinions about their experiences for diorama supported biodiversity teaching activities. Reflection on the experience form consisted of 6 questions. The focus group interviews allowed researchers to clarify students' views in the reflection forms and to further explore students' understanding of their experiences.

2.3. Analysis of Data

The collected data was analysed based on guidance for phenomenological analysis of interview data described by Hycner (1985). It involves transcribing, bracketing, delineating units of meaning, relating to research questions, eliminating redundancy, clustering, thematising, contextualising and summarising.

2.3.3. Dioramas used for teaching biodiversity

Dioramas of marten, squirrel, turtle, seagull, dragonfly, grasshopper, crab, frog, lizard and silkworm were prepared by the researchers with the help of specialists from the department of fine arts. The rest of dioramas used for teaching biodiversity were barrowed from the zoology museum of the university.

Picture 1. Examples of dioramas used in the study.

2.4. Intervention Process

In the study, the experimental intervention process lasted for 8 teaching hours. The topics were "Biodiversity Richness in Turkey and the World", "Animal Biodiversity Richness of the Southeast Anatolia Region", "Designing with Biomimicry". During the teaching activities the participant students were divided into groups of four in order to facilitate group discussions and provide room for social interaction. In addition to the science teacher and researchers, four student teachers on their teaching practice courses, provided support for students when necessary during the teaching process.

The teaching sequence was based on the 5E constructivist learning model. The teaching process started with questions to engage students. During the exploration phase, worksheets and dioramas were used to help students explore the topics. In the explanation phase, the theoretical framework was formed by the lecturers. In the elaborating phase, the process was supported with examples from contemporary life, and the relationship of activities with nature was emphasized. In final phase, the worksheets were evaluated.

2.4.1. Teaching sequence

Topic 1: Biodiversity Richness in Turkey and the World.

- Students fill in the estimation sections of the worksheet individually,
- Teacher presentation of biodiversity in Turkey and the world
- Students fill in the rest of the worksheet individually,
- Group discussions,
- Whole class discussion led by the teacher and evaluation.

Topic 2: Animal Biodiversity Richness of the Southeast Anatolia Region

Dioramas and related activities used in this topic

- In the worksheet, questions such as "What is the name of the animal?", "Where does it live?", "Which kingdom is it classified in?", "What does it feed on?" and "What is its function in nature?" for at least ten animal species exhibited in the dioramas were answered by students.
- Teacher presentation for the species exhibited in the dioramas.
- Group discussions and work on worksheets,
- A whole class discussion on the species exhibited in the dioramas and other species belonging to the same family.

Topic 3: Designing with Biomimicry

- Diagnosing students' pre-knowledge about the concept of biomimicry
- Groups examining biomimicry examples with the help of student teachers
- Teacher presentation of biomimicry.
- Brainstorming on biomimicry and designing biomimicry.
- Group presentation of the biomimicry designed by each group.
- Evaluation

2.5. Ethical Permission of Research

This research has the permission of the ethics committee dated 27 January 2020 and numbered 11342, which was granted by Dicle University Ethics Committee.

3. RESULTS and DISCUSSIONS

The analysis of the data produced four main themes; dioramas as tools for learning biodiversity, dioramas as tools for changing misconceptions, dioramas for raising awareness to protect biodiversity, dioramas for sustainability of biodiversity.

3.1. Dioramas as Tools for Teaching Biodiversity

The participant students' experiences in the research revealed that the use of dioramas in biodiversity teaching contributed positively to the learning process (Table 1). According to the participant students' responses, having dioramas in the learning environment enhances understanding and motivation, mediates group discussions and helps to realise the importance of biodiversity.

Table 1. A summary of students' views on the contributions of dioramas as a tool for learning biodiversity

Dioramas importance	Students' evaluations
Dioramas as a learning tool	- It enables us to recognize the duties of living things in nature they live in. - It helps us to see the feeding patterns of living things. - It visualizes an organism's relationship to its species and to other species - It is much easier to make group discussions when dioramas are present in the learning environment. - It allows us to make new designs inspired by dioramas. - It contributes to our understanding of the importance of biodiversity in the life cycle and that humans are also a part of this life cycle. - Since students are active in the learning process, their motivation to learn is high.

This is clearly evident in students' narratives based on their experiences with dioramas. All of the participant students stated that learning with diorama helps them to understand biodiversity better and easier.

...I understood the relationship between living things and environment better. I understood why frogs always live in watery places… (Student 2).

...The knowledge we gained from the dioramas was helpful...the living things stood before our eyes. That's why I learned better… (Student 18).

... we usually copy from the board or from the book. But I think I understand better when it is visual…with dioramas everything is visual… The report we wrote here was about our own thoughts and creativity, so it was very useful (Student 15).

Dioramas provided students with opportunities to observe living thing in their environment that helps convey biodiversity knowledge that is often difficult to express in words. Observation is one of the scientific process skills that is thought to develop during students' interactions with dioramas. Reiss et al. (2011) states that observation skill is vital for scientific learning and should be developed and applied with students.

... I understood better because it allowed me to see the connections between the subjects... (Student 22).

Seeing the animals with the place they live in helped me to learn things I did not know about before. For example, I better understand why the marten is a wild animal. (Student 3).

The life cycle diorama of the silkworm gave me a better understanding of the life stages of the insects (Student 4).

...I understood the consequences of the reduction of biodiversity due to human influence (Student 17).

The continuity of the food chain… It made it easier for me to understand its importance. Because I took a closer look at the creatures in the chain and their lives (student 23).

...I couldn't recognize many of the animals in the dioramas… I didn't know what they were feeding on. I learned a lot (Student 8).

The findings of the study support the previous studies that reported a positive relationship between the use of dioramas and the interpretation of biodiversity (Ash 2003; Zhbanova et al., 2019). Dioramas help develop critical thinking and questioning skills as well as classification, comparison and measurement skills (Zhbanova et al., 2019). The evidence from students' experiences in the study supports the assertion that teaching with dioramas facilitates learning by improving communication skills facilitated by dioramas include asking questions, forming hypotheses, and testing hypotheses (Reiss & Tunnicliffe, 2011):

…When I had difficulties trying to recognize the animals in the dioramas, I asked my friends for help. We talked about dioramas. I learned better while discussing (Student 24).

…The dioramas showed how fun it is to study biodiversity (Student 20).

…Working with the diorama was like doing a puzzle. We saw, but we had little knowledge… Afterwards, the whole puzzle seemed to be completed with the activities (Student 1).

…I had a lot of fun working with the dioramas because we didn't sit around in the lesson. …We constantly studied dioramas, talked about and discussed. Then we tried to design new things by taking inspiration from them. It would be more difficult to design if we did not see the dioramas (Student 6).

…The diorama seems to have made it easier for me to understand. Because at the end of the lesson you asked us to make our own design. This intimidated me at first when I examined the dioramas again, my fear was gone. Because new ideas came to my mind (Student 10).

…Diorama made it easier for me to learn because I could discuss what I saw with my friend (Student 2).

All of the students drew attention to the fact that the biodiversity, food chain and ecological order of the dioramas are more understandable and easier to learn through the dioramas. The use of dioramas, especially in teaching students about the ecosystem, supports academic achievement. Because with the help of dioramas, students have the opportunity to see different plant and animal forms living in the ecosystem. In their study, Reiss and Tunnicliffe (2011) states that dioramas make a significant contribution to students' understanding of biology, their understanding of biological structures, their interpretation of taxonomic structuring, and their depiction of species behaviour. In particular, it helps students to determine the relationships between organisms such as predator-prey, social group, and mutual life. Similarly, in their study, Marandino et al. (2009) determined that with the help of dioramas, the students were able to identify plant, animal, fungal species, their habitat, fauna, flora, soil type and rock forms. Mifsud and Tunnicliffe (2013) emphasizes that students who visit dioramas develop their scientific skills such as observing, matching observations, asking questions and forming hypotheses. It is stated in the literature that interacting with biological dioramas reveals the skills of identification, interest, interpretation and research (Tunnicliffe & Scheersoi, 2010).

The majority of the students stated that dioramas were sufficient to demonstrate the importance of biodiversity as a teaching tool. In particular, they expressed the opinion that dioramas are a cross-section of the life cycle, allowing them to better understand the relationship between the living thing and its habitat. They emphasized that they have very little relationship with nature due to urban life, and in this context, dioramas can better understand the close or distant relationship between living things and humans.

… I was not aware of the commercial contribution of the silkworm to humankind. It made me realize what we have, thanks to the silkworm's life cycle in the diorama and the silkworm (Student 1).

…The creatures we see in our daily lives are limited. That's why I didn't know about living species. Thanks to the dioramas, I had the opportunity to see living things in their habitats. I learned a lot (Student 5).

…I like watching documentaries. But I couldn't recognize half of the creatures here. Now I know species that I will never forget (Student 8).

…I learned a lot of things that I did not know and the time passed very well (Student 21).

…It is very enjoyable to work with dioramas. It's like some kind of re-enactment. I felt as if the marten was looking at me and telling me about itself (Student 2).

…I loved dioramas. I wish science classes were always like this (Student 11).

The use of dioramas as a teaching tool allows students to feel themselves in nature and as a part of nature. In this context, it is important that dioramas offer students the opportunity of environmental education in nature. Tunnicliffe and Scheersoi (2010) emphasized that dioramas are a unique teaching tool for environmental education since they present the living thing not as an object but as a part of the ecosystem. In this respect, dioramas provide students with the opportunity to perceive the ecosystem holistically, to observe the complex relationships in the ecosystem and to create a discussion about ecosystem mechanisms. In addition, the use of dioramas as a teaching tool provides students with the opportunity to work based on a discovery process. Recent studies point out the role and educational potential of dioramas in biodiversity education, which provide realistic learning environments (Reiss & Tunnicliffe, 2007). In addition, dioramas are considered important in terms of creating a social learning environment and enabling students to reach more information than they would acquire alone.

3.2. Diorama as a Tool to Change Misconception about Biodiversity

The analysis of data also revealed dioramas can be useful tool to overcome students' misconception about biodiversity. Different participant students expressed how dioramas helped them to change their previous knowledge of biodiversity:

> *I thought biodiversity consisted only of living things…I was also surprised to see that there were different the lizard species in the dioramas. I thought there was only one species of lizard. It was interesting to learn what genetic diversity is and how important it is (Student 8).*
>
> *It was very useful to learn that there is ecological diversity…I now know biodiversity does not include only the number of living things around us… we had the opportunity to see the habitats with dioramas. This helped me to correct my knowledge (Student 23).*
>
> *…there was a question during lesson that in which habitat can the dragonfly live? My answer was air… But now I know the right answer thanks to Diorama. Because it was like I went to visit the dragonfly house (Student 24).*
>
> *I thought I knew what biodiversity was. I learned the truth with dioramas (Student 1).*
>
> *I did not think loss of a species affects everyone. Learning with dioramas made me realise we have to be very careful about other living things (Student 5).*
>
> *I thought biodiversity was the number of living things. Dioramas helped me to change my knowledge (Student 12).*
>
> *Thanks to the dioramas, I realized the greatness and value of our biodiversity richness…I now know species compete for their needs in the ecosystem (Student 9).*

Misconception is an important factor hindering learning science. They are usually formed over a long period of time and present challenges for teachers to teach new topics. The implicit narrative in dioramas encourages remembering knowledge, integrating it with new knowledge, and creating one's own new narrative (Reiss & Tunnicliffe, 2011). Dioramas invite students to an atmosphere that is very close to the real thing they have not seen before, allowing them to combine everyday experiences with the more formal taxonomic structures of science. They provide an ideal setting for students of all ages to look, point, name and discuss how animals live and behave and wonder how these animals might adapt to their own lives. Students had the opportunity to see the relationship of living things living in the ecosystem with their own species and different species. Thus, the students could compare the previous knowledge with the new knowledge and reconstruct the new knowledge in their mind by interacting with dioramas (Mifsud & Tunnicliffe, 2013).

3.3. Diorama and Raising Awareness to Protect Biodiversity

One of the major findings that the analysis of data shows is that teaching with dioramas increased participant student awareness for protecting biodiversity. The majority of the students emphasized that their intention to protect biodiversity increased.

Before this lesson, I did not know that I was so separate from nature, but I understood better that nature does not need humans, but humans need nature in order to live. All living things in dioramas are used for people's better living and this is not fair. We must protect nature (Student 9).

I realized how serious the job of protecting biodiversity is. If we don't protect other living things, humans could become extinct as well (Student 23).

This study gave me a new perspective on the plants my mother grew at home. Now I will help water the plants (Student 11).

I will begin to protect because I have a better understanding that humans are a part of the ecosystem (Student 10).

I have a better understanding of the importance of animals for life (Student 14).

(Before this lesson, I was killing a fly, bee, grasshopper and living things that entered our house. I'm definitely not going to kill anymore. I will put it between two papers and leave it to nature again (Student 21).

Before this lesson, I thought that everything was for humans. But I don't think so anymore. We must protect biodiversity… (Student 3).

… I saw the beauties in the dioramas and I realized that there are endless beauties that I have not seen. I have stronger intention to protect biodiversity (Student 24).

…biodiversity is very important to us. For example, if we kill snakes, mice will eat our food, spread disease, the balance of the world will be disturbed and it cannot be repaired again. Without plants, there would be no photosynthesis, no clean air, and we would be doomed. Therefore, we must protect it (Student 20).

I love nature very much. I am aware of its importance and I try to protect it, but when my friends don't act like me, I feel lonely… (Student 7).

I see some small children throwing stones at stray dogs. I want to be angry with them, but I do not dare when the adults next to them do not get angry (Student 16).

Biodiversity should be more strictly protected. So, the penalties should be high, there should be laws (Student 12).

Dioramas can serve as a great tool for raising students' awareness for biodiversity protection. Because dioramas can reflect the interactions of the components within biodiversity, the environmental changes that occur over time (Tunnicliffe & Scheersoi, 2010) and human effect on biodiversity during this period. Therefore, it is reasonable to suggest that dioramas are a tool that can be used to inform students about ecological changes caused by environmental problems. Pohjakallio (2007) emphasizes that arts-based environmental education such as dioramas shows that humans and nature are mutually influencing factors. This approach to environmental education draws attention to the importance of seeing people as a part of nature, not as a user or consumer of nature. The fact that students see themselves as a part of nature is considered important in terms of developing their intentions to protect nature. This is evident in the participant students' views on the contributions of dioramas to increase their awareness to protect biodiversity.

3.4. Sustainability of Diorama and Biodiversity

All of the students shared a common view on the preservation of the healthy continuation of the life cycle of learning biodiversity with dioramas.

…Dioramas show the animal and its habitat and feeding preferences. We must maintain this balance so that nature does not disappear (Student 4).

…I knew grasshoppers as pests. It helped plants to decompose and re-grow. And its number in the world is decreasing day by day. I just found out. I will no longer kill so that the plants continue to grow. Otherwise, the plants will die one day. Then the whole balance will be upset… I understood that human beings, who disturb the balance of nature, also have the ability to correct (Student 13).

…Dioramas taught me the importance of maintaining biodiversity in order to find clean air, clean water, clean soil (Student 24).

…When biodiversity disappears, the balance of nature is disturbed. The disease comes out. For example, asthma, allergies, cancer. We must protect nature for a healthy life. Dioramas are important because they show the pristine state of nature. Nature is beautiful (Student 18).

…All living things interact with each other, so every living thing is important to each other. Diorama allowed me to see this interaction better (Student 21).

…I understood that if people do not protect nature, nature and the world will perish (Student 2).

…Before this lesson, I was killing insects I encountered. Once I know its benefits, I won't do it anymore (Student 6).

…If you don't protect biodiversity, we might end up with extinct species (Student 22).

…We must make more efforts to ensure that the population balance of the animals in the diorama is not disturbed (Student 8).

…Biodiversity is important for the whole universe; how do we know that we are not destroying the universe by disrupting the world? (Student 2).

…As we see in the dioramas, animals are fed in the food chain. If a species disappears or cannot function by humans, this chain is broken and a butterfly effect occurs. This affects us negatively. That's why we need to protect biodiversity so that the cycle continues to turn (Student 20).

The current ecological crisis, which deeply affects every geography in the world, calls for a global change in values and attitudes towards nature (Żeber-Dzikowska et al., 2016). Therefore, education systems must find a way to radically change their programs in order to educate the young generation who will inherit the world in the context of biodiversity sustainability. Żeber-Dzikowska et al. (2016) defines the main purpose of ecology as the discovery of connections between living organisms, including humans, and the environment. It is stated that ecological literacy, which is the result of this discovery, has an emotional component that directs the environmentally sensitive behaviours of individuals. Affective components, on the other hand, are based on the understanding that people see themselves as a part of the global ecosystem they affect (Zeber-Dzikowska et al., 2016). The understanding of individuals being a part of nature is one of the biggest steps in ensuring the formation of systems that improve sustainability.

4. CONCLUSIONS

This study investigated students' views on teaching biodiversity integrating dioramas in the learning environment. Based on the participant students' views on their experiences the study found that the use of dioramas has potential to enhance student learning of biodiversity, overcome the misconceptions about biodiversity, increase students' awareness for protection and sustainability of biodiversity. The importance of using dioramas during biodiversity instruction stems from the fact that dioramas have the potential to exhibit the components of an ecosystem, the interactions of these components with each other and environmental changes occur over time (Tunnicliffe & Scheersoi, 2010). As well as being a useful tool for teaching biodiversity, dioramas have the potential to provide students with a platform for informed discussions related to environmental problems. Thus, students engage in active learning and internalization of new knowledge. Based on the findings of the study, using dioramas in environmental education, particularly in biodiversity, should be an integral part of teaching activities. This should, particularly, be applied to the learning environments where teacher centred instruction is prevailing or outdoor activities are limited due to time, resources or any other restricting factors.

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5. REFERENCES

Ash, D. (2003). Dialogic inquiry in life science conversations of family groups in a museum. *Journal of Research in Science Teaching*, 40, 138-162. https://doi.org/10.1002/tea.10069.

Assa, J. & Wolf, L. (2007). Diorama construction from a single image, *Computer Graphics Forum*, *26*(3), 599–608. https://doi.org/10.1111/j.1467-8659.2007.01083.x.

Beiersdorfer, R. E. & Davis, W. E. (1994). Suggestions for planning a class field trip. *Journal of College Science Teaching*, 23, 307-311.

Convention on Biological Diversity (2010). Global biodiversity outlook 2. Retrieved Janruary 3, 2022, from https://www.cbd.int/doc/gbo/gbo2/cbd-gbo2-en.pdf.

Dikmenli, M. (2010). Biology student teachers' conceptual frameworks regarding biodiversity. *Education*, 19, 479-489.

Gayford, C. (2000). Biodiversity education: a teacher's perspective. *Environmental Education Research*, 6, 347-362. https://doi.org/10.1080/713664696.

Hycner, R.H. (1985). Some guidelines for the phenomenological analysis of interview data. *Human Studies*, 8, 279-303.

IUCN (2020). IUCN Red List 2017–2020 Report. Retrieved May 2, 2021, from https://5wf.org/wp-content/uploads/2021/09/IUCN_RED_LIST_QUADRENNIAL_REPORT_2017-2020.pdf.

Johnson, B. & Christensen, L (2020). *Educational research: Quantitative, qualitative and mixed approaches*. Sage.

Kaşıkçı, D.N., Çağıltay, K., Karakuş, T., Kurşun, E. & Ogan, C. (2014). Internet habits and safe internet use of children in Turkey and Europe. *Education and Science*, 39, 230-243.

Kassas, M. (2002). Environmental education: biodiversity. *The Environmentalist*, 22, 345-351. https://doi.10.1023/A:1020766914456.

Leakey, R.E. & Lewin, R. (1996). *The sixth extinction: Biodiversity and its survival*. Weidenfeld and Nicolson.

Lindemann-Matthies, P. & Bose, E. (2008). How many species are there? Public understanding and awareness of biodiversity in Switzerland. *Human Ecology*, 36, 731-742.

Marandino, M., Dias Oliveira, A. & Mortensen, M.F. (2009). *Discussing biodiversity in dioramas: A powerful tool to museum education*. ICOM Natural History Committee Newsletter, 29, 30-36.

Mayer, J. (1996). Education and communication for biodiversity: Key concepts, strategies and case studies: Using the Delphi-technique to identify and prioritize concepts for biodiversity education. (D. Elcome, Ed). IUCN.

Meffe, G. & Carroll, R. (1997). *Principles of conservation biology*. Sinauer Associates.

Menzel, S. & Bögeholz, S. (2006). Vorstellungen und argumentationsstrukturen von schüler(inne)n der elften jahrgangstufe zur biodiversität, deren gefährdung und erhaltung. *Zeitschrift für Didaktik der Naturwissenschaften*, 12, 199-217.

Menzel, S.& Bogeholz, S. (2010). Values, beliefs and norms that foster chilean and german pupils' commitment to protect biodiversity. *International Journal of Environmental & Science Education*, 5, 31-49.

Mifsud, E. & Tunnicliffe, S.D. (2013, September). *Children interpreting wildlife trough national history dioramas* in Proceedings of Conference of the European Science Education Research Association (ESERA), Nicosia, CYPRUS, 2-7 September.

Mifsud, E. & Tunnicliffe, S.D. (2016, September). *Learning at natural history dioramas: a model for interpreting museum biological settings* in Challenges in Biology Education Research- Eleventh Conference of European Researchers in Didactics of Biology. Karlstad, Sweden, 5-9 September.

Miller, J.R. (2005). Biodiversity conservation and the extinction of experience. *Trends Ecol. Evol*., 20, 430-434. https://doi.org/10.1016/j.tree.2005.05.013.

Miller, J.R. (2006). Restoration, reconciliation, and reconnecting with nature nearby, *Biological Conservation***,** 127, 356-361, https://doi.org/10.1016/j.biocon.2005.07.021.

OECD (2008). Environmental outlook to 2030, OECD Publishing. https://doi:10.1787/9789264040519-en.

Peart, B.& Kool, R. (1998). Analysis of a natural history exhibit: Are Dioramas the answer? *International Journal of Museum Management and Curatorship***,** 7, 117-128. https://doi.org/10.1080/09647778809515113.

Pohjakallio, P. (2010). Mapping environmental education approaches in finnish art education. *Synnyt/Origins***,** 2, 67-76. https://doi.org/10.24342/9tc2-2c71.

Pyle, R.M. (2003). Nature matrix: reconnecting people and nature. *Oryx*, *37*(2), 206-214. https://doi:10.1017/S0030605303000383.

Reiss, M. & Tunnicliffe, S. D. (2011). Dioramas as depictions of reality and opportunities for learning in biology. *Curator*, 54, 447-459. https://doi.org/10.1111/j.2151-6952.2011.00109.x.

Sax, D.F. & Gaines, S.D. (2008). Species invasions and extinction: The future of native biodiversity on islands. *PNAS*, 105, 11490-11497. https://doi.org/10.1073/pnas.0802290105.

Shepardson, D. P. (2005). Student ideas: What is an environment. *Journal of Environmental Education*, 36, 49-58.

Stern, T. (2009). An afternoon among dioramas at Yale peabody museum. In Tunnicliffe, S.D.& Scheersoi, A (Eds.), *The important role of natural history dioramas in biological learning*, 14-15. ICOM Natural History Committee Newsletter.

Tunnicliffe, S. D. (2009). Inquiry at natural history dioramas: Useful resources in science education. In Tunnicliffe, S.D. & Scheersoi, A (Eds.), *The important role of natural history dioramas in biological learning*, 16-12. ICOM Natural History Committee Newsletter.

Tunnicliffe, S. D., & Scheersoi, A. (2010). Dusty relics or essential tools for communicating biology? In Filippoupoliti, A (Eds.) *Science exhibitions: Communication and evaluation*. Museums ETC.

Tunnicliffe, S. & Reiss, M. (2000). Building a model of the environment: How the children see plants? *Journal of Biological Education*, 34, 172-178.

Turner, W.R., Nakamura, T. & Dinetti M. (2004). Global urbanization and the separation of humans from nature. *Bioscience***,** 54, 585-590.

Ulbrich, K. (2010). The internet software PRONAS – from ALARM to education. In Ulbrich, K., Settele, J.& Benedict, F.F (Eds.), *Biodiversity in Education for Sustainable Development – Reflection on School-Research Cooperation*, 17-29, Pensoft.

UNESCO (1977). Intergovernmental Conference on Environmental Education, Tbilisi (USSR), Retrieved October 20, 2021, from http://www.gdrc.org/uem/ee/EE-Tbilisi_1977.pdf.

Żeber-Dzikowska, I., Chmielewski, J. & Wojciechowska, M. (2016). Ecological and environmental education in the ethical context. *Ochrona Srodowiska i Zasobów Naturalnych*, 27, 44-47.

Zhbanova, K.S., Rule, A.C. & Tallakson, D.A. (2019). Ocean underwater scene dioramas of first graders with submarine porthole views. *Journal of STEM Arts, Craft, and Constructions***,** *4* (1), 63-82.

Opinion Article

Correcting Fallacies about Validity as the Most Fundamental Concept in Educational and Psychological Measurement *

Vahit BADEMCİ [1]

Abstract

Validity is the most fundamental cerebration in educational and psychological testing. That is to say, validity is a crucial concept in psychometrics, but it is still misunderstood and misused. Validity has changed in the last 100 years, in other words, evolved. Validity is the degree to which evidence and theory support the adequacy and appropriateness of the proposed interpretations and uses of the scores obtained from the test or measurement instrument applied to a particular population or sample. In short, validity is not a property of a test or measurement instrument itself, but it is a property of the proposed interpretations and uses of the scores. Thus, such statements as 'the test is valid', 'the validity of scale' or 'the scores are valid' should not be used. The most authoritative source regarding the development and evaluation of educational and psychological tests is published by name of the Standards for Educational and Psychological Testing and briefly referred to as the Standards. The view of content validity, criterion-related validity and construct validity supported in 1966 Standards was quitted in 1999 Standards.

Keywords: Validity, validation, sources of validity evidence, reliability, misconceptions in educational and psychological testing

1. INTRODUCTION

The field of educational and psychological testing is replete with fallacies, urban legends or misconceptions; reliability and validity concepts have also got one's share of these (Bademci, 2007, 2014; Goodwin & Goodwin, 1999; Phelps, 2009). However, validity is the most fundamental cerebration in educational and psychological measurement. In other words, measurement is at the core of scientific research and validity is at the heart of measurement (Bademci, 2013; Viswanathan, 2005).

Validity is the most important concept in educational and psychological testing, but it has been the most misunderstood or widely misused for a long time (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999, 2014; Frisbie, 2005; Rogers, 1995). On the other hand, validity evolved and it still continues to evolve (Kane, 2001; Messick, 1989). Conceptions of validity have also changed remarkably over the past 100 years (Angoff, 1988; Kane, 2006).

1.1. Current Definitions of Validity, Validation, and Reliability

Validity and validation are two closely related but different concepts used in measurement (Kane, 2006; Newton & Shaw, 2014). Validity is the degree to which evidence and theory support the adequacy and appropriateness of the proposed interpretations and uses of the scores obtained from the test or measurement instrument applied to a particular population or sample (Bademci, 1999, 2019). Validation, on the other hand, is the process by which the evidence of the validity of score interpretations is collected (Bademci, 1999, 2017b). Besides, reliability is the reproducibility or the

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consistency of the scores obtained from the test or measurement instrument applied to a particular population or sample (Bademci, 1999, 2011). It must be borne in mind that score reliability is necessary but not sufficient for score interpretation validity (Thompson, 2003).

2. MODERN VIEW ON VALIDITY AND CORRECTING FALLACIES ABOUT VALIDITY

Validity is a property of the proposed interpretations and uses of the scores; in other words, validity is not a property of a test or measurement instrument itself or of test scores (Bademci, 1999, 2017a; Cronbach, 1971; Furr & Bacharach, 2008; Kane, 2006). Therefore, the fallacious expressions such as 'validity of the test', 'the test is valid', 'the validity of scale', 'the validity of measurement instrument (or method)', 'the measurement procedure is valid', 'assessment validity', 'the validity of raters', 'the validity of exam', 'the validity of test scores', 'the scores are valid' and so on should never be used (AERA, APA, & NCME, 1985; Bademci, 2007). For example, the question "Is the test valid" is incorrect; it is appropriate to ask the question "Is it valid the interpretation of the scores from the test?"

Today, there is a broad consensus on the point that validity is related to the interpretations that have been made according to the test scores but not the tests themselves (AERA, APA, & NCME, 1999, 2014; Cizek, 2016; Cronbach, 1971; Kane, 2006; Messick, 1989). Also, at the core of this consensus, there is the underlying opinion that the interpretation of test scores is valid (Cronbach, 1971; Newton, 2012). Validity is a matter of degree; that is, validity is not a concept of all-or-none (Bademci, 1999, 2019; Kane, 2013; Nunnally, 1978). Instead, validity of the interpretation of the scores should be stated with certain degrees such as high validity, medium validity, low validity or no validity (Linn, 2010; Linn & Gronlund, 1995). That is to say, validity is not presented as a dichotomy (valid or not), because it is a continuum, one end of which is anchored by interpretations of scores that simply are not justified (Koretz, 2008). Validity is also dependent on the population or the sample like reliability; in other words, it is always specific to a particular population or sample or group (Bademci, 1999, 2011; Linn & Gronlund, 1995). It should not be neglected that "…validity information varies with the group tested…" (Linn & Gronlund, 1995, p. 77).

Validity is an evaluation argument and includes an evaluative judgement; it was founded on empirical evidence and theoretical rationales (Bademci, 1999, 2017a; Linn & Miller, 2005; Messick, 1989; Osterlind, 2006). In other saying, validity requires an evaluation of the degree to which the proposed interpretations and uses of the scores are justified by supporting evidence (Linn & Miller, 2005). Philosophical bases of the validity theory have also changed in years. The traditional psychometric viewpoint on validity which was put forward in the early twentieth century was rooted in positivism; nevertheless, the practices of contemporary validity theory and validation which point out that validity is a property of interpretations which were made from scores have been strongly influenced by constructivism (constructive realism, especially since 1980s) (Bademci, 1999, 2017a; Messick, 1989; Mislevy, 2018; Sijtsma, 2009).

3. CONTEMPORARY VALIDITY AND *1999 STANDARDS*: REJECTION OF THE HOLY TRINITY OF VALIDITY (CONTENT VALIDITY, CRITERION-RELATED VALIDITY, AND CONSTRUCT VALIDITY)

In fact, the most authoritative source regarding the development and evaluation of educational and psychological tests is published by name of the *Standards for Educational and Psychological Testing* (AERA et al., 1985, 1999, 2014; APA et al., 1966) and briefly referred to as the *Standards*. The most major change in concept of validity also occurred in *1985 Standards*; validity is a unitary concept (AERA, APA, & NCME, 1985; Algina & Penfield, 2009; Bademci, 1999, 2007; Messick,

1989). "The trinitarian doctrine" or "the holy trinity" of validity (Guion, 1980) which accepts that there are three kinds of validity such as content validity, criterion-related validity and construct validity supported in *1966 Standards* was rejected and abandoned in *1999 Standards* (APA, AERA, & NCME, 1966; AERA, APA, & NCME, 1999; Bademci, 1999, 2017b).

However, in *1999 Standards* that have represented the modern view arguing validity as a unitary concept based on various types of validity evidence, under the title of "sources of validity evidence", the types of validity evidence was presented as 1) evidence based on test content, 2) evidence based on response processes, 3) evidence based on internal structure, 4) evidence based on relations to other variables, 5) evidence based on consequences of testing [evidence for validity and consequences of testing] (AERA, APA, & NCME, 1999, 2014); the latest edition of the *Standards* was published in 2014. The types of validity evidence are encapsulated below.

3.1. Sources of Validity Evidence

Evidence based on test content "can be obtained from an analysis of the relationship between the content of a test and the construct it is intended to measure" (AERA, APA, & NCME, 2014, p.14). Such evidence includes "traditional content validity studies and alignment studies that require independent subject matter experts (SMEs) to review and rate test items according to their content relevance, representativeness, or alignment to curricular objectives as well as practice (job) analyses in the case of employment, licensure, or certification tests" (Sireci & Faulkner-Bond, 2015, p. 221-222).

Evidence based on response processes refers to "concerning the fit between the construct and the detailed nature of the performance or response actually engaged in by test takers (AERA, APA, & NCME, 2014, p.15). Validity evidence in this type include think-aloud protocols, cognitive interviews that rely on examinees' verbalizations about their own thinking processes, eye-movement patterns and timing of responses (Ercikan & Pellegrino, 2017; Urbina, 2014).

Evidence based on internal structure comes from "analyses of the relationships of responses to different items on the test. The central idea is to investigate whether the relationships among item scores or score on parts of the test are as expected from the theory of the construct" (Algina & Penfield, 2009, p.118). In other words, "analyses of the internal structure of a test can indicate the degree to which the relationships among test items and test components conform to the construct on which the proposed test score interpretations are based" (AERA, APA, & NCME, 2014, p.16). Approaches or methods for gathering such evidence include factor analysis, item response theory, multidimensional scaling, differential item functioning, structural equating modeling, and cluster analysis (AERA, APA, & NCME, 1999, 2014; Algina & Penfield, 2009; Osterlind, 2006). Besides, it has been suggested strategies involving generalizability theory or internal consistency methods and other indexes of score reliability as validity evidence in this type (Osterlind, 2006; Urbina, 2014). Thus, Sireci and Soto (2016) remarked "Internal structure evidence also evaluates the "strength" or "salience" of the major dimensions underlying an assessment, and this salience has a relationship to internal consistency reliability " (p.152). Urbina (2014) noted "…for example, a test is designed to assess a unidimensional construct such as spelling ability or test anxiety. For these kinds of instruments, high internal consistency coefficients, like the coefficient alpha…, support the contention of unidimensionality" (p. 185). Nevertheless, Crocker and Algina (1986) noted "…alpha should not be interpreted as a measure of the test's unidimensionality" (p. 142). Bademci (2014) also emphasized that "Unidimensionality may be examined using exploratory factor analysis or especially confirmatory factor analysis…But, Cronbach's alpha should not be used as a measure of unidimensionality [or homogeneity]…Cronbach's alpha should be used to estimate of the score reliability based on the internal consistency among the [item] scores after unidimensionality is examined" (p. 23). However, it must be borne in mind that reliability serves as an integral component to the interpretation of the scores in many validation studies (Algina & Penfield, 2009).

Evidence based on relations to other variables refers to analyses of the relationship test scores and other variables. In other words, "In many cases, the intended interpretation for a given use implies that the construct should be related to some other variables, and, as a result, analyses of the relationship of test scores to variables external to the test provide another important source of validity evidence" (APA, AERA, & NCME, 2014, p.16). Such evidence can include multitrait-multimethod study, test-criterion relationships (predictive and concurrent studies), validity generalization study, contrasted groups studies (APA, AERA, & NCME, 1999, 2014; Reynolds & Livingston, 2012; Suen & Rzasa, 2004). However, Algina and Penfield (2009) noted "…validation methods making use of correlational approaches (e.g., the correlation of multiple tests and multi-trait multi-method studies) can be impacted by the reliability of the obtained test scores, and thus the proper estimation of the reliability of the scores is an important consideration in interpreting the obtained validity evidence" (p. 119).

Evidence based on consequences of testing refers to evaluation of the intended (positive and negative) and unintended (positive and negative) consequences associated with interpretations and uses of test scores (AERA, APA, & NCME, 2014; Sireci & Faulkner-Bond, 2015). Examples of evidence based on consequences of testing include increased student dropout, increased teacher stress, improved student achievement, enhanced teacher and student motivation (Linn, 2010). The standard sets which were produced in *1999 Standards* have been maintained exactly and in an enhanced way in *2014 Standards* (AERA, APA, & NCME, 1999, 2014).

4. IN LIEU OF CONCLUSION: VALIDITY IS A UNITARY CONCEPT

In contemporary validity, distinct types of validity was rejected such as content validity, criterion-related validity and construct validity. As *1999 Standards* and *2014 Standards* pointed out, validity is a unitary concept and there are various types of validity evidence as evidence based on test content, evidence based on response processes, evidence based on internal structure, evidence based on relations to other variables, evidence based on consequences of testing [evidence for validity and consequences of testing] (AERA, APA, & NCME, 1999, 2014). Contemporary validity and the sources of validity evidence was manifested in Figure 1.

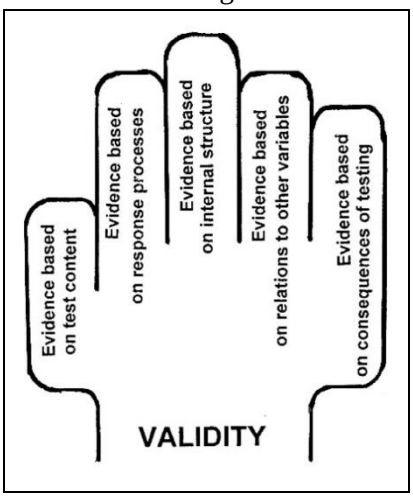

Figure 1. Validity and the sources of validity evidence

In addition, the radical changes related to validity and reliability were brought up to Turkey's agenda within the framework of a paradigm change by Bademci (1999, 2004, 2017a) 23 years ago for the first time.

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3. REFERENCES

Algina, J., & Penfield, R. D. (2009). Classical test theory. In R. Millsap, & A. Maydeu-Olivares (Eds.), *The Sage handbook of quantitative methods in psychology* (pp. 93-122). Los Angeles: Sage.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (AERA, APA, & NCME) (1985). *Standards for educational and psychological testing*. Washington, DC: American Psychological Association.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (AERA, APA, & NCME) (1999). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (AERA, APA, & NCME) (2014). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

American Psychological Association, American Educational Research Association, & National Council on Measurement in Education (APA, AERA, & NCME) (1966). *Standards for educational and psychological tests and manuals*. Washington, DC: American Psychological Association.

Angoff, W. H. (1988). Validity: An evolving concept. In H. Wainer, & H. I. Braun (Eds.), *Test validity* (pp. 19-32). Hillsdale, New Jersey: Lawrence Erlbaum.

Bademci, V. (1999). *Türkiye'de eğitim fakülteleri ve öğretmen yetiştirme: Öğretmen yetiştiren programlar nasıl olmalı?* [*Education faculties and teacher training in Turkey: How should teacher training programs be?*] Panel. Düzenleyen: ESEF İşletme Araştırma Topluluğu. Ankara: G.Ü. Mesleki Eğitim Fakültesi Konferans Salonu, 21 Mayıs 1999.

Bademci, V. (2004). Testin güvenirliği" veya "test güvenilirdir" diye ifade etmek doğru değildir [It is incorrect to express of "the reliability of the test" or " the test is reliable"]. *Türk Eğitim Bilimleri Dergisi*, *2*, 367-373.

Bademci, V. (2007). *Ölçme ve araştırma yöntembiliminde paradigma değişikliği: Testler güvenilir değildir* [*A paradigm change in measurement and research methodology: Tests are not reliable*]. Ankara: Yenyap.

Bademci, V. (2011). Türk eğitim ve biliminde bilimsel devrim: Testler ya da ölçme araçları güvenilir ve geçerli değildir [Scientific revolution in Turkish education and science: Tests or measurement instruments are not reliable and valid]. *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi*, *16*, 116-132.

Bademci, V. (2013). Değerbiçiciler arası (interrater) ölçüm güvenirliğinin Cronbach'ın alfası ile kestirilmesi [Estimation of interrater score reliability by the Cronbach's alpha]. *Gazi Üniversitesi Endüstriyel Sanatlar Eğitim Fakültesi Dergisi*, *30*, 55-62.

Bademci, V. (2014). Cronbach's alpha is not a measure of unidimensionality or homogeneity. *Journal of Computer and Educational Research*, *2*(3), 19-27.

Bademci, V. (2017a). Ölçme ve araştırma yöntembiliminde çağdaş gelişmeler ve yeni standartlar 1: Geçerlik, ölçümlerin kullanımlarının ve önerilen yorumlarının bir özelliğidir [Contemporary developments and new standards in measurement and research methodology 1: Validity is a property of the proposed interpretations and uses of scores]. *JRES*, *4*(1), 63-80.

Bademci, V. (2017b). Ölçme ve araştırma yöntembiliminde çağdaş gelişmeler ve yeni standartlar 2: Geçerlikte üçleme (kapsam, ölçüt ilişkili ve yapı geçerlikleri) öğretisinin reddi ve geçerlik kanıtının kaynakları [Contemporary developments and new standards in measurement and research methodology 2: Rejection of the trinitarian (content, criterion-related, and construct validities) doctrine in validity and sources of validity evidence]. *JRES*, *4*(1), 81-97.

Bademci, V. (2019). Geçerlik: Nedir? Ne değildir? [Validity: What is it? What is it not?] *JRES*, *6*(2), 373-385.

Cizek, G. J. (2016). Validating test score meaning and defending test score use: Different aims, different methods. *Assessment in Education: Principles, Policy & Practice*, *23*(2), 212-225.

Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. Fort Worth: Holt, Rinehart and Winston.

Cronbach, L. J. (1971). Test validation. In R. L. Thorndike (Ed.), *Educational measurement* (2nd ed.) (pp. 443-507). Washington, DC: American Council on Education.

Ercikan, K., & Pellegrino, J. W. (2017). Validation of score meaning using examinee response processes for the next generation of assessments. In K. Ercikan, & J. W. Pellegrino (Eds.), *Validation of score meaning for the next generation of assessments* (pp. 1-8). New York: Routledge.

Frisbie, D. A. (2005). Measurement 101: Some fundamentals revisited. *Educational Measurement: Issues and Practice*, *24*(3), 21-28.

Furr, R. M., & Bacharach, V. R. (2008). *Psychometrics: An introduction*. Los Angeles: Sage.

Goodwin, L. D., & Goodwin, W. L. (1999). Measurement myths and misconceptions. *School Psychology Quarterly*, *14*(1), 408-427.

Guion, R. M. (1980). On trinitarian doctrines of validity. *Professional Psychology*, *11*(3), 385-398.

Kane, M. T. (2001). Current concerns in validity theory. *Journal of Educational Measurement*, *38*(4), 319-342.

Kane, M. T. (2006). Validation. In R. L. Brennan (Ed.), *Educational measurement* (4th ed.) (pp. 17-64). Westport, CT: American Council on Education & Praeger.

Kane, M. (2013). Validating the interpretations and uses of test scores. *Journal of Educational Measurement*, *50* (1), 1-73.

Koretz, D. (2008). *Measuring up: What educational testing really tells us*. Cambridge, Massachusetts: Harvard University Press.

Linn, R. L. (2010). Validity. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International Encyclopedia of Education, Volume 4* (pp. 181-185). Oxford: Elsevier.

Linn, R. L., & Gronlund, N. E. (1995). *Measurement and assessment in teaching* (7th ed.). Upper Saddle River, New Jersey: Prentice-Hall.

Linn, R. L., & Miller, M. D. (2005). *Measurement and assessment in teaching* (9th ed.).Upper Saddle River, New Jersey: Pearson.

Messick, S. (1989). Validity. In R. L. Linn (Ed.), *Educational measurement* (3rd ed.) (pp. 13-103). New York: American Council on Education and Macmillan Publishing Company.

Mislevy, R. J. (2018). *Sociocognitive foundations of educational measurement*. New York: Routledge.

Newton, P. E. (2012). Clarifying the consensus definition of validity. *Measurement, 10*(1-2), 1-29.

Newton, P. E., & Shaw, S. D. (2014). *Validity in educational & psychological assessment*. London: Sage.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Osterlind, S. J. (2006). *Modern measurement: Theory, principles, and applications of mental appraisal*. Upper Saddle River, New Jersey: Pearson.

Phelps, R. P. (Ed.). (2009). *Correcting fallacies about educational and psychological testing*. Washington, DC: American Psychological Association.

Reynolds, C. R., & Livingston, R. B. (2012). *Mastering modern psychological testing: Theory & methods*. Boston: Pearson.

Rogers, T. B. (1995). *The psychological testing enterprise: An introduction*. Pasific Grove, California: Brooks/Cole.

Sijtsma, K. (2009). Correcting fallacies in validity, reliability, and classification. *International Journal of Testing*, *9*, 167-194.

Sireci, S. G., & Faulkner-Bond, M. (2015). Promoting validity in the assessment of English learners. *Review of Research in Education*, *39* (1), 215-252.

Sireci, S. G., & Soto, A. (2016). Validity and accountability: Test validation for 21st-century educational assessments. In H. Braun (Ed.), *Meeting the challenges to measurement in an era of accountability* (pp. 149-167). New York: Routledge.

Suen, H. K., & Rzasa, S. E. (2004). Psychometric foundations of behavioral assessment. In S.N. Haynes, & E. M. Heiby (Eds.), M. Hersen (Series Ed.), *Comprehensive handbook of psychological assessment, Volume 3* (pp. 37- 56). Hoboken, New Jersey: John Wiley & Sons.

Thompson, B. (2003). Understanding reliability and coefficient alpha, really. In B. Thompson (Ed.), *Score reliability* (pp. 3-23). Thousand Oaks, California: Sage.

Urbina, S. (2014). *Essentials of psychological testing* (2nd ed.). Hoboken, New Jersey: Wiley.

Viswanathan, M. (2005). *Measurement error and research design*. Thousand Oaks, California: Sage.

Research Article

Teacher Accountability on Underperforming Schools: An Investigation in Primary Schools around Mapela Circuit in Mogalakwena District *

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Abstract

The department of Education (DoE) clearly stated that other South African primary schools are underperforming. The aim of this study was to investigate teacher causes of underperforming schools in Mapela Circuit at Mogalakwena District. Data was also collected from 5 selected primary schools where commonly known by underperforming. Semi-structured interviews which included open-ended questions were included as part of a way of changing school for open communication, to understand how underperforming can make the culture the culture of the school to look very bad. Sampled schools were referred to as a school A, B, C, D and E. The study indicated that lack of resources in the rural schools compare to urban school contribute to the poor performance. The study further indicated that the large number of students prohibit the teachers to pay attention to all learners. The main problem was the impact of teacher accountability on underperforming schools and how it affects the Circuit, District, Province and National. Schools must come with new strategies to improve their performance and the Department of Basic Education must provide the necessary support to schools. The study further recommended the principals, school governing body and teachers to work together to achieve their goal setting in order to close the gaps.

Keywords: Accountability, teachers, underperforming schools, learners

1. INTRODUCTION

The term "accountability" refers to a management practice in which a person takes responsibility for his/ her actions in an organization (Guijt, 2020). These responsibilities can be positive or negative, and they can either enhance or inhibit the smooth running of the organization. Based on the action or response, accountability processes may require the person to correct his or her error. Accountability also refers to one's ability to take responsibility for the work and provide answers to peers and superiors to explain performance, actions, and decisions (Bovens, Goodin & Schillemans, 2014). Stobart (2007) defined *accountability* as meeting the minimal requirements, expectations, and standards associated with the effectiveness of actions taken by an employee or person in a position of power. The term "Accountability" is also synonymously with responsibility, blameworthiness, and liability (Wood & Winston, 2005). In education, school accountability involves evaluating the school's overall performance in terms of learner performance or examination scores (Figlio & Loeb, 2011). However, accountability is using administrative data to increase learner performance. Accountability can generate rewards or sanctions for a school based on students' scores in public examinations. The rewards could be monetary, promotions for teachers who produced excellent results, threats of demotion or closure of underperforming schools, loss of jobs, community unrest, and strikes for better results.

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In education, accountability provides means that allow policymakers at national, district, circuit, and school levels, parents, and taxpayers to monitor learners' performance in schools. Performance is regarding how resources are utilized to achieve the organization's objectives. Accountability systems require educational institutions to report their progress to the public, taxpayers, and policymakers (Van Gronigen & Meyers, 2019). Accountability is consequential to the actors, either reward earned because of outstanding performance or sanctions imposed for poor performance.

Accountability is vital in education since the community's expectations lie with the school system (Jongbloed, Enders & Salerno, 2008). All school activities should meet societal expectations by making the education system responsive to the needs of the communities, competitive compared to other institutions and productive in producing quality learners who can be integrated into the world of work. School administrators are also accountable to all stakeholders in education and tasked to achieve education goals using minimal resources. Accountability in education requires administrators to skillfully mobilize their subordinates and resources to achieve education goals (Farrel, 2015).

1.1. Environmental Factors

Background of the study was conducted at Mapela Circuit in Mogalakwena District based on the teacher accountability on underperforming schools. It is all about accountability from an international context, African accountability context, and in South African context.

Worldwide reveals accountability as the as the main problem in various organizations. The educational sector needs all stakeholders to be accountable in their various departments. In African context the study based on in Nigeria, United Kingdom and United State of America. In Nigeria Spaull and Taylor (2015) defined accountability as being in a position to provide answers to someone in authority for the actions of the decision made. In United States, both Democratic and Republican federal administrators' education policies use accountability as a measure to monitor education system. Accountability in South African context explained that accountability from this perspective promotes a sense of love, assist communities and discourage selfishness, discouraging diverting public resources for personal enrichment. Accountability calls for the need for South African citizens to be united and create equal access to education irrespective of differences in individual backgrounds (Nandozie, 2017). Schools are held Responsible for their Outcomes or Performance.

1.2. Job Description of School the Principal

Down (2018) states that the principal's job is to provide guidance on all school activities. The principal is other core responsibilities include attending after-school activities, sports, concerts, theatre, parenting conferences, and school board meetings. Other important duties include ensuring the safety of learners and emergency response procedures. Other core responsibilities of the principal include attending after-school activities, sports, concerts, theatre, parenting conferences, and school board meetings.

The emphasis on measurable learner outcomes requires principals to jointly work with teachers to set and achieve high standards of performance. Principals must always be prepared to answer questions how the school adjusts to any success gaps between different groups of students and overall performance. The principal's duties and responsibilities vary depending on the needs and requirements of the school. The principal is the school's accounting officer and is in charge of the school's professional management. He gives appropriate instructions and guidelines for student admission and placement (Mestry, 2013). He is also in charge of various school accounts and records, as well as their upkeep and the effective use of funds for the benefit of students using relevant agencies such as the SGB. The principal is in charge of all academic resources.

The principal participates in the recruitment of staff members. It is the principal's responsibility to guide newly appointed teachers and integrate them into the school culture, directing and providing professional advice. The principal ensures that responsibilities are shared equally

among staff based on their specific areas, so that students receive adequate teaching. The principal is responsible for the appointment of teachers and other support staff, recommends promotions, and is a member of the school advisory committee and chairs several school committees. The principal plays an important role in promoting academic and extra- curriculum activities such as participation in sports, education, and culture organized by community organizations.

The principal is responsible for liaising with the school's external stakeholders. He serves as the school governing body and is a link between the school and the community. The principal interacts with the community on behalf of the school by participating in community-related activities. The principal is responsible for communicating with the circuit office, district or district offices, providers, and the finance department about administrative issues, such as staffing, accounting, procurement, research, and student and student statistics. The principal liaises with other relevant government departments that directly support schools, such as the Department of Health and Social Services and Public Works. Other key functions include collaborating with higher education institutions such as universities, colleges, and other student record-related programs as well as INST programs and management development programs. The principal participates in professional committees and seminars that review expert opinions/principles. The principal can organise, delegate, direct and supervise school activities. The principal responded to the circuit even in the district with the passing of the students.

1.3. Job Description of School the Deputy-Principal

According to Kelly (2020), the deputy principal's role is to assist the principal. The deputy principal is the person in the school organogram who is second in power to the principal. The main function of the deputy principal is to provide administrative support to the principal. Furthermore, the deputy principal maintains full oversight of administrative procedures throughout the school curriculum. The duties and responsibilities of a deputy principal vary from one school to another depending on the school enrolment, staff size and the style of leadership or model used in a particular school. However, the general duties of a deputy principal include assisting the principal with school management tasks, compiling a list of tasks, dealing with absenteeism, internal and external assessment and evaluation, school calendar, admission of new students, distribution of classrooms, and organizing school activities. School fees and maintenance of resources, for example, cost planning and budgeting, budgeting/resources, general cleanliness, maintenance and condition of the school and its furniture and equipment, annual stock management-testing.

In addition to classroom teaching activities, the deputy principal has a role to play in additional activities and subject-related activities such as coordinating the work of study teams and groups, planning and developing programs, and organizing the teaching process. Another important role is to assist the Principal in overseeing student counselling, activities, ethics, compulsory school attendance and well-being of all learners. The deputy principal also supervises and supervises the work and activities of other staff members and, where necessary, discusses and writes reports. The deputy assists teachers in reviewing their professional work to improve teaching and learning.

1.4. Job Description of School Teacher/Educator

The term "teacher" means any person designated to teach, teach or train other people (students). Teachers provide professional services in community schools, other training institutions, and adult basic education institutions. The teacher's main task is to engage the students in the classroom. Other activities include administrative support, disciplinary education issues, and planning additional and joint activities. The teacher's responsibilities include the promotion of meaningful learning. The teacher's duties are to prepare practice-focused courses, regional courses, new methods, strategies, assessments, and resources in their field. The teacher takes on the role of leader as the lesson's subject. The role of the teacher is to plan, coordinate, control, manage, evaluate and report the learner's progress in his / her studies. The teacher should use various strategies to meet the curriculum

outcomes (Yusof, Roddin & Awang, 2015). Teachers should create an inspiring classroom environment that engages students enthusiastically in learning. The teacher should use the learners' knowledge to support teaching and learning.

In addition to classroom activities, the teacher is responsible for additional co-curricular activities. The teacher assists the HOD with subject-related matters such as teaching and conducting course meetings. Another role of teachers is to perform pedagogical activities by providing education and well-being for all students. Teachers also provide student counselling, career guidance, disciplinary roles, and care for student well-being. Another role of the teacher is to plan additional and co-curricular activities such as sports and other community school activities.

The teacher also acts as the subject manager for coordinating and overseeing all special subject-learning activities. Other activities include controlling and coordinating stock and equipment used and required for practical lessons, performing or assisting with one or more of some of the non-teaching management activities confined to the school premises. Teachers are also authorized to contact stakeholders such as parents, district officials, students and school supplies. Teachers participate in agreed-upon school/teacher assessment programs regularly. They review their professional work to improve teaching, learning and management.

Communication is one of the most important resources in any organization (Isa, 2015). Collaboration between teachers from all grades is essential to maintaining teaching standards and student progress. Organizational communication promotes effective management within the school (Alansari & Rubie-Davies, 2021). Teachers from different schools can participate in planning and conducting additional exchange and co-co-curricular activities. Teachers can also schedule parent meetings to discuss student progress and behaviour. This helps to build a teacher-parent relationship. The relationship between parents and teachers helps develop the child academically, morally, and socially.

1.5. Research Questions

The researcher used main question and followed by the four themes questions.

1.5.1. Main research question

1.5.1.1. What is the impact of teacher accountability on underperforming schools?

1.5.2. Sub research questions

The following sub research questions are from the main research topic:

1.5.2.1. What are the causes of poor performance in your school?

1.5.2.2. What is teacher accountability in education?

1.5.2.3. How can be done as teachers to address the issue of underperforming during teaching and learning?

1.5.2.4. How do teachers implement teacher accountability at schools?

It was important to have good knowledge of what causes other schools to underperform and which strategies can be implemented to assists both teachers and learners to perform well.

1.6. Theoretical Framework

According to Anfara and Meretz (2015), a theoretical framework is "any empirical or quasi-empirical theory of a social and psychological process that can be applied to the understanding of events". The researcher uses the framework to construct the research findings, guiding the researcher to work within the confines of the accepted ideas when offering academic courses.

Furthermore, the theoretical framework helps the researcher put the research's focus into perspective (Shah & Al-Bargi, 2013). The theoretical framework is linked to the research problem (Tamene, 2016). Guides the researcher when choosing research design and data analysis methods. Therefore, the theoretical framework assists the researcher in selecting the most appropriate research methodology, analytical tools, and processes for his or her study.

1.6.1. Theory of action

Action theory defines the relationship between inputs and materials, functions, effects, and outputs. This operational perspective governs the objectives and objectives of the system. Theory connects organizational goals, accountability structure, outcomes, communication, and support to policymakers' expected outcomes. The action theory describes how an accountability system brings about the necessary changes in education. The theory helps to judge the suitability and efficiency of an educational system. The theory of action emerges from the philosophy "knowledge is power." It holds the view that when employees are subjected to consequences of their actions, they improve their efficiency and strengths, correct their mistakes and minimize the wastage of resources. The following concessions are helpful when building an efficient accountability system.

1. Accuracy in reporting results.
2. Correct Interpretation of results
3. There are alternative ways to improve the situation strategies to achieve organizational goals.
4. Administrators are willing to lead and motivate employees.
5. Employees are knowledgeable of alternative strategies.
6. Selected actions are correctly executed.
7. Selected actions enhance the realization of results.

According to Deventer and Kruger (2003), the principal must foster a collaborative environment so fewer people can do more work. This can be accomplished by providing services that enable employees to perform their duties effectively, as well as by fostering an environment conducive to the implementation of education management principles such as support, cooperation, solidarity, and trust in order to provide individuals and departments with the resources they require (Smith & Cronje, 2000). After the school has been fully staffed and divided into departments and units, responsibility and authority must be assigned to each position in the school building. The teacher's assistant (s) receives instructions (from the employee). It is the leader or teacher's responsibility to carry out the instructions.

1.6.2. Application of the theory to the study

The study uses the theory of Deventer (2003). This theory falls into this study because its organizational framework directs teacher accountability mechanisms that help improve student performance. The organizational structure of Deventer (2003) is similar to the school organogram. The principal is the centre of power and goes from top to bottom (staff and students). This is called a "top-down" or successive management framework. In this organizational structure, the principal has authority or another employee acting following his or her instructions. The deputy principal is the second highest authority in the body responsible for the specific functions assigned to the principal. Powers of authority are defined, and the duties and responsibilities of each employee are set out.

This structure promotes good communication, which contributes to the performance of staff. In this organizational structure, all stakeholders have roles, responsibilities and responsibilities that contribute to student performance. Everyone should be held accountable for their actions, and teachers should be accountable for learners' performance. If a school does not do well, it means that the entire structure of the organization did not do its job as expected by the Department of Education**.** Every teacher has got his or her own job descriptions according to their levels. Their job descriptions are as follows:

2.1 Research Methodology

The methodology is the overall plan upon which the study is conducted, and it guides the researcher on "how" the research should be conducted (Mohajan, 2017). This methodology chapter includes the following research paradigm, research approach, research design, case studies, population, sample, data collection and analysis, trustworthiness, and ethical consideration.

In this research, the researcher used a qualitative research approach. According to Aspers and Corte (2019), qualitative research is an interactive process of understanding the phenomenon studied. According to Skovdal and Cornish (2015), qualitative research is a method of inquiry describing social meanings Skovdal et al. (2015). Using qualitative research can generate evidence to develop programmes tailored to local contexts. The researcher used qualitative research because the researcher will go to underperforming schools to focus on participants' understanding, descriptions, labels, and meanings to observe teachers and learners, interview them, observe their teaching methods, and even how they use their teaching methods when teaching learners.

The researcher used participant observation in her study and the objective based on more recent field research, how teacher accountability has more impact on underperforming schools. The department of Education deployed circuit managers to monitor the situation at schools. Deploy the curriculum advisors to manage the curriculum and to give support to teachers by giving them workshops and more training. Those selected schools were visited more often to give them support.

2.2. Participants

Five schools in this circuit were selected for the research. The sample consists of 16 educators which is 5 principals and 11 HODs. And semi-structured were used in the study with interview questions. The researcher presents the data collected from one-on-one interviews with the school principals and school Department Heads. The researcher asked the from participants question to gain more information and to explain more about their own background and to assured the participant that their information will be privacy and will be kept. Both male and female were interviewed and each interview were running between 40 minutes and 1 hour. The participant's ages ranged from 30 to 59 years old. Two participants were female ranged between 30-39. While others ranged between 40-50 years old.

3. FINDINGS

Findings of this study as provided through Principals' and Departmental Heads questionnaires.

3.1 Theme: Sufficient resources for teaching and learning

Lack of resources at schools led to most learners' poor performance in primary schools. If the department supplies the schools with enough relevant LTSM (Learner Teaching Supporting Materials), the teacher will ensure that quality teaching and learning will be given to the learners. Teachers must use the LTSM up to a moral standard. Regarding this situation, principals and DH must request books on time so the syllabus covered from all angles. A participant mentioned that:

> *"No teachers and learners need technology gadgets e.g. Tablets, computers and Wi-Fi for them to access information very easy. We need all-purpose Labs E.g. Computer Labs, Science Labs etc."*

In contrast to ISIP 1, ISIDH3 indicate that:

> *"Yes, some resources are provided to us by the Platinum Mine (AASA) programme."*

Reflecting on the above quotation, perhaps there is a shortage of staff and poor allocation of staff according to specialization. Enough teachers are allocated to the school. According to the post establishment, the learners will get enough curriculum coverage. All curriculum documents must be followed properly, and the relevant people must properly supervise and monitor.

3.2 Theme: Overcrowding has an impact on learner performance at school

Overcrowding impacts learner performance in the school. Together with the School Governing Body (SGB), the principal could apply for mobile classes for effective teaching and learning. The learner will be more manageable in the class. To comply with Corvid 19. Participants ISIDH1 and ISIDH3: mentioned that:

"The issue of overcrowding is also another problem that leads to poor performance. Teaching and learning are not effective in overcrowding classes. Teaching cannot reach the needs of all learners if they are many in one class. Resources sometimes not sufficient for a large group".

On the other hand, participants in ISIP1and ISP2 contrast a view that:

"Teachers are unable to identify slow learners. They take time to assess learners individually. Play full may not be noticed".

Reflection on the above quotations, if learners may not attend class simultaneously, all learners will be attended individually, and those not performing well will be noticed. The few learners will be manageable in the class.

3.3 Theme: Teachers accountability in the class

When principals and HS communicate, they can work together towards this common goal. Every subject manager must be accountable for the decision or action was taken by the term or annual results because the learners' progress is in their hands. If learners are underperforming in the different subjects in class, it will affect the school's performance, circuit, district, province, and even the nation. Hardworking is the key to success. Participant ISIP4 mentioned that:

"It ascertains that teacher stay on their lanes in as far as teaching and assessing are concerned. It helps to identify learner's barriers to learning".

Reflection on the above quotation may argue that teachers must give learners feedback after writing their activities, and the results must be analyzed.

4. DISCUSSION and CONCLUSION

This theme entails managing the causes of poor performance in schools. The principals, DHs, teachers, and learners must work together to improve performance. The following are the major cause of poor performance in schools: insufficient resources, overcrowding in the classroom, and poor management at school. Sub-themes: The causes of poor performance at school. Main issues: sufficient resources for teaching and learning, the impact of overcrowding on learner performance at school, and the importance of accountability in the classroom.

To improve the quality of teaching, all principals must make sure that teachers, learners and parents are involved in implementing school policies. For effective teaching and learning, teachers must prepare their lessons thoroughly in the subject guideline. Teaching and learning can be effective when teachers can use different teaching methods to cater to all learners. Using appropriate teaching aids and giving enough activities according to various subjects will be more useful to the learners. Remedial work should give the learners more competence in their subjects. The researcher recommends that accountability is more important in the classroom because it helps teachers know their subjects very well. It allows teachers to be more strategic and accountable; teachers will be more developed in their areas of expertise. It helps them track their performance and identify gaps and where they need to be closed, leading to analyzing the results. The study recommends that it is important that teachers must account for education. The study recommends that teacher accountability is a wonderful process whereby all educators account for or give feedback for all subjects they teach. Doing this will help to detect performance gaps so that they get ways of improving their subject for better performance. Teachers must teach in order to improve learner performance. Curriculum delivery should be done fruitfully to unfold the learner's potential to the best of his ability. Teaching and learning should be directed to a learner as a total being.

The researcher recommends that teachers experience most of the challenges during teaching and learning, such as overcrowded classrooms, less attention to individual learners, and minimal teaching and learning aids. The principal and the SGB for overcrowding in the Department of education and make applications for the mobile makings may address these challenges. Learning and teaching will be conducive to the learners; learners will be more manageable in the class.

The researcher recommends that the teaching and learning be effectively and efficiently if there effective learning. Learners must attend classes without fail, be punctual, and introduce extra lessons. Proper planning will lead the school to perform well and attend classes regularly; it will make learners get more information as required for the examination.

Commitment among teachers and learners will make them build a strong team to improve learner performance at school. These challenges may be addressed that every stakeholder around the school must be involved, moreover, by establishing working subjects' committees, Professional Learning Communities among the clustered schools. The committees must work as a team in order to improve learner performance. Furthermore, all teachers must be committed to teaching and learning.

Teachers must attend classes without fail, be punctual for teaching and learning, give learners more activities, be assessed every time and get immediate feedback. The principal may address these challenges to check and monitor the situation, and quarterly feedback must be given to the parents according to their children's performance. The researcher recommends using different teaching strategies to improve teaching and learning. Visual and display of learner performance results and written accountability committed to effect changes towards teaching and learner assessment. These challenges may be addressed that will then have a record by writing for future reference. Write the changes that can be done next term, if not a year. The researcher recommends that presentations be done during designated staff meetings as writing, and it will make teachers commit themselves by writing to implement remedial work.

For the betterment of the school in order the school to run smoothly, all stakeholders at school such as learners, teachers, departmental heads, deputy principal, principal SGB and parents must play their important role. Learners must attend their classes regularly and write their activities as they are given, teachers must plan, prepare and present their lessons on time, marked learners books accordingly and give feedback to learners and must account on their mediate senior, departmental heads must give teachers support with some internal workshop and make sure they check and monitor the situation as it is required, the Quality Teaching and Learning Campaign (QLTC) is effective, deputy principal as the curriculum manager must make sure that the departmental heads run the phase as it is required, relevant Learner Supporting Material (LTSM) are being used, class visits is practiced and quality time of teaching learners is given to the learners, SGB must run the school according to South African Schools Act 84 of 1996. For the school to run smoothly. Parents must provide the school and support their children with the needs of the school. All the above-mentioned stakeholders can make the school to run smoothly and also to perform well.

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5. REFERENCES

Alansari, M., & Rubie-Davies, C. M. (2021). Enablers and barriers to successful implementation of cooperative learning through professional development. *Education Sciences, 11*(7), 312-318.

Alvesson, M., & Sköldberg, K. (2017). *Reflexive methodology: New vistas for qualitative research*. London: Sage Publications.

Ansell, N. (2015). Shaping global education. International agendas and governmental power. *International Development Planning Review, 37* (1), 7-16.

Farrel, P. (2015). *Simple skills for every woman: success in keeping everything together*. Oregon: Harvest House Publishers.

Figlio, D., & Loeb, S. (2011). School accountability. In, E A. Hanushek, S. Machin, and L. Woessmann, (Eds): *Handbooks in economics*, Vol. 3. The Netherlands: North-Holland.

Guijt, I. (2020). Accountability and learning: Exploding the myth of incompatibility between accountability and learning. In NGO Management (pp. 339-352). London: Routledge.

Isa, A. A. (2015). Conflicts in organizations: causes and consequences. *Journal of Educational Policy and Entrepreneurial Research* (JEPER), *2*(11), 54-59.

Jongbloed, B., Enders, J., & Salerno, C. (2008). Higher education and its communities: Interconnections, interdependencies and a research agenda. *Higher Education*, *56*(3), 303-324.

Mestry, R. (2013). A critical analysis of legislation on the financial management of public schools: A South African perspective. *De Jure*, *46*(1), 162-177.

Morris, J., McNaughton, D., Mullins, R., & Osmond, J. (2009). *Post-positivist epistemology*. Unpublished paper, University of Victoria, Victoria.

Rehman, A. A., & Alharthi, K. (2016). An introduction to research paradigms. *International Journal of Educational Investigations*, *3*(8), 51-59.

Shah, S. R., & Al-Bargi, A. (2013). Research paradigms: Researchers' worldviews, theoretical frameworks and study designs. *Arab World English Journal*, *4*(4), 252-264.

Tamene, E. H. (2016). Theorizing conceptual framework. *Asian Journal of Educational Research*, *4*(2), 50-56.

Usman, Y. D. (2015). The impact of instructional supervision on academic performance of secondary school students in Nasarawa State, Nigeria. *Journal of Education and Practice*, *6*(10), 160-167.

Van Gronigen, B. A., & Meyers, C. V. (2019). How state education agencies are administering school turnaround efforts: 15 years after no child left behind. *Educational Policy*, *33*(3), 423-452.

Yusof, Y., Roddin, R., & Awang, H. (2015). What students need, and what teacher did: The impact of teacher's teaching approaches to the development of students' generic competences. *Procedia-Social and Behavioural Sciences*, 204, 36-44.

Research Article

Challenges Encountered by School Principals and Teachers that Impede the Optimal Use of Instruction Time in South African Schools *

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Abstract

The purpose of this article is to investigate the challenges encountered by school principals and teachers in South African schools in ensuring that instructional time is optimally used during contact time. Challenges that impede the optimal use of instruction time are extensively investigated as they are encountered daily by school principals and teachers. This article therefore sought to understand the impact of these challenges on the smoothing flowing and delivery knowledge during teaching and learning activities. In this article, data was collected through semi-structured interviews and document analysis. School principals and post level 1 teachers were individually interviewed with the intension to investigate and understand what challenges do they encounter during contact time in regard to the optimal use of instruction time. All interviews were then transcribed, coded and themes developed. School principals and teachers from township schools encounter similar challenges with their counterparts in former Model C schools. However, if all school principals work hand in gloves with teachers and other stakeholders, then a number of challenges encountered they encounter will be minimised resulting in improved learners' academic performance. Some participating teachers could have some reservations to speak openly particularly if the challenges were as a result of some weaknesses pertaining to how their school principals manage instruction time. As subordinates, teachers could try to protect their school principals in fear of being victimised regardless of being assured of their names' anonymity and confidentiality of the information shared. This article's finding and recommendations thereof may be used by the school principals, teachers and the Department of Basic Education as source of information in identifying the timewasters that impedes the optimal use of instruction time and the strategies that can be employed in order to minimise or eradicate them. Based on this study, school principals and teachers can revisit the way they deal with such challenges with the aim to improve the effective use of instructional time. This article provides both theoretical and empirical contribution to the existing literature on the challenges encountered by school principals and teachers pertaining the optimal utilisation of instruction time. In addition, it also highlights some recommendations that give advice to school principals and teachers on how they can minimise or eradicate these challenges for the betterment of learners' academic performance.

Keywords: Time management, timewasters, instructional time, effective teaching and learning, learners' academic performance

1. INTRODUCTION

Worldwide, time has become one of the most important limited resources (Ayeni, 2020; Cattaneo, Oggenfuss & Wolter, 2017; Kayode & Ayodele, 2015). The success of teaching and learning processes in any school is also mainly influenced by the time factor (Jez & Wassmer, 2015). Schools are faced by a dilemma in which allocated instructional time is always disturbed or interrupted by a number of timewasters leading to poor or unexpected learners' academic performance. In South Africa, school principals and teachers experience a number of challenges in the form of timewasters which frustrate smooth flowing of teaching and learning activities. Ideally, "the time that teachers and learners spend on instructional matters is limited by the hours in a day, the days in a week and the weeks in a school year" (Cattaneo et al., 2017:1). In essence, this implies that any time lost during contact time bears negative results on the overall completion of work schedule and

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ultimately affects the general performance of learners. Apparently, some researcherss unanimously agree that there is a direct and positive relationship between the optimal use of instruction time and the academic performance of learners (Cattaneo et al., 2017; Fisher & Berliner, 1985; Wedel, 2021). School principals, as instructional leaders, should know that any instruction time lost is very unlikely to either be reclaimed or replaced (Bush, 2013). Therefore, there is no room for timewasters if schools anticipate to achieve good learners' academic results.

1.1. Purpose of the Study

This article argues that whenever there is limited or no timewasters to instructional time, then then learners' results are more likely to improve. However, to achieve this in schools, school principals and teachers have to work on strategies that reduces or eradicate some timewasters during contact time. When time is managed properly, enough time prevails for teaching and learning, engendering positive academic results (Khan, Farooqi, Khalil & Faisal, 2016; Master, 2013). Timewasters encountered by teachers in township schools are similar to those encountered by their counterparts in former Model C schools.

1.2. Background of the Study

The background to this study emanates from the timewasters encountered by teachers during teaching and learning activities. Teachers always complain about the lack of time to complete teaching and learning activities (Ekundayo, Konwea & Yusuf, 2010). Time ought to be effectively managed so that timewasters to instruction time are minimised. School principals as instructional leaders have to ensure that conducive environments prevail in their schools suppressing any chances of timewasters. Sadly, a number of school principals, more so in township schools, tend to compromise their instructional leadership roles by focusing on other activities, which Mestry, Moonsammy-Koopasammy and Schmidt (2013) identify as administrative duties rather than curriculum and instruction duties. By merely ignoring their instructional leadership practices pertaining to instructional time, school principals are opening a gap of timewasters that is likely to affect their schools' overall academic results.

1.3. Literature Reviews

In this article, literature reviews talk about timewasters and how does these frustrate teachers and ultimately affect the academic results of learners. It also spells out why time management skills and effective classroom management are a requirement in schools in order to improve the optimal use of instruction time. In case where instruction time is lost, ways of compensating such time is also discussed as part of literature.

1.3.1 Time management skills

Time management can be described as the effective and optimal use of available instruction time with the aim to achieve the intended main objective of the school which is teaching and learning (Bush, 2013). Ultimately, the main objective of any school is improved learner academic performance. Undoubtedly, time management is considered to be a vital predictor of learning outcomes. Consequently, better or poor learner academic results are a consequence of effective and poor time management in schools, respectively (Khan et al., 2016; Ling, Heffernan & Muncer, 2003).

Effective time management skills in schools can help school principals in achieving their instructional leadership goals (Goldring, Grissom, Neumerski, Blissett, Murphy, & Porter, 2019). The main purpose of time management in schools is to maximise the use of allocated instruction time (Van Deventer & Kruger, 2003; Kayode & Ayodele, 2015). In their instructional leadership roles, school principals should support and develop their teachers so that they are enriched with time management skills so that they can effectively manage instruction time in order to achieve educational excellence in academic results (Shava & Heystek, 2018). Well-managed time minimises unnecessary timewasters of instruction time (Khan et al., 2016). Teachers with sound time-management skills always prioritise their instructional time for the sake of effective teaching and learning activities. These teachers take

charge of controlling every minute of instruction time, unlike those without such skills (Ayeni, 2020; Boniwell, 2004).

1.3.2 Salient timewasters

By consuming or limiting instructional time, time wasters tend to disrupt the efficient flow of teaching and learning processes (Vannest, Soares, Harrison, Brown & Parker, 2010). Effective school leaders put in endless effort to curtail time-wasting practices in their institutions (Van der Merwe, 2018). Time wasters can build up to a significant loss in instructional time if improperly managed. Bush (2013) asserts that it is doubtful that any missed instructional time brought on by time wasters will be made up for or restored. Among the many typical ways that students waste time in class include tardiness and absenteeism, as well as school briefings, assemblies, and breaks, unscheduled disruptions of class, and insufficient lesson preparation by teachers.

The best use of instructional time can be harmed by absenteeism. According to Ibrahim and Mohammed (2019), absenteeism among instructors and students appears to be more common in township and rural schools compared to the former Model C schools. Similarly, improper management of tardiness might result in a loss of instructional time (Fish, Finn & Finn, 2011). The following, among others, are some of the detrimental effects of tardiness on teaching and learning: disruptions of classes, loss of instructional time, rise in unacceptably disruptive student behavior, and low academic achievement of students (Osae, 2017).

Many South African rural and township schools are performing poorly, according to Maile and Olowoyo (2017), due of the ineffective use of instructional time. The ineffective planning and handling of school briefings, assemblies, and breaks appear to be a major factor in the reduction of instructional time in schools. Daily breaks in instruction time brought on by tardy start times for lessons or the school day should be avoided or minimized. This is crucial since the daily amount of missed instructional time can readily increase if a combination of delays from briefings, assembly, and breaks are used (Rogers, Mirra, Seltzer & Jun, 2014).

There seem to be a lot of disruptions in schools, but they can basically be minimized or avoided. Unexpected school visits, unexpected school closings, and mobile phone use by teachers and students during class time are all common interruptions to instruction. Teachers can use all of the allotted instructional time efficiently if they have properly prepared their lessons. The best use of class time is positively impacted by a lesson that has been well prepared (Legotlo, 2014). Lesson planning and preparation facilitate teaching and learning execution and enhance the efficient use of class time, according to Kayode and Ayodele (2015).

1.3.3 Effective classroom management

Effective classroom management is a skill that aids teachers in fostering and sustaining a supportive learning environment that results in efficient use of class time (Ibrahim, 2017; Kyriacou, 2014). Classroom management is also defined by Martin and Sass (2010) as the steps teachers use to control student behavior in relation to the teaching and learning processes. The tone of the classroom is set by the teacher's behavior and interactions with the students during contact time, which can encourage students to pay closer attention and develop their confidence. This reduces interruptions brought on by students' behavioral issues (Burton & Chapman, 2012).

During contact time, teachers should work to establish and maintain a safe learning environment that supports efficient teaching and learning. Oddly enough, according to Jones and Jones (2012), many teachers, whether seasoned or less experienced, frequently struggle to establish and maintain a well-managed classroom where students may learn effectively. The effectiveness of the teaching and learning process, which depends on how well teachers manage their classes during class time, determines the success of any school principal (Protheroe, 2010). The efficiency with which instructional time is used to achieve the desired goal depends on the teacher's ability to manage the classroom while teaching and learning.

Engaging students and reducing disruptive behavior are two things teachers must do in order to establish and maintain an effective classroom (Egeberg, McConney & Price, 2016). Egeberg et al. (2016) further emphasize that excellent instructional teachers always manage the best use of their instructional time because they possess abilities for both controlling student misbehavior and preventing misbehavior from arising in the first place. Behavior issues are reduced when students are motivated and actively involved in teaching and learning activities. As a result, instruction time can be used to the fullest extent possible because no time will be lost on addressing students' behavioral issues (Savage & Savage, 2010; Weinstein & Romano, 2014).

1.3.4 Increasing instruction time

Although school administrators make every effort to protect instructional time, it is nonetheless usual to run into some time wasters during contact hours. Offering more lessons is one approach to make up for the time lost to timewasters. Wedel (2021) claims that one of the simplest strategies to raise students' academic achievement is to extend instruction time. Conducting additional lessons outside of the regular allotted school time is a typical approach to extend the amount of instruction time. Principals of schools should make sure that any additional instructional time is utilized effectively because it is related with high expenditures of compensating teachers who teach additional classes (Andersen, Humlum & Nandrup, 2016; Gromada & Shewbridge, 2016).

Teachers can provide students more time and opportunity to connect with the subject matter by lengthening the time spent in class (Heafner & Fitchett, 2015). Increased instructional time for teaching and learning is a key component of many governments' efforts to boost students' academic performance, according to Andersen et al. (2016). This can be done as morning or afternoon lessons, before or after regular school hours. Some schools provide extra classes on weekends and even during school breaks in addition to during the week. Increased instruction time gives students more time to learn, increasing their opportunity to enhance and have a favorable impact on their academic achievement (Gromada & Shewbridge, 2016; Ntuli, 2018).

Principals of instructional schools must convince instructors and students to take extra classes because doing so enhances the performance of all regularly enrolled participants (Bush, 2013). According to Ntuli (2018), extra classes help teachers and students cover the required material that was left out due to interruptions or a lack of instruction time during contact time. Additionally, the additional instructional time may be used for remedial education, which can help students who are struggling academically and thereby broaden their knowledge base (Meroni & Abbiati, 2016; Ntuli, 2018). However, learners must also be given some "free time" to decide what to do with it within the calendar for the additional sessions; otherwise, boredom and impatience would quickly overtake them and render the goal of the additional instruction time meaningless (Mokoena, 2016).

2. METHOD

2.1. Research Methodology

In this study, the researchers used a qualitative research methodology. This research strategy gave the researchers a thorough qualitative understanding of the difficulties faced by school administrators and teachers in their attempt to fully utilize the allotted instructional time during contact time (McMillan & Schumacher, 2010; Rensburg, Alphaslan, Du Plooy, Gelderblom, Van Eeden & Wigston, 2011). Because of COVID-19 protocol rules, the researchers were unable to physically visit the research locations, but they were still able to collect information from school administrators and instructors through semi-structured, one-on-one telephone interviews and document analysis.

In this study, an interpretive/constructivist paradigm was utilized to comprehend and explain the complicated issues school administrators and instructors in township and former Model C schools confront because of some timewasters that have a negative impact on the quality of teaching and learning (Patton, 2002). The difficulties school administrators and instructors face in their day-to-day

work to ensure that there is effective teaching and learning during contact time were thoroughly investigated as a result of this paradigm (Cohen Manion & Morrison, 2008; Trao & Quang, 2015).

2.2. Participants

Despite the fact that all township and former Model C schools in the province of Gauteng were included in the target demographic, the researchers (McMillan & Schumacher, 2010) purposely chose four public high schools: two township and two former Model C schools. A total of 16 people from this population were chosen to make up the study's sample. All participants provided the researchers with their information voluntarily (Magashoa, 2013). The 12 teachers who were chosen for the program have at least five years of classroom experience and are employed at the same post level by all four school principals.

Prior to participating in this study, the school administrators and chosen instructors received assurances from the researchers that their real identities would be kept secret and that the information, opinions, and input they provided would be treated in confidence (Lichtman, 2010). The names of schools, school principals, and teachers were coded to comply with these standards. As a result, the schools in the township and the previous Model C were given the names School A and B and Schools X and Y, respectively. Similar to this, school leaders from Model C schools and township schools were labeled as PA, PB and PX, PY, respectively. Similarly, instructors from township and previous Model C schools were labeled as TA1, TA2, TA3; TB1, TB2, TX1; TX2; TX3; and TY1, TY2; and TY3; respectively.

2.3. Data Collection

Two specific data collection techniques was used:

Data was mostly gathered through a few one-on-one conversations with each participant. At a time that worked for them, each school's principal and teacher underwent a telephone interview (McMillan & Schumacher, 2010). Enough information about the difficulties participants face in dealing with time wasters that prevent them from making the most of instruction time during teaching and learning activities was received from them. The researchers verbatim transcribed every interview they performed after audio-recording the conversations in order to analyze them.

2.4. Data Analysis

Data received from documents and data obtained from interviews were compared. Documents provide easily accessible data that are typically less vulnerable to participant manipulation than interviews (Prior, 2008). The school's curriculum policies, the minutes of staff meetings and morning briefings, the school principal's notes to teachers, the monitoring instruments used to keep an eye on teaching and learning activities, and the internal and external whole-school evaluation reports were all examined. The researchers reviewed and noted all of the comments, ideas, announcements, and recommendations made by school principals and instructors on the difficulties they face that prevent the efficient use of instructional time in these documents.

All of the data was organized and divided into sizable, manageable chunks, as proposed by Chivanga and Monyai (2021), in order to gain a comprehensive and in-depth comprehension of the phenomenon under study.

3. FINDINGS

The findings revealed a number of challenges encountered by school principals and teachers which they identified as timewasters impeding the optimal use of instructional time in their schools. Below is a discussion of the main challenges with which all the participants identified and raised in this study.

3.1. Late Coming of Learners

One of the issues that results in lost instructional time, according to the data gathered, is learners who arrive late. The first period in the morning is a severe concern, complained TA2 from School A regarding this situation. I know their time is always a concern, so one of my hopes is that, uh, I don't get the first periods. I have to wait till the students arrive at school. They are tardy. TY2 expressed a similar view when he remarked, "We have students who only arrived at school long after nine o'clock. Our school begins at seven thirty. It seriously disrupts classroom instruction. The administrator of the school, PX, also voiced his displeasure about students arriving late by emphasizing that "late arrival of students is a challenge more so to students that comes from remote areas... Every time they enter the classroom, they force the teacher to interrupt, disrupting class time. The principal of school Y expressed great concern over students arriving late, saying that it "...is a severe concern in this school since it leads to unnecessary movement of students during contact time interrupting teaching and learning activities" (Extract from minutes of staff meeting). One solution to this problem is for school administrators to work closely with parents to ensure that students arrive at school on time. In order to prevent disruptions to the lesson's orderly progression, schools should also make sure that any tardy arrivals are detained in a school hall and only allowed to enter the classroom at the end of the first or second period during change-over time.

3.2. Teacher Absenteeism

The findings also revealed that it is also very rare to see a school with a 100 % teacher attendance on a daily basis be it township or former Model C schools. From School B, P_B indicated that, "*There are some cases where you find that we have got a number of educators who are absent and this affect contact time".* The same challenge was also raised in by T_{Y1} who revealed that, *"... uhm… teacher's absenteeism is one of our biggest problems at our school. And that wastes a lot of time. Uhm… as soon as learners pick up that there are like four, five, maybe six uh teachers absent, then… oh… discipline and everything goes out of the window and to control the school and the learners is almost impossible".*

School principals are advised to put stringent measures in place in minimizing teacher absenteeism. In addition to the above, it is recommended that whenever a teacher is absent, there must be some relief teachers who take care of that teacher's learners. Effective teaching and learning can only take place when both the teacher and learners are present in the classroom (South African Government, 2009; Taylor, Van der Berg & Mabogoane, 2013). School principals need to take note that, while learner absenteeism usually affects the absent learner directly, teacher absenteeism negatively affected the whole class's instruction time.

3.3. Unannounced Visits

In as much as teaching and learning activities should never be interrupted, the findings revealed that unannounced visits from either parents or education officials was still a challenge leading to instructional time wasting in schools. T_{A1} complained*, "You are teaching at nine o'clock and suddenly someone is sent to you, you are wanted at the office there's a parent. Or sometimes you are actually told that there's an official who wants to see you – he is at the office. It means you have to leave your class unattended and attend to that parent or official, so that one is also a disturbance".* T_{X2} in School X also proclaimed that, *"...yeah, there are many times when they* (district officials) *just pop up and then they want you to come to the office or they come to your class, and when they come to class, the whole lesson stops. Now you need to attend to them".*

It is recommended that unannounced visits should be strictly controlled so that teaching and learning is not compromised. School principals can have it as a police that education officials and parents only visit school upon appointment, unless their visit does not require the presents of any teacher, otherwise they should visit during lunch or outside contact time after school. Van der Merwe (2018) also reiterated that unannounced visits from education officials should not take teachers out of the class for this can have negative impact on the optimal use of instruction time in schools.

3.4. Prolonged Morning Briefings

Uncontrolled and prolonged morning briefings is one challenge also identified as impeding the optimal use of instruction time. On this issue, T_{A1} had this to say, "*...this is a problem at our school. Because you will find out that eeh… when you attend a briefing, the briefing will end up being a meeting and it can actually take away almost fifteen to twenty minutes of our teaching time…eeh… our briefings always encroach into contact time".* It was also mentioned by the principal in one of the previous minutes from School B that, "we are trying a new strategy of ending the school at 14:30 in order to have enough time for our briefings so that we do not encroach on contact time" (Extract from minutes of a staff meeting). Morning briefings should be meant for sharing information, hence
School principals ought to ensure that they plan and stick to the program of the briefing. It is also recommended that school briefing being held during lunch or after school so that should there be a delay due to arising issues, no instruction time is put at stake. Any unplanned short briefing can easily turn into a full meeting encroaching into contact time which then will affect the learners' academic performance.

3.5. Untimely Announcements via the Intercom

While the use of intercoms has become one common way that modern schools use as a communication channel in which announcements can be made to learners and teachers, the participants in this study also mentioned its untimely use as another challenge they encountered as a timewaster that interrupts the optimal use of instruction time during contact time. T_{B1} from School B complained to say, *"... with the intercom, you need to stop teaching because they are going to say attention to everybody. Then you stop teaching and say what it is they want, and yes teaching time is compromised there because even these learners they start to say attention, attention".* From School X, T_{X2} also said, *"Uh… number one challenge is definitely the intercom. Uhm… you are teaching something, and you have it, and then there is an announcement. Then you have to stop, and you carry on, then there is another announcement. Uhm… when you add those 1, 2 minutes, it actually adds up to a lot of minutes, and sometimes as a teacher you forget where you were, and now you must start all over again. So, it definitely does cause an in convenience when it comes to learning and teaching".* From school Y, T_{Y1} had this to say, *"... but there are sometimes announcements just come through. Why? I don't know, and yes that is why some of our teachers are on the brink of breaking intercoms as well as cutting the wires because yes! That is so disruptive. It's not even funny because now you have to stop and get everybody's attention and then you have to try to get hold of the attention and start somewhere but then you lost your position where you were in the lesson".*

School principals ought to control hoe the school's intercom is used. They can do that by ensuring that they make use of the intercom when it's a real emergency, otherwise it is recommended that for individual messages, it is better to send a messenger directly to the affected person. According to Fitzsimons (2011), the little instruction time lost whenever there is an announcement to be put across during contact time can amount to hours and finally days within the academic year.

4. CONCLUSION

This article investigated the challenges encountered by school principals and teachers that impede the optimal use of instruction time in South African township and former Model C schools. The argument brought by this research is that although school principals in former Model C schools seem to have better strategies in managing instructional time than their counterparts in township schools, both experience the same challenges. In the majority of South African schools, tardiness among students and instructor absences are commonplace. Additionally, a large amount of instructional time is lost as a result of unscheduled parent and educational official visits, protracted morning briefings, and tardy intercom announcements. However, learners are more likely to arrive early at school when parents make sure their kids leave the house on time. Additionally, if the

Department of Education took strict action against teachers who took uncalled-for absences, teacher absences would decline. Principals of schools can drastically cut down on the time that is typically wasted by such timewasters by strengthening school procedures about when and what time visitors should meet with teachers, how long a briefing should be, and when to make an announcement over the intercom.

4.1. Contribution to literature

This research added to the already existing literature that if school principals need to effectively protect instructional time, then they should work towards minimising and eradicating any time waster to teaching time. Teaching and learning time should under no circumstance be disturbed or interrupted unless it is an emergency. Effective teaching and learning only takes place where there is smooth flow of curriculum delivery in which both teachers' and learners attention directed to the business of the day for the whole duration of the period.

4.2. Implications for research, practice and/or society

The findings and recommendations thereof emanating from this research may be used by education officials, in particular school principals, teachers and department of education at large as source of information in regard what challenges leading to timewaster are encountered in schools and how they can be minimized. School principals can improve their instructional leadership roles in managing instruction time by collectively working with teachers, learners and parents in ensuring that timewaster to instruction time are dealt with accordingly. Whenever schools manage to minimise timewasters to instruction time, then improved learners' academic performance is assured leading to the general improvement of the socio economic of the school.

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5. REFERENCES

Andersen, S.C., Humlum., M.K., & Nandrup, A.B. (2016). Increasing instruction time in school does increase learning. *Proceedings of the National Academy of Sciences, 113*(27), 7481-7484.

Ayeni, A.J. (2020). Principals' instructional time management and students' academic performance in secondary schools in Ondo North senatorial district of Ondo State, Nigeria. *Journal of Education and Learning,14* (1), 123-133.

Boniwell, I. (2004, July). *Use of time and well-being: Methodological issues.* Paper presentation. 2nd European Conference on Positive Psychology, Pallanza, Italy, 5-8 July 2004.

Burton, L. & Chapman, D. (2012). Does increasing instructional time lead to higher student achievement? Evidence from India. *Asian Education and Development Studies, 1*(3), 208-221.

Bush, T. (2013). Instructional leadership and leadership for learning: Global and South African perspectives. *Education as Change, 17*(1), S5-S20.

Cattaneo, M.A., Oggenfuss, C., & Wolter, S.C. (2017). The more, the better? The impact of instructional time on student performance. *Education Economics, 25*(5), 433-445.

Chivanga, S.Y. & Monyai, P.B. (2021). Back to basics: Qualitative research methodology for beginners. *Journal of Critical Reviews, 8*(2),11-17.

Cohen, L., Manion, L., & Morrison, K. (2008). *Research methods in education. (6th ed.).* London: Routledge.

Egeberg, H.M., McConney, A., & Price, A. (2016). Classroom management and national professional standards for teachers: a review of the literature on theory and practice. *Australian Journal of Teacher Education, 41*(7), 1-18.

Ekundayo, H.T., Konwea, P.E., & Yusuf, M.A. (2010). Towards effective time management among lecturers in Nigerian universities. *Journal of Emerging Trends in Educational Research and Policy Studies*, *1*(1),22-24.

Fish, R.M., Finn., K. V., & Finn, J.D. (2011). The problems public schools face: High school misbehavior in 1990 and 2002. *Education Research and Perspectives, 38*(1),59-80.

Fisher, C.W., & Berliner, D.C. (1985). *Perspectives on instructional time*. New York: Longman.

Fitzsimons, J.T. (2011). Adding instructional time at no greater cost. *School Administrator, 68*(11), 40-41.

Goldring, E., Grissom, J., Neumerski, C.M., Blissett, R., Murphy, J. & Porter, A. (2019). Increasing principals' time on instructional leadership: Exploring the SAM process. *Journal of Educational Administration, 58*(1), 19-37.

Gromada, A., & Shewbridge, C. (2016). Student learning time: A literature review. OECD Education Working Papers, No. 127. OECD Publishing. https://doi.org/10.1787/5jm409kqqkjh-en .

Heafner, T.L., & Fitchett, P.G. (2015). An opportunity to learn US History: What NAEP data suggest regarding the opportunity gap. *The High School Journal*, *98*(3), 226-249. https://doi.org/10.1353/hsj.2015.0006.

Ibrahim, M.G., & Mohammed, I. (2019). Assessing effective utilisation of instructional time by secondary school teachers in Northern Region, Ghana. *Research on Humanities and Social Sciences, 9*(2), 98-106.

Jez, S.J., & Wassmer, R.W. (2015). The impact of learning time on academic achievement. *Education and Urban Society*, *47*(3),284-306.

Jones, V., & Jones, L. (2012). *Comprehensive classroom management: Creating communities of support and solving problems*. New York, NY: Pearson.

Kayode, G.M., & Ayodele, J.B. (2015). Impacts of teachers' time management on secondary school students' academic performance in Ekiti State, Nigeria. *International Journal of Secondary Education, 3*(1), 1-7.

Khan, H. M.A., Farooqi, M.T.K., Khalil, A., & Faisal, I. (2016). Exploring relationship of time management with teachers' performance. *Bulletin of Education and Research, 38* (2), 249-263.

Kyriacou, C. (2014). *Essential teaching skills. (4th edition).* Oxford: Oxford University Press.

Legotlo, M.W. (2014). *Challenges and issues facing the education system in South Africa*. Pretoria: Unisa.

Lichtman, M. (2010). Chapter 4. Ethical issues in qualitative research. In *Qualitative research in education: A User's Guide. (2nd ed.).* Thousand Oaks: SAGE. 51-67.

Ling, J., Heffernan, T.M., & Muncer, S.J. (2003). Higher education students' beliefs about the causes of examination failure: A network approach. *Social Psychology of Education*, 6, 159-170.

Magashoa, T.I. (2013). *Teaching and learning policies in South African schools in the new democratic dispensation: A critical discourse analysis*. Doctoral thesis: University of South Africa, Pretoria. https://uir.unisa.ac.za/handle/10500/11895

Maile, S., & Olowoyo, M.M. (2017). The causes of late-coming among high school students in Soshanguve, Pretoria, South Africa. *Pedagogical Research, 2*(2),1-11.

Martin, N.K., & Sass, D.A. (2010). Construct validation of the behavior and instructional management scale. *Teaching and Teacher Education*, 26,1124-1135.

Master, C.C. (2013). *Time and its use: A Self-management guide for teachers*. NY: Teachers College.

McMillan, J.H., & Schumacher, S. (2010). *Research in education. Evidence-based Inquiry. (7th ed.).* Boston: Pearson Education.

Meroni, E.C., & Abbiati, G. (2016). How do students react to longer instruction time? Evidence from Italy. *Education Economics*, *24*(6),592–611.

Mestry, R., Moonsammy-Koopasammy, I., & Schmidt, M. (2013). The instruction leadership role of primary school principals. *Education as Change, 17*(S1), S49-S64.

Mokoena, S.P. (2016). A conceptual framework for successful succession of Generation Y teachers through shared leadership. *International Journal of Business and Management Studies*, *8*(2),152-168.

Ntuli, L.T. (2018). *Managing curriculum implementation at selected primary schools in the Sekhukhune district, Limpopo province*. Doctoral thesis. University of South Africa, Pretoria.

Osae, C. (2017). How teachers can effectively deal with student tardiness. The New Times. [online]. Available at: https://une.idm.oclc.org/login?url=https://search-proquestcom. (Accessed on 28/01/2021).

Patton, M.Q. (2002). *Qualitative research and evaluation methods. (3rd ed.).* Thousand Oaks: SAGE.

Prior, L. (2008). Repositioning documents in social research. *Sociology, 42*(5), 821-836.

Protheroe, N. (2010). *The principal's playbook: Tackling school improvement.* Alexandria, Virginia: Educational Research Service.

Rensburg, G.H., Alphaslan, A.H., Du Plooy, G.M., Gelderblom D., Van Eeden, R., & Wigston, D.J. (2011). *Research in the social sciences.* Pretoria: University of South Africa.

Rogers, J., Mirra, N., Seltzer, M., & Jun, J. (2014). *It's about time: Learning time and educational opportunity in California secondary schools.* Los Angeles: UCLA IDEA.

Savage, T., & Savage, M. (2010). *Successful classroom management and discipline: Teaching self-control and responsibility.* Thousand Oaks: SAGE.

Shava, G.N., & Heystek, J. (2018). Agency and structure: Principals' ability to bring about sustainable improvement in underperforming schools in South Africa. *Africa Education Review*. https://doi.org101080/18146627.1340809.

South African Government. (2009). Presidential interaction with school principals. https://www.gov.za/president-zuma-interact-school-principals.

Taylor, N., Van der Berg, S., & Mabogoane, T. (2013). '*Context, theory, design' Creating effective schools*. Cape Town: Pearson.

Trao, T., & Quang, T. (2015). The interconnection between interpretivist paradigm and qualitative methods in education. *American Journal of Educational Science, 1*(2),24-27.

Van der Merwe, N.H. (2018*). The effective use of instruction time at secondary schools: A case study in the northern Free State*. Master's dissertation. University of South Africa, Pretoria. https://uir.unisa.ac.za/handle/10500/25248

Van Deventer, I., & Kruger, A.G. (2003). *An educator's guide to school management skills*. Pretoria: Van Schaik.

Vannest, K.J., Soares, D.A., Harrison, J.R., Brown, L. & Parker, R.I. (2010). Changing teacher time. *Preventing Failure, 54*(2),86-98.

Wedel, K. (2021). *Instruction time and student achievement: The moderating role of teacher qualifications*. IFO Working Papers, 344.

Weinstein, C., & Romano, M. (2014). *Elementary classroom management: Lessons from research and practice*. New York: McGraw-Hill.

Review Article

Social Issues on the Academic Performance of Secondary School Learners in the Limpopo Province*

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Abstract

South Africa, after Apartheid and with a democratic government and newly amended policies, committed to provider equal opportunities to every citizen, including the right and access to education. The purpose of this study, following the state of the education system as it is, is to investigate the social issues that contribute to the poor performance of secondary school learners in South Africa, and specifically the Palala circuit in the Waterberg district, Limpopo. A mixed methods approach was used (qualitative and quantitative) to investigate the possible improvements that could be used to deal with the social issues facing secondary school learners. The target population was 10 secondary schools in the Palala circuit in the Waterberg district, Limpopo. The sample was 10 principals, 10 Head of Departments (HoDs), 10 Life Orientation teachers, and 30 learners, 3 per school in the 10 selected schools. The response rate was 93% and data was collected by using questionnaire surveys and interviews with the same 56 participants. The study revealed the predominant social issues that affect the academic performance of learners in secondary schools in the Palala circuit as poverty, teenage pregnancy, bullying, low self-esteem, and parental unemployment. The strategies to eradicate these social issues are in place and need the input and active participation of all stakeholders, especially government, community members, teachers, parents, and the learners themselves.

Keywords: Social issues, academic performance, secondary school, learners

1. INTRODUCTION

As in many other countries, education remains one of the most important basic human rights and needs in South Africa (Moyo, 2013). The Apartheid regime played a big role in segregating learners of colour, who now reside in areas burdened by a wide range of social issues, including socio-economic status, environmental, and psychological factors, which are key factors contributing to the known social issues faced by learners (Kibaara & Kabura, 2015; Taylor, 2010). However, the government after democracy in 1994 has allocated funds and devised policies and strategies to eradicate the inequality and segregation because of the oppression from the Apartheid era (Taylor, 2010). The government has managed to allocate funds including social grants and food schemes in schools with the goal of making education more accessible for those in need, usually the poverty-stricken groups from rural areas.

It is important to acknowledge the effects of the environment people live in. An environment is unarguably a contributing factor in a person's growth, as there is a difference in the welfare of people from different environments. Teh and Otman (2018) differentiate between people from different environments, stating that a healthy environment is more likely to rear a perfect individual, while a less or unhealthy environment will rear a problematic/troublesome person. It is important to

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look into the demographics of students/learners while analysing and examining the possible social issues challenging them. Teh and Otman (2018) further states that, "the environment is a contributing factor to students' delinquency such as loitering, playing truant, bullying, skipping, and more". To some extent, this needs to be looked at from a South African viewpoint, as some of the highlighted delinquencies are prominent in South Africa. Considering the inequality in South Africa, where the greater part still earns below minimum wage, the environment they come from and the high rate of crime, a clear picture of how learners struggle in their academics is needed.

People reside in different areas of the country, some live in suburbs, some in townships, and others in rural areas and it is clear that the standard of living, as per the Stats SA report, is not the same. Engelbrecht, Nel, Nel and Tlale (2015) conducted a study on teachers' understanding of inclusive education in a journal titled *Enacting understanding of inclusion in complex contexts: classroom practices of South African teachers*, and one of the things that are discussed in the journal is that classrooms comprise of a heterogeneous mix of learners. This entails the difference in race, tradition, gender, beliefs, language, ability, and capabilities, and this is the same for all learners residing in different parts of the country, whether they come from rich or poor backgrounds, there will be a difference in traits and capabilities despite the social factors/issues affecting them individually. Among other issues, some of the prevalent social issues facing most South African secondary schools are pregnancy, crime, bullying, prostitution, and early parenthood (Teh & Otman, 2018)

According to Kibaara and Kabura (2015), there are many factors that contribute to secondary school learners' social issues that could impact their academic performance. In developing countries such as Kenya, India, and South Africa, the issues are quite different from developed countries. The socio-economic factors, as identified by Kibaara and Kabura (2015:1) in Kenya include the lack of electricity and proper medical care at home, child labour, the inability of parents to afford school requirements, and not enough food at home. In India, the prevailing factors are poverty, lack of secondary schools (200,000) compared to elementary schools (over 1 million). South Africa is faced with similar social issues such as electricity, parental unemployment, food, and poverty, and teenage pregnancy.

According to Kibaara and Kabura (2015), tribal intolerance, textbook to pupil ratio, pupil to teacher ratio, and insufficient facilities and classrooms are the factors impacting learner performance in Kenya. Gupta, Gupta and Kumar (2018:79) that India records over a million graduates annually, mostly from the Information Technology and Engineering faculties; however, the fact that India has no "common school system", means that students are enrolled based on their ability to pay for tuition and their social status (Lall & House, 2005:4). South Africans also have very diverse backgrounds, where learners in urban and suburban environments have better schools, buildings, transport systems, and access to technology, which leads to better academic performance (Teh & Otman, 2018:930). Other pressing factors in rural schools are the overcrowding in classrooms, the shortage of skilled teachers, insufficient facilities, and transport.

1.1. Preliminary Literature

The new South Africa, post-apartheid and newly amended policies promised to offer equal opportunities to every citizen in having access to adequate education; however, there is still a number of challenges that prevent and forces other citizens, especially children between 7 and 18 years of age to drop out of school, or consider school as unimportant (Kibaara & Kabura, 2015; Taylor, 2010). This is a result of collective failures in the implementation of strategies and inadequate solutions to remedy the situation. The purpose of this study is to investigate the social issues that contribute to the poor performance of secondary school learners in South Africa, and to scrutinise the failed solutions already implemented to solve social issues affecting secondary school learners.

The question remains: How accessible is education? It will be addressed throughout this study. Humans are natural social beings in their daily lives, and in almost everything they do, they interact

with other individuals, which is why they tend to feel the need to belong (Starratt, 2004:724). Their interactions in society tend to form a way of life where they live by certain morals, beliefs, and traditions. Some of these have a positive impact while others have a negative impact on different individuals, and these are at the root of the social issues that we all face. Learners also face numerous social issues within the education system, some of which need serious intervention. Social issues that need intervention within schools include but are not limited to bullying, poverty, and teenage pregnancy.

1.2. Purpose and Objectives

The purpose of this study is to investigate the social issues while providing solutions in secondary schools in South Africa, particularly in the Palala circuit division of the Waterberg district in Limpopo. The study firstly explores the social issues faced in schools by applying meta-synthesis methods to identify the research gap, problem, and questions, and furthermore to identify social issues in schools globally; the study then analyses the identified social issues based on applicability in the South African secondary schools and lastly, through questionnaire surveys and interviews, possible recommendations are provided for these social issues faced to secondary learners in the schools sampled for the study.

1.3. Main Research Question

How best can the known, social issues be controlled in Secondary Schools?

1.3.1. Sub-research questions

- What are the prominent well known social issues faced by learners in schools?
- From the identified social issues, which of them are relevant to South African Secondary Schools?
- What recommendations could be made to address social issues in schools?

2. METHODOLOGY

2.1. Research Methodology

A research methodology can be defined as a channel or route used in research to guide the researcher to find solutions and answers to a research problem; it may be from following a framework, research onion, or a flow chart (Kumar, 2011). To account for the research problem, a route is followed in an attempt to find answers and deal with the research gap in the study. Initially, the study employs a meta-synthesis approach, which explores the available literature from secondary sources, help to identify the research gap, research problem, and research questions; and then a population of interest and a sample size is developed. Furthermore, by choosing to employ mixed method research (both qualitative and quantitative methods) in-depth interviews are used to conduct exploratory research and an online survey for descriptive quantifiable research. From collecting data, an analysis is done, and solutions and recommendations are provided for the research problem. This research employs an epistemological approach, narrowed to two philosophical concepts namely positivism and interpretivism. Positivism focuses on the objective knowledge, which is derived from the empirical nature of study and supported by facts and quantifiable observations, and interpretivism focuses on the subjective knowledge derived from people's perspectives and understanding (GuhaThakurta & Chetty, 2015). This particular research approach works in a sequential manner, with the research approach and method structured in the study, as the quantitative study is based on the concept of positivism where positivism is approached through a method of collecting primary data, and involve the development of hypotheses, which is later tested and confirmed with data to answer the research problem. It also caters for the qualitative study as it considers people's knowledge, the subjective meaning of events, and

social phenomena through the interpretivist approach (GuhaThakurta & Chetty, 2015). The research employed a mixed method approach where questionnaire surveys and interviews were the tools used to collect data.

2.2. Participants

The sample size was drawn from the identified population, which are secondary schools in Limpopo. The sample size for this study included secondary school learners and teachers from the Palala circuit division of the Waterberg district in Limpopo. The sample was 30 learners, 7 Life orientation teachers, 10 HoDs, and 9 Principals. Saunders, Lewis, and Thornhill (2009) developed a research onion that describes and shows stages leading to the development of an effective research methodology; the study also follows a structure in a sequence, where steps in conducting the research are taken.

2.3. Instruments

Data to investigate the possible improvements that could be used to deal with the social issues facing secondary school learners were using questionnaire and interviews. For the data collection, questionnaire surveys were distributed to the sample size for participation, and interviews as a tool of qualitative data were conducted amongst the participants from the sample size. A questionnaire is said to be a widely used tool in research to collect relevant quantifiable data or information that is reliable and valid (Taherdoost, 2016). It is usually used to ensure reliability and validity by its consistent and accurate nature (Taherdoost, 2016: 29). The study employed a questionnaire survey to ensure that the data collected forms reliable and valid findings, which can be relied on in terms of the accuracy of the study. Face-to-face interviews are another type of research tool used in the study. The use of interviews and a questionnaire was to gather as much information as possible, also considering the subjective and objective point of view of the respondents. Questionnaires are used for objective information, while interviews are used for subjective information. Participants volunteered for the study. The purpose of the research was explained to the participants. The names of respondents were not identified for ethical reasons.

2.4. Data Analysis

Thematic analysis of the data was performed using open coding techniques, this required data to be carefully arranged, classified, summarized, and described in terms of useful topics to categorize the data, codes were given to themes (Hesse-Biber & Leavy, 2011). According to Tustin, Ligthelm, Martins and Van Wuk (2010), central editing involves the process of checking for completed questionnaires and wrong answers that do not necessarily answer the research questions to achieve the research objectives. The questionnaires returned from the respondents were checked, edited, and analysed to generate a percentage feedback based on the questions asked in the questionnaire surveys. For the qualitative data collected through face-to-face interviews, and themes and sub-themes were developed.

3. FINDINGS

3.1. Poverty

The overarching theme and most prominent social issue was poverty. Poverty in this context refers to the lack of resources, the inability of parents to afford school requirements, and parents or guardian unemployment. When asked about the inability of parents to afford scholastic materials, it was found that most of the learners from child-headed families, poor backgrounds, and/or disadvantaged families had no proper and clean uniforms. The uniforms were torn and worn out or it did not fit them properly (old uniform).

Learners and teachers expressed their frustrations about the uniform. One of the teachers indicated that, "*Learners without proper uniform tend to feel insecure and has low self-esteem. They wear torn clothes without jerseys during winter; these negatively affect their school performance*".

Teacher 4: *"I once asked one of the learners, what it is that I can do to help, and I discovered that the learner didn't have a simple calculator and he also raised that they cannot afford study guides that some of the learners have.*"

The South African government, in an effort to provide equal educational access to all South Africans, provides social grants to families and children, as well as a nutritional meal to every learner at school. However, it seems that in many cases, these meals might be the only meal for the day.

Learner 2: *"No, I don't eat breakfast because I don't have time as I have to wake up early in the morning to prepare my siblings for school, so I only eat at school during lunch time".*

Learner 7: *"No, I only eat during break times at school and after school at drop-in centre because I am staying with my grandmother who is sick, and unable to prepare food for us. In the morning I sometimes fail to concentrate waiting for break time so that I can eat".*

It is clear, according to Chinyoka (2014), which the home economic situation affects learners academically and parents cannot afford to support them in their education.

The study found that the majority of students in South African schools, particularly those in rural regions, suffer from poverty as a result of the fact that the majority of parents are unemployed and dependent on social assistance. The government has been successful in allocating funds, such as social grants and food programs in schools, with the aim of making studying more accessible for those in need, typically the impoverished groups from rural areas. Despite the allocation of funds and the provision of access to education, there are still barriers that prevent some students from attending school on a daily basis or even attending at all.

3.2. Teenage Pregnancy and Early Parenthood

Teenage pregnancy and early parenthood is a serious concern in South Africa, together with alcohol and drug abuse.

Teacher 4: "In our area, there are two social ills that affect learners the most and they are drug abuse and teenage pregnancy."

Learner 18*: "I am staying with my grandmother who is unemployed and there is no one supporting us, so I ended up falling pregnant to get the grant to be able to put food on the table; that is the reason I ended up falling pregnant."*

Teacher 1: "Learners are not ready to deal with demands of being a parent and when it does happen, it becomes too much for them and if they have to come to school, they drop in terms of performance altogether."

Teacher 5: "In our areas there are two social issues that affect learners the most and they are drug abuse and teenage pregnancy."

The quality of the content from a teacher has the potential to build a learner, and if the teacher is not properly equipped to educated teenage learners in secondary school, there could be a possible decline in the learners' academic performance. Teenage pregnancy is a problem in most schools, and it's even worse in rural areas where there are fewer facilities and students engage in sex for entertainment.

De Wet, Amoo and Odimegwu (2018; 88) supports most of the comments mentioned and agree that among many other factors, the key factors contributing to teenage pregnancy include lack of parental care and control, lack of some material needs, poor peer guidance, lack of sex education, and the influence of alcohol and drug abuse. From the statements above, girls from vulnerable families are at risk of falling pregnant as they try to make ends meet. They often fall prey to older men, known as a

"blesser" who will provide financial support if the learner becomes pregnant. Mogotlane (2020:30) agrees that poverty-stricken learners tend to follow any possible route for finances.

Learners' psychological well-being is also a social issue impacting their school attendance and performance. Bullying and victimisation, which include sexual harassment, is cause for concern. Marx (2018:15) states that bullying can traumatise the victim, causing changes in their behaviour, personality, and self-esteem. Victims could develop depression, anxiety, and withdrawal.

Head of Department: *"Yes, pupils' esteem. I think that lack of self-esteem is affecting me in my studies because I don't really believe in myself and sometimes, I am even scared to ask teacher for help when I don't understand some topics"*.

Teacher 6 confirms that some learners are not performing well due to violence and bullying at home, "*I then called in the parents and spoke to them about this problem and that's when I realised that these learners are sometimes bullied by their own parents."*

Learner 5: *"I think it is because they have family issues, or they are being abused; I think those are the reasons."*

Violence in schools is not only directed to learners; teachers also experience violence at the hands of their learners, which could lead to teachers being stressed out, leading to absenteeism (Ramulumo & Pitsoe, 2013). One of the teachers also mentioned that they fear being bullied by learners who use drugs because they do not know how they would react if questioned.

Parental support is critical to ensure learners are actively taking part in their academic journey (Ramulumo & Pitsoe, 2013). A concern is that some parents do not regard education highly, or are themselves not very educated, and therefore do not understand their role in supporting their children. Considering how a parent views education, there is a close link to how their children eventually perform in school (Nieuwenhuis, 2018). Because of a parent's social inferiority or lack of social impact and access of funds for school programmes, the parent, given their poor educational level, may not value education as much, which in turn affects the children's readiness for school (Nieuwenhuis, 2018).

Teacher 2: "*Parents can play must be empowered on how to assist their children and motivate their children and we need to encourage parental involvement as teacher."*

To account for the statement by the teacher above (Mafokwane, 2017), who states that parental involvement is also a social issue of importance, it has been shown that learners who have positive support and involvement of their parents in their education tend to perform better.

3.3. Strategies to Address Social Issues

Teachers play a vital role in learners' upbringing, knowledge, development, and behaviour to some extent; learners believe the teacher over any other available source (Mohamedayupkhan & Mani, 2014).

Principal 3: *"The other intervention which I think we should go into is trying to find other structures within the community to try and help them.*"

Teacher 6: *"I think it needs other stakeholders, police maybe.*" And from Teacher 3: *"Bringing in all the stakeholders because for instances, in terms of alcoholism, tavern owners contribute and in terms of absenteeism, parents are involved, so there is a need for regular meeting with the stakeholders. As a school, we discuss with the stakeholders' ways to minimize those issues."*

Head of Department 2*: "We need to have people who have got the ability and skills that can assist and go further with advising these learners so that they can perform better. If possible, each school must have a social worker and this social worker must work on the moral of the learners."*

Teacher 1: *"If parents just play their part by supporting learners and try to give them just basic needs and where it is impossible try and cry for help."*

Teacher 3: *"Parents should regularly check their children's books, communicate with teachers and the principal, and also attend school meetings to get all the updates from the school."*

Principal 2: *"Parents need to be very much involved and supportive to these learners. Even if the learner may have been exposed and fallen into these social issues, the parents need to support them.*"

From the observation of the statements and the survey, it is evident that both learners and teachers believe that parents, teachers, and external stakeholders could bring change and help combat the social issues facing learners. Teachers stated all the support system structured they think could help these learners from the impact from social issues and potentially improve their academic performance. The following were mentioned as the relevant support system structures to help in this regards are teachers, parents, social workers, psychologist and community The stakeholders, considering the context of a school, can provide "Student support programmes, behaviour modification, life skills programmes, parental involvement, and capacity building are some intervention strategies to enhance learners' performance" (Katamei & Omwono, 2015).

3.3.1. Socio-economic issues (the impact of social issues)

Learners were asked to choose the relevant social issues from a list of identified social issues and the responses were observed.

The question was a closed-ended question that provided the mentioned social issues In that affect learners academic performance. Respondents had to indicate the relevance of the mentioned social issues to the academic performance of secondary school learners. The survey results were as follow:

Table 1. List of social issues affecting learners' academic performance

Social issues		Relevant	Not Relevant
1.	Crime	85%	15%
2.	Pregnancy	96%	4%
3.	Bullying	88%	12%
4.	Prostitution	54%	46%
5.	Early parenthood and/or teenage pregnancy	96%	4%
6.	Poverty	96%	4%
7.	Inability of parents to afford school requirement	88%	12%
8.	Parents/guardian unemployment	85%	15%
9.	Tribal intolerance	46%	54%
10.	Stereotypes	62%	38%
11.	High prevalence of drug abuse	81%	19%
12.	Alcoholism	85%	15%
13.	Pupil to teacher ratio (lack of teachers)	81%	19%
14.	Lack of education facilities	85%	15%
15.	Pupils' stress emanating from poor parental support	81%	19%
16.	Pupils' anxiety prior to and during exams and stress because of poor health and nutrition	73%	27%
17.	Pupils' self-esteem	88%	12%
18.	Pupils attitude to attending classes	88%	12%
19.	Mental preparedness of pupils	85%	15%
20.	Stigma related to sickliness due to HIV/AIDS and related sickliness	73%	27%
21.	Lack access to technology and high-quality content	81%	19%
22.	Low motivation	77%	23%
23.	Lack of competent and qualified academic staff ineffective school development management	46%	54%
24.	Child marriage	38%	62%
25.	Discriminatory treatment to women	38%	62%
26.	Violation of human rights	38%	62%

It was found that out of the 30 learners, 81% said that the high prevalence of the drugs is one of the pertinent social concerns they confront that has a detrimental effect on their academic performance. The least detrimental effects of human rights violence are child marriage and prejudice.

4. DISCUSSION AND CONCLUSION

The aim of this study was to investigate the social issues affecting the performance of secondary school learners in the Palala circuit division of Waterberg district in the Limpopo province. Various issues such as crime, poverty, unemployment of parents, teenage pregnancy, and early parenthood were identified, where some of these issues are not restricted to the South African context only. In this study, the research findings were formulated and integrated with what was reported in literature to account for the research questions and objectives of the study. The findings suggested that the social issues exposed to both learners and their teachers have a negative impact on the overall academic outcome of the learners. The findings further suggested that these social issues co-exist and correlate with one another to present yet another issue; this is generated from the resulting issues of poverty forcing some learners to resort to pregnancy, alcohol, drugs, and crime, which are other social issues affecting not only learners and teachers.

Recommendations on possible strategies to eliminate these social issues have been made, which require the input and active participation of all stakeholders, especially government, community members, teachers, parents, and the learners themselves. Schools should establish functional health, alcohol, and drug committees that will ensure that learners do not use drugs, alcohol, and other substances that could lead to poor academic performance due to consistent absenteeism, bullying, and dropout. Inviting learners' role models, social, and former students to give a motivational talk that would show how they themselves addressed challenges when they were still learners and the dangers of not focusing on their schoolwork. Establishing all stakeholder forums that will include tavern owners, learner-transporters, and parents to show how each of them contributes to the academic performance of learners. Another recommendation would be to include the severity of social issues to not only the learners but to teacher and the community, because all these social issues holistically affect a school learner through its affection to the community, parents, and the teachers. From the observation of the statements and the survey, it is evident that both the learners and teachers believe that parents and teachers could bring change and help combat the social issues exposed to learners. This is supported by the statement by the teachers from the interview, for instance one of the teachers stated that parents need to be involved their children's education and be supportive, although some could have been exposed already and fallen a victim to social ills, so in hindsight the involvement shows concern and could potentially help redirect these learners and eventually their academic performance could improve. This study proposed innovative and support system methods to help reduce the challenges of learners to attain good academic results and know how to deal with social issues.

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5. REFERENCES

Chinyoka, K. (2014). Influence of home based factors on the academic performance of girl learners from poverty stricken families: A case of Zimbabwe. *Mediterranean Journal of Social Sciences Publishing*, *5*(6). https://www.mcser.org/journal/index.php/mjss/article/viewFile/2410/2384

De Wet, N., Amoo, E.O. & Odimegwu, C.O. (2018). Teenage pregnancy in South Africa: Where are the young men involved? *South African Journal of Child Health*, *2018*(1), 44-50. http://www.sajch.org.za/index.php/sajch/article/view/1443

Engelbrecht, P., Nel, M., Nel, N. & Tlale, D. (2015). Enacting understanding of inclusion in complex contexts: classroom practices of South African teachers. *South African Journal of Education*, *35*(3). https://www.ajol.info/index.php/saje/article/view/121843

GuhaThakurta, S. & Chetty, P. (2015). Understanding research philosophy. *Knowledge Tank*.

Gupta, B., Gupta, R. & Kumar, A, (2018). A bibliometric study of Indian contribution on Indian economy during 2006-17. *International Journal of Information Dissemination and Technology*, 8, 79-84. https://www.researchgate.net/publication/327337838_A_bibliometric_study_of_Indian_contribution_on_Indian_Economy_during_2006-17

Hesse-Biber, S. N. & Leavy, P. (2011). *The practice of qualitative research*. (2nd ed., 360–365). Singapore: SAGE Publication Inc.

Katamei, J.M. & Omwono, G.A. (2015). Intervention strategies to improve students' academic performance in public secondary schools in arid and semi-arid lands in Kenya. *International Journal of Social Science Studies*, *3*, 107. https://redfame.com/journal/index.php/ijsss/article/view/796

Kibaara, T.M. & Kabura, G.W. (2015) Factors ınfluencing academic performance in urban ınformal settlements in kenya: a case study of public primary schools of Kibera slums, Nairobi county. *Kabarak Journal of Research & Innovation*, *3*(1), 1-8. http://ojs.kabarak.ac.ke/index.php/kjri/article/view/47

Kumar, R. (2011). *Research methodology: a step-by-step guide for beginners*. Los Angeles: SAGE Publications.

Lall, M.C. & House, C. (2005). *The challenges for India's education system*. London: Chatham House.

Mafokwane, M.F. (2017). *An investigation of the challenges affecting reading in the foundation phase in rural areas of bolobedu, limpopo province* (Doctoral dissertation), University of South Africa.

Marx, H. (2018). *Children's decisions to support victims of bullying: friend and peer influences and the effects of a cross-age teaching of social issues intervention*. University of Chester. https://chesterrep.openrepository.com/handle/10034/621793?show=full

Mogotlane, S. (2020). *Orphans and vulnerable children's perceptions of child poverty in Cator Manor, KwaZulu-Natal, South Africa*. (PhD Dissertation), University of KwaZulu-Natal.

Mohamedayupkhan, M. & Mani, S. (2014). A study on higher secondary students personal problems, study involvement and academic achievement. *International Journal of Science and Research, 5*(5), 876-882. https://www.ijsr.net/archive/v3i5/MDIwMTMxOTQw.pdf

Moyo, W. (2013). Causes and effects of poverty on academic achievements of rural secondary school students: Case of tshazi secondary school in Insiza district. *International Journal of Asian Social Science*, *3*(10), 2104-2113.

Nieuwenhuis, J. (2018). The interaction between school poverty and agreeableness in predicting educational attainment. *Personality and Individual Differences*, *127*, 85-88. https://www.sciencedirect.com/science/article/pii/S0191886918300680

Ramulumo, M.R., & Pitsoe, V.J. (2013). Teenage pregnancy in South African schools: Challenges, trends and policy issues. *Mediterranean Journal of Social Sciences*, *4*(13), 755.

Saunders, M., Lewis, P. & Thornhill, A. (2009). Research methods for business students. *Pearson Educatio*n. https://www.richtmann.org/journal/index.php/mjss/article/view/1569

Starratt, R.J., (2004). Leadership of the contested terrain of education for democracy. *Journal of Education Administration*, *42*(6), 724-731. https://eric.ed.gov/?id=EJ802987https://eric.ed.gov/?id=EJ802987

Taylor, S. (2010). The performance of South African schools: Implication for economic development. stellenbosch: University of stellenbosch. *Technology*, *8*(2), 79-84.

Taherdoost, H. (2016). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. *International Journal of Academic Research in Management*, 5. https://www.researchgate.net/publication/319998004_Validity_and_Reliability_of_the_Research_Instrument_How_to_Test_the_Validation_of_a_QuestionnaireSurvey_in_a_Research

Teh, M. & Otman, M.S. (2018). Influence of social environment on student's behaviour. *International Journal of Academic Research in Business and Social Sciences*, *8*(7). https://hrmars.com/papers_submitted/4520/Influence_of_Social_Environment_on_Students_Behaviour.pdf

Tustin, D.H., Ligthelm, A.A., Martins, J.H. & Van Wuk, H.D.J. (2010). *Marketing research in practice*. 2nd Impression.

Review Article

Character Education Human Nature Based-Curriculum in Science Learning of Primary School *

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Abstract

Dioramas are seen as unique teaching tools for environmental education in general and biodiversity education in particular as they present realistic learning environments that can reflect the components of the biodiversity, relationships among these components and changes occur over time. The aim of this study is to examine middle school students' views on diorama supported biodiversity education. A phenomenological approach based on student experiences were employed for the study. The study group of the research consists of twenty-four 7th grade students studying during the 2021-2022 academic year. Students participated in an 8 hours experimental process included diorama supported 5E constructivist teaching model. Interviews were used as the data collection tool. The analysis of data revealed that dioramas contribute positively to biodiversity education as they enhance learning, mitigate the effects of misconceptions, increase students' awareness to protect biodiversity and of biodiversity sustainability. Therefore, including and using dioramas in learning environments for biodiversity education can mediate learning as well as help students to benefit from a realistic environment that include living things, the ecosystems they form and the places they live in.

Keywords: Curriculum, character, human nature, physics

1. INTRODUCTION

Character is a characteristic that distinguishes a human from another. Character is a basic thing that every human being has. Character education is learning that must be internalized from the start at all levels of education, from elementary to university level (Widayanti, 2018). Schools are one of the strategic places for character building other than in the family and society (Abdulloh Hamid, 2017). Therefore, it is necessary to cultivate character education, especially in elementary schools with various activities that can support character cultivation in intra-curricular, co-curricular, and extra-curricular activities. school. Sa'dun Akbar, a professor of Primary Education from the State University of Malang, said in his paper that several problems in today's educational practice cannot develop the personality of students as a whole, so it is not optimal in developing good character for students, such as taxonomic orientation, unbalanced between the "thought" and "heart" aspects in educational practice, unbalanced development between the Programmed Curriculum and the Hidden Curriculum, the problem of presenting and internalizing values through various subjects, and non-optimal in educational practices and learning for personality development (Akbar, 2011). Reinforcing what has been described by Sa'dun Akbar, Hamdi Muluk who is a Professor of Psychology at the University of Indonesia explained that the elementary school level should make the character a pressure point. According to him, education in primary schools in Indonesia must be improved by emphasizing character education (Muluk, 2019).

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In the concept of Islamic education, character education is not contemporary because the spirit or core of Islamic education is character education which was originally known as moral education. Character education has never been neglected because Islam that was spread by the Prophet was Islam in the full sense, namely integrity in faith, good deeds, and noble character (Marzuki, 2015). Islamic education means the formation of the Muslim person. The content of the Muslim personality is the full practice of the teachings of Allah and His Messenger. However, the Muslim personality will not be achieved or nurtured except with teaching and education (Hairuddin, 2013).

Allah subhanahu wa ta'ala has created all his creatures based on their nature, in the form of potential and creativity that can be built, which has the possibility of developing and increasing so that their abilities far exceed their physical abilities (Suriadi, 2019). According to Abd al-Rahman al-Bani, quoted by an-Nahlawi, states that the task of Islamic education is to keep and maintain the nature of students, develop and prepare all their potentials, and direct that nature and potential towards goodness and perfection, and realize the program in stages (Al Nahlawi, 1996). The importance of inserting religious values (verses of Kauniyyah) in science learning can be based on several reasons: (1) The spiritual void in science education in schools and the scientific world must be avoided and solutions are sought; (2) Natural phenomena that exist and occur on the earth and sky are objects of scientific study and objects of contemplation of Allah Subhanahu wa ta'ala; (3) Science that "rejects" God can cause humans who "wrestle" with science to experience various multidimensional crises; (4) The presentation of science in textbooks (theories and explanations), which is based on materialism, has eliminated God as the creator; (5) The verses of the Qur'an (Kauniyiah) which are stated in the outline will be better understood if they are supported by an understanding of science; and (6) As an effort to "fence" science, so students do not fall into teachings that are contrary to creed and faith (Khoiri et al., 2017).

Based on explanation above, this study tries to formulate how the concept of human nature-based character education curriculum in Physics Science learning of Elementary Schools as by learning Physics Science students grow their characters in accordance with the nature of their creation, so they can become Servants of God wholly in accordance with the purpose of human creation on earth.

2. METHODOLOGY

This research used library research method. Library research is a study that limits the collection of materials through library collections without having to go out into the field (field research) (Zed, 2008). The data comes from related literature, where all data sources and materials used in this study are books, journals, and other written documents relevant to the theme of the study, related to the concept of character education based on human nature in learning Physics in Elementary Schools.

3. RESULTS and DISCUSSIONS

3.1. Character Education

Etymologically, the character comes from the Greek charassein which literally means to carve. Character is like carving gemstones or hard iron surfaces. The understanding then developed, the character is defined as a special sign or pattern of behavior (Judiani, 2010). In French, it is called *carakter* which means to make sharp or make deep. In English, it is called character which has the meaning: of character, nature, role and letters (Syarbini, 2016). In the Indonesian Dictionary, the word character is defined by character, psychological traits, morals, or manners that distinguish one person from another (National, 2008). Based on the concept of character, the term character education was first coined by German Pedagog F.W Foerster (1869-1966). Then, the terminology of character education was introduced since the 1990s where Thomas Lickona was considered the bearer,

especially when he wrote a book entitled The Return of Character Education, which was then followed by his book. Educating for Character: How Our School Can Teach Respect and Responsibility (1991). Through these books, Thomas Lickona made the western world aware of the importance of character education (Syahri, 2019).

However, the practice of character education in Indonesia has been going on for a long time before Indonesia's independence, such as the education practice carried out by Ki Hajar Dewantara, R.A Kartini, K.H Hasyim Asy'ari, K.H Ahmad Dahlan, M. Natsir and other figures. At that time it was not called character education. Then, the term character education became popular in Indonesia around the 2000s, where a person who was instrumental and considered a pioneer of character education in Indonesia was Ir. Ratna Megawangi, Ph.D. (Syarbini, 2016).

According to Khan, character education is a process of activities carried out with all conscious and planned power and effort to direct students. Character education is also a process of activities that lead to improving the quality of education and developing a harmonious mind that always teaches, guides, and fosters every human being to have intellectual competence, character, and interesting skills. The values of character education that can be lived in this study are religious, nationalist, intelligent, responsible, disciplined, independent, honest, wise, respectful and polite, generous, helpful, mutual cooperation, confident, hard-working, tough, creative, leadership, democratic, humble, tolerant, solidarity and caring (Yahya, 2010).

Through character education, students will be able to independently improve and use their knowledge, study and internalize, and personalize character values and noble character, so they are manifested in daily behavior. At the institutional level, character education leads to the formation of school culture, namely the values that underlie behavior, traditions, daily habits, and symbols that are practiced by all school members and the community around the school (Fatimah & Kartika, 2013).

3.2. Curriculum

The curriculum is a system that has certain components. (Hamid, 2012), what components make up the curriculum system and the interrelationships between its components can be seen in the chart below:

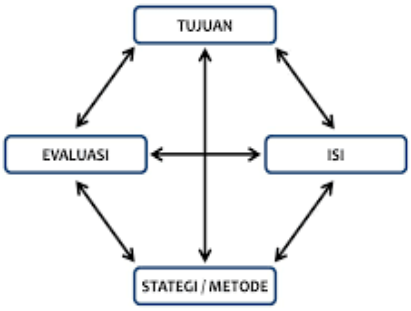

Figure.1.Curriculum components

The chart illustrates that the curriculum system is formed by four components, namely: the objective, the content, the method or strategy for achieving the objectives, and the evaluation. As a system, each component must be related to the other. When one of the components that make up the curriculum system is disturbed or not related to other components, the curriculum system as a whole will also be disrupted.

3.3. Human Nature (*Fitrah*) Concept

Fitrah can be understood from an etymological (*harfiyah*) and terminological (*ishtilah*) point of view, according to Langgulung in (Suriadi, 2019), the origin of the word *fitrah* etymologically comes from Arabic, namely *fitrah* (فطرة), the plural form *fithar* (فطر) which means temperament,

character, incident, original, religion, creation. Experts explain the definition of *fitrah* as quoted in (Muliati, 2017) which explains and summarizes the meaning of *fitrah*, namely:

Fitrah means holy; *fitrah* means Islam; *fitrah* means recognizing the Oneness of Allah; *fitrah* means pure; *fitrah* means the condition of human creation that has a tendency to accept the truth; *fitrah* means basic human potential as a tool to serve and ma'rifatullah; *fitrah* means stipulations or occurrences of human origin regarding happiness and misguidance; *fitrah* means the natural nature of humans (human nature). The Islamic concept of *fitrah* is comprehensive, rooted in the idea that humans are born in a state of nature which is then influenced by existing circumstances (Bhat, 2016). *Fitrah* in the Qur'an can mean holy, pure, or even natural (Purnama, Aziz, Nurhusna, & Ulfah, 2020).

From the opinion above, it can be concluded that *fitrah* is the basic human potentials that have the nature of goodness and holiness to receive stimuli and influences from outside towards perfection and truth. The concept of *fitrah* demands that Islamic education be directed to rely on *at-tawhid*. This is intended to strengthen the relationship that binds humans to *Allah azza wa jalla*. What students learn should not conflict with these principles of monotheism. This concept of *at-tawhid* emphasizes the greatness of Allah that must be obeyed and considered in the Islamic education curriculum.

3.4. Fitrah-Based Character Curriculum in Science Learning

3.4.1 Objective component

The goals of Islamic education contain certain values according to their respective views which must be realized through a directed and consistent process using various physical and non-physical means. The goal or "target" or "intention" which in Arabic is called "*ghayat*" or "*ahdaaf*" or "*maqasid*" (H.M. Arifin, 2019). In the concept of character education based on nature, the purpose of the education curriculum that is carried out cannot be separated and must be in line with the purpose of the creation of humans themselves, namely as servants to worship *Allah ta'ala*.

Allah ta'ala says in the Qur'an Surah Adz-Zariyat 56:

Translation: And I did not create the jinn and mankind except to worship me.

The verse above explains that the purpose of the creation of humans, namely to worship Allah in the position of humans as a servant, so the curriculum concepts created must all be in harmony and in line with the purpose of the creation of humans themselves, namely to worship and unite to *Allah ta'ala*. The purpose of education in general and Islamic education, in particular, is not only as a knowledge transfer process ut also as a process of transferring Islamic values (Triwidyastuti & Siregar, 2018).

Based on the explanation above, the purpose of the human nature-based character curriculum in Physics Science learning is how to direct students to be able to worship and know their Creator, as explained by Arif: All subjects should insert and instill values of faith and piety (imtak) and noble character, including in science subjects (Arif, 2017).

3.4.2 Content/Material components

Curriculum content is a component related to the learning experience that students must have. The content of the curriculum concerns all aspects related to knowledge or subject matter which are usually described in the content of each subject matter given as well as student activities.The material for science education in Indonesia is contained in the Minister of National Education Regulation Number 22 of 2006 concerning Content Standards which states that science subjects in elementary schools aim to make students have the following abilities:

1. Gaining confidence in the greatness of God Almighty based on the existence, beauty, and orderliness of His natural creation.
2. Developing knowledge and understanding of science concepts that are useful and can be applied in everyday life.
3. Developing curiosity, positive attitude, and awareness about the interplay between science, environment, technology, and society.

4. Developing process skills to investigate the environment, solve problems, and make decisions.
5. Increasing awareness to participate in maintaining, safeguarding, and preserving the natural environment.
6. Increasing awareness to appreciate nature and all its regularities as one of God's creations.
7. Acquiring knowledge, concepts, and skills in science as a basis for continuing education to the next level.

All of these materials in the concept of human nature-based character education must be directed to students can become complete servants with faith and piety to their Creator, for example, as explained by (Fatimah & Kartika, 2013) regarding solar system material, it is very important when a teacher can integrate with religious character education. Because learning the solar system is taught about the arrangement of the extraordinary solar system. The arrangement of the solar system will not be orderly without God's intervention, so we can live in peace and not experience disturbances.

The characters that can be developed through the Physics Science curriculum material in elementary schools are: Characters that can be developed through learning Natural Sciences (IPA) are objectivity, accuracy, precision, the pursuit of truth, problem-solving, protect human life: safety and risk, humane, intellectual honesty, academic honesty, courage, low humility, decision-making, willingness to suspend judgment, scientific inquiry: being fair and just, questioning of all things, verifying, respect logic, integrity, diligence, persistence, curiosity, open-mindedness, critical evaluation of alternatives, and imagination (Arif, 2017). Furthermore, the learning material for Physics Science as explained by Aulia in her article includes four main elements which include attitudes, processes, products and applications. Each element means (1) Attitude: curiosity about objects, and natural phenomena, (2) Process: problem-solving procedures through the scientific method; (3) Products: in the form of facts, principles, theories, and laws. (4) Application: application of scientific methods and scientific concepts in everyday life (Rasyid, Alifah, & Fajar, 2019).

The material from the human nature-based character curriculum in physics learning is that students are not only taught about formulas and laws that move nature, or formulas that must be memorized every time they enter class, but need to teach the axiological values of life implied in the formulas. The existing formulas all lead to the formation of character and self-awareness as servants of the Creator.

3.4.3 Method/Strategy component

Methods and strategies are the third component of curriculum development. This component has a very important role because it relates to curriculum implementation. How good and ideally the goal must be achieved without the right strategy to achieve it. Then, the goal may not be achieved. Science learning can be done with various methods, approaches, and suitable learning models, namely through direct experience (learning by doing) because science is a part of human life where direct student-centered learning can strengthen students' memory (Putra, 2017).

The learning method in character building through learning Physics in elementary schools is active learning where the role of science learning in character building of students can be developed through active, creative, and innovative learning models with a learning process that is not only in the classroom but also carried out in the environment (nature). The interaction of students with the environment or nature is expected to produce behavioral changes for the better (Rasyid et al., 2019).

Furthermore, according to (Muhamad Mustaqim, 2015), the application of character education in elementary schools can be done by several methods, namely: inculcation, modeling, facilitation, and skill building. A science teacher must provide as many opportunities as possible for students to think and use reasoning abilities. Students can do this by being directly involved in various activities, such as class discussions, problem-solving, or experimenting. In other words, students should not only be used as passive objects with the burden of memorizing various concepts and scientific formulas (Mundilarto, 2003). According to (Mansir, 2021) an effective method in the role of Religion and

Science Education in the formation of character building is the mixed method, by combining problem-solving methods, inquiry methods, and discovery methods. The role of educators in the formation of character building is very important. In addition, this method is the right method to be implemented in an educator, namely making himself a role model for students because an educator is a role model for the students. Based on the description and explanation above, it can be concluded that the method used in the concept of human nature-based character in science learning in elementary schools is how learning grows awareness of students about what is obtained in the learning process to become independent individuals, and make students creative and active in the learning process, all of which lead to the optimization of physical and intellectual functions to be able to become servants of the Creator as a whole.

3.4.4 Evaluation component

Evaluation is a component to see the effectiveness of achieving goals. In the context of the curriculum, evaluation can work to find out the goals which have been set, or it is used as feedback in improving the strategy that has been set. In the concept of character education based on human nature, the purpose of the evaluation is more emphasized on the mastery of attitudes (affective and psychomotor) rather than cognitive aspects (knowledge). In the Qur'an and hadith, there are many evaluation benchmarks, example, related to the implementation of the nature of faith, which is related to prayer that is done properly and correctly will be able to prevent someone from evil and evil deeds (Q.S Al-'Ankabut : 45). The benchmarks related to morality, for example, a person who believes loves his brother as he loves himself; the benchmark for bad morality is as a characteristic of a hypocrite, namely: if he speaks, he lies; if he promises, he will break it, and if he is given a mandate, he will betray. The form of evaluation in the concept of human nature-based character in learning at elementary schools must be conceptualized and discussed together by the school and parents. The form can be in the form of a description that includes aspects: aspects of faith, aspects related to aqidah, worship, attitude (*adab* and *akhlaq*) material; learning aspects: aspects related to children's learning behavior and learning styles; talent aspect: aspects related to children's interests and talents during activities at home.

4. CONCLUSION

Based on the explanations that have been explained and described by the researchers, the concept of a human nature-based curriculum character in learning Physics at elementary schools is how curriculum materials can be used and directed as a means to build morals and noble character in accordance with the nature of their creation where students will know themselves and his creator. Through physical science learning, students will pay attention, think about, and reflect on God's creation in the universe both in the heavens and the earth, so a sense of love for God and his creation will be awakened as well as compassion and care for fellow living creatures and their environment.

Acknowledgment

Due to the scope and method of the study, ethics committee permission was not required.

5. REFERENCES

Abdulloh Hamid. (2017). *Pendidikan karakter berbasis pesantren (Pelajar dan Santri dalam Era IT & Cyber Culture)* (Kedua). Imtiyaz.

Akbar, S. (2011). *Revitalisasi pendidikan karakter di sekolah dasar*. Universitas Negeri Malang.

Al Nahlawi, A. (1996). *Prinsip-prinsip dan metode pendidikan islam dalam keluarga, di sekolah dan Masyarakat*. Diponegoro.

Arif, R. M. (2017). Implementasi pendidikan karakter dalam pembelajaran sains. *STILISTIKA: Jurnal Bahasa, Sastra, Dan Pengajarannya*, *2*(1), 314-324. https://doi.org/10.33654/sti.v2i1.385

Bhat, A. M. (2016). Human psychology (fitrah) from islamic perspective. *International Journal of Nusantara Islam*, *4*(2), 61-74. https://doi.org/10.15575/ijni.v4i2.1187

Fatimah, S., & Kartika, I. (2013). Pembelajaran ipa sekolah dasar berbasis pendidikan karakter. *Jurnal Al-Bidayah*, *5*(2), 281-297. https://jurnal.albidayah.id/index.php/home/article/view/125

H.M. Arifin. (2019). *Ilmu pendidikan islam-tinjauan teoritis dan praktis berdasarkan pendekatan interdisipliner* (Ke-8). PT Bumi Aksara.

Hairuddin. (2013). Pendidikan karakter berbasis sunnah nabi. *Jurnal Al-Ulum*, *13*(1), 167–190.

Hamid, H. (2012). *Pengembangan kurikulum pendidikan* (ke-1). cv.pustaka setia.

Judiani, S. (2010). Implementasi program penguatan pendidikan karakter di sekolah dasar melalui penguatan pelaksanaan kurikulum. *Jurnal Pendidikan Dan Kebudayaan*, *16*, 280. https://doi.org/10.26858/pir.v3i2.14971

Khoiri, A., Agussuryani, Q., & Hartini, P. (2017). Penumbuhan karakter islami melalui pembelajaran fisika berbasis integrasi sains-islam. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, *2*(1), 19-31. https://doi.org/10.24042/tadris.v2i1.1735

Mansir, F. (2021). Aktualisasi pendidikan agama dan sains dalam character building peserta didik di sekolah dan madrasah. *J-PAI: Jurnal Pendidikan Agama Islam*, *7*(2), 87–93. https://doi.org/10.18860/jpai.v7i2.11704

Marzuki. (2015). *Pendidikan karakter Islam* (N. L. Nusroh (ed.); Pertama). AMZAH.

Muhamad Mustaqim. (2015). Model pendidikan karakter terintegrasi pada pembelajaran di pendidikan dasar. *STAIN Kudus*.

Muliati, I. (2017). Konsep fitrah dan implikasinya dalam pendidikan. In *Universitas Negeri Padang 5* (2), 223. Universitas Negeri Padang. https://doi.org/10.31942/pgrs.v5i2.2611

Muluk, H. (2019). *Kacau, Pendidikan Dasar Kita Lebih Banyak Akademiknya Daripada Nilai Budi Pekerti*. Sekolahdasar.Net. https://www.sekolahdasar.net/2019/02/kacau-pendidikan-dasar-kita-lebih-banyak-akademiknya.html

Mundilarto. (2003). Membangun karakter melalui pembelajaran sains. *Jurnal Pendidikan Karakter*, *20*, 153-163.

Purnama, S., Aziz, H., Nurhusna, L., & Ulfah, M. (2020). The concept of fitrah for children in ıbn katsir's qur'an exegesis: a pedagogical implication in early childhood islamic education. *Jurnal Pendidikan Islam*, *9*(1), 79–104. https://doi.org/10.14421/jpi.2020.91.79-104

Putra, P. (2017). Implementasi pendidikan karakter dalam pembelajaran ıpa di mın pemangkat kabupaten sambas kalimantan barat. *JIP: Jurnal Ilmiah PGMI*, *3*(1), 49–61. https://doi.org/10.19109/jip.v3i1.1377

Rasyid, A. N., Alifah, I. N., & Fajar, D. M. (2019). Optimalisasi pendidikan karakter melalui pembelajaran ipa terpadu. *IAIN Jember*, 173-190. http://digilib.iain-jember.ac.id/1709/3/Buku IPA-185-202.pdf

Suriadi, S. (2019). Fitrah dalam perspektif al-quran (kajian terhadap ayat-ayat al-quran). *Muaddib : Studi Kependidikan Dan Keislaman*, *8*(2), 143. https://doi.org/10.24269/muaddib.v8i2.1424

Syahri, A. (2019). *Pendidikan karkter berbasis sistem İslamic boarding school* (Pertama). CV. Literasi Nusantara.

Syarbini, A. (2016). *Pendidikan karakter berbasis keluarga* (Pertama). Ar-Ruzz Media.

Triwidyastuti, T., & Siregar, M. (2018). The concept of islamic education development based on the theory of Fitrah. *Indonesian Journal of Interdisciplinary Islamic Studies*, *2*(1), 31–52. https://doi.org/10.20885/ijiis.vol2.iss1.art2

Widayanti, E. W. S. D. (2018). Penguatan pendidikan karakter berbasis religius. *CIASTECH*, *5*(2). https://doi.org/10.31479/citra.v5i2.28

Yahya, K. (2010). *Pendidikan karakter berbasis potensi diri*. Pelangi Publishing.

Zed, M. (2008). *Metode penelitian kepustakaan*. Obor.

Research Article

The Difficulties and Educational Stress of Nursing Students in Clinical Practice during the Covid *

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Abstract

The present study aims to determine the challenges and educational stresses of nursing students in clinical practices during the COVID-19 pandemic and to offer solutions for these issues. The research was conducted at two universities in Turkey between December 2021 and February 2022. Data were collected using a Sociodemographic Diagnostic Form and the Nursing Education Stress Scale. Of the nursing students who participated in our study, 58.2% were 20 years old or younger, 74% were female, and 48.5% were sophomores. In addition, 43.9% of participants had lower expenses than their income. Our results showed that students' total score average on the nursing education stress scale was 61.74±23.58. We found a statistically significant difference between the total score on the Nursing Education Stress Scale and the mean scores of the sub-dimensions of Practice Stress and Academic Stress according to the class and income level of the students. Furthermore, we observed a statistically significant difference by gender between the mean scores of the Practical Stress and Academic Stress sub-dimensions ($p<0.05$). The nursing students experienced moderate stress during their nursing education. The stress level was higher in female sophomore students whose income was equal to their expenses and whose income was less than their expenses. We suggest that the nursing students' behaviours of problem-solving, decision-making and coping with stress should be improved.

Keywords: Nursing students, clinical practice, educational stress, clinical stress, Covid-19

1. INTRODUCTION

In line with measures taken against the global COVID-19 outbreak, schools and universities all over the world stopped face-to-face educational activities and went over to distance learning (Oducado & Estoque, 2021). After the first cases were seen in Turkey in March 2020, nursing education started to be given by distance learning in order to meet educational needs and to prevent possible difficulties in education (Çelik-Eren, Korkmaz, Öz-Yıldırım & Aydın-Avci, 2021). Distance learning makes access to time and information easy for students and allows teaching and learning activities to continue while protecting students from infection (Çelik-Eren, et al., 2021). Although distance education has positive aspects, it also has adverse effects on clinical practice and the wholeness of nursing education. The most important of these adverse effects is the inadequacy of students in developing clinical skills (Aslan & Pekince, 2021).

This has meant that education in critical thinking skills, acquisition of professional experience and professional identity, and the transfer of theoretical knowledge into practice have remained limited in distance learning, and this remains a stress factor for students (Çelik-Eren, et al., 2021). In research conducted with nursing department students, Oducado and Estoque (2021) determined that students found distance learning stressful, and their satisfaction levels with distance

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learning were low. Their results showed that distance learning negatively affected their academic success. In a study also conducted with nursing department students, it was reported that distance learning practices were inadequate for lessons, that being away from the clinics affected learning, and that distance learning was not suitable for the nursing department, and that clinical practice must be done in hospitals after the pandemic (Kürtüncü & Kurt, 2020). Furthermore, in a study with university students, it was reported that students could not learn enough clinical practice with distance learning and worried about not being successful in their working lives (Yağan, 2021). It is unclear when the COVID-19 pandemic will end or what consequences it will have (Özkan, Taylan & İlaslan, 2021). Accordingly, universities must update their nursing education curriculums and develop solution proposals. Evaluating students' experiences in curriculum changes to be made in nursing education and presenting suggestions for a solution is vital for nursing education and care quality (Oducado & Estoque, 2021). Therefore, in the present study, we aimed to determine the difficulties and educational stress of nursing department students in clinical practice during the pandemic and to present potential solution to proposals for the issues regarding educational activities.

1.1. Research Questions

- What kind of difficulties do nursing department students face in clinical practice during the pandemic?
- What are the stress levels of students in nursing education during the COVID-19 pandemic?

2. METHOD

2.1. Research Design

The current study was designed as a descriptive based on a quantitative method. This method was chosen to describe the experiences of the nursing students who attended the clinical practice during the Covid-19 pandemic, measure their stress levels, and reveal the features that affect them.

2.2. Research Population and Sample

The research was conducted to determine the difficulties and educational stress experienced in clinical practice during the pandemic of nursing students studying in the nursing departments of two universities between December 2021 and February 2022 and to present potential solution proposals for the issues affecting educational activities. The research was conducted at two universities in Turkey with a total of 196 students who agreed to participate in the study. A purposive sampling method was used for the selection of samples. In the fall semester of the 2021-2022 academic year, students attended the clinical practice for ten weeks, two days a week.

2.3. Inclusion and Exclusion Criteria

2.3.1. Criteria for inclusion in the research

- Participating voluntarily in the research
- Being able to use social networking
- Studying in the nursing department

2.3.2. Criteria for exclusion from the research

- Being unwilling to participate voluntarily in the research
- Not taking clinical practice

2.4. Collection of Research Data

Distance learning is still continuing in Turkey due to the COVID-19 pandemic. Therefore, data were obtained using an electronic questionnaire instrument. A Sociodemographic Description Form and a Nursing Education Stress Scale were used to collect data. In our study, the participants received the invitation to the survey and an online survey link via WhatsApp, clearly stating that participation was voluntary.

2.4.1. Sociodemographic Description Form: This form was created by a scan of the literature (Achmad, Sutono, Setiyarini, Kusumawati & Alim, 2021; Blackley, Morda & Gill, 2019;Suarez-Garcia, Maestro-Gonzalez, Zuazua-Rico, Sanchez-Zaballoz & Mosteiro-Diaz, 2018), and consisted of 21 questions on age, gender, satisfaction with distance learning, difficulties experienced in clinical practice, and solution suggestions.

2.4.2. Nursing Education Stress Scale (NESS): The scale was developed in 1981 (Gray-Toft & Anderson, 1981), and was modified and took its final form in 1985 (Rhead, 1995). The Turkish adaptation of this scale made by Karaca, Yıldırım, Ankaralı, Açıkgöz and Akkuş, (2014) consists of 32 four-way Likert-type items. It has two sub-scales: Practice Stress and Academic Stress. Stress levels are scored from 0 to 3 for each item. A score of 3 indicates a very stressed condition, and 0 indicates a condition of no stress. A high score indicates a high level of stress. The total which can be obtained on the scale is 96. The Cronbach alpha reliability coefficient was found to be between 0.81 and 0.93. In our study, the reliability coefficient of the scale was found to be 0.95 (Karaca et al. (2014).

2.5. Ethical Considerations

To conduct the research, Ethics Committee permission (12.16.2021- 98849436-100-32755) was obtained from a government university, institutional permission was obtained from the universities where the study was conducted, and written approval was obtained from the participants. Permission was obtained to use the Nursing Education Stress Scale, a data collection instrument in the research. The study was carried out in accordance with the principles of the Declaration of Helsinki.

2.6. Data Analysis

The program package SPSS 24.0 (Statistical Package of Social Sciences) was used to evaluate the data obtained in the research. In the statistical analysis, the Kolmogorov-Smirnov test was used to test the normal distribution of the data, and the normal distribution of the data was confirmed. Descriptive statistics (percentage, frequency, mean, standard deviation, minimum and maximum), t-test in independent groups and the ANOVA test were used to evaluate data obtained in the research.

3. FINDINGS

It was found that 58.2% of the students participating in the study were aged 20 years or younger, 74% were female, 48.5% were in their second year of study, 27% had lived most of their lives in a city, 71.4% were living in a student dormitory during their university education, 43.9% had an income which was less than their expenditure, and 43.9% had an income which was equal to their expenditure (Table 1).

It was found that there was no statistically significant difference according to age, place of most extended residence, or place of residence during university education between mean total scores on NESS and its subscales or according to gender between mean total NESS scores ($p>0.005$). A statistically significant difference was found between the students' NESS total mean score and their mean scores on the Practice Stress and Academic Stress sub-scales according to their gender, year of study and income status ($p<0.05$) (Table 1).

Table 1. Comparison of NESS total and subscales according to the students' sociodemographic characteristics (n=196)

		NESS		
		Practice Stress	**Academic Stress**	**NESS Total**
	n(%)	$\bar{X}$±SD	$\bar{X}$±SD	$\bar{X}$±SD
Age				
< 20 years	114(58.2)	29.89±12.89	29.97±12.74	59.86±25.05
20-24 years	73(37.2)	31.95±10.53	34.79±10.99	64.27±21.02

> 24 years	9(4.6)	31.66±12.75	33.33±11.57	65.00±24.25
***Significance**		p=0.508	p=0.365	p=0.423
Gender				
Female	145(74)	31.87±11.29	31.62±11.36	63.50±2.12
Male	51(26)	27.52±13.56	29.21±13.84	56.74±26.92
****Significance**		**p=0.044**	**p=0.022**	p=0.078
Year of Study				
1st year	56(28.6)	26.26±13.95	25.35±14.06	51.62±27.65
2nd year	95(48.5)	34.02±10.03	34.56±9.92	68.58±19.37
3rd year	26(13.3)	30.38±10.87	31.73±10.85	62.11±21.53
4th year	19(9.7)	28.05±11.44	28.78±11.10	56.84±22.84
***Significance**		**p=0.001**	**p=0.000**	**p=0.000**
Place of longest residence				
Big city	90(45.9)	30.08±12.75	30.27±12.71	60.36±25.02
City	53(27)	30.86±11.27	31.22±11.45	62.09±22.03
Town	39(19.9)	32.46±10.03	32.92±10.20	65.38±19.51
Village	14(7.1)	29.71±15.67	29.42±15.23	59.14±30.64
***Significance**		p=0.764	p=0.670	p=0.704
Place of residence during university study				
With family	17(8.7)	31.29±10.15	33.35±10.07	64.64±19.80
Dormitory	140(71.4)	31.63±11.91	31.79±12.13	63.42±23.40
With friend	8(4.1)	25.50±16.40	26.50±15.84	52.00±31.89
Alone	31(15.8)	27.77±12.10	27.29±11.25	55.06±23.26
***Significance**		p=0.241	p=0.151	p=0.185
Income				
Income less than expenditure	86(43.9)	33.80±11.49	34.25±11.47	68.05±22.53
Income equal to expenditure	86(43.9)	28.83±10.34	28.91±10.35	57.75±20.06
Income more than expenditure	24(12.2)	26.62±16.70	26.79±16.67	53.41±32.70
***Significance**		**p=0.005**	**p=0.003**	**p=0.003**

*NESS = Nursing Education Stress Scale *ANOVA test **Independent groups t test p<0.05*

It was found that 71.4% of the students participating in the study had chosen the nursing department willingly, 78.6% intended to work as nurses after graduation, and 77% wanted face-to-face education in the future. Also, 56.1% that distance education contained enough information for clinical practice, 57.7% that they did not see themselves as adequate in clinical practice, 51% that they felt fear when performing nursing procedures during clinical practice, and 84.7% that face to face education was more effective for gaining skills in clinical practice, and 53.1% stated that nurses avoided giving them duties in clinical practice because of distance learning (Table 2).

A statistically significant difference was found between the students' mean Academic Stress and NESS scores according to whether they had the nursing department willingly ($p<0.05$). A statistically significant difference was also found between the students' mean scores on NESS and the subscales of Practice Stress and Academic Stress according to whether they had felt fear when performing nursing procedures in clinical practice, and whether nurses had avoided giving them duties in clinical practice because of distance education ($p<0.05$). No statistically significant difference was found between the students' mean scores on NESS and the subscales of Practice Stress and Academic Stress according to their intentions to work as nurses, their feelings of adequacy in clinical practice, or their thoughts on which type of education was more effective in their gaining clinical practice skills ($p>0.05$) (Table 2).

Table 2. Comparison of students' NESS total and subscales according to their characteristics relating to nursing education (n=196)

		NESS		
		Practice Stress	**Academic Stress**	**NESS Total**
	n(%)	$\bar{X}$±SD	$\bar{X}$±SD	$\bar{X}$±SD
Did you choose the nursing department willingly?				
Yes	140(71.4)	29.88±12.09	29.67±11.94	59.55±23.54
No	56(28.6)	32.89±11.73	34.32±11.84	67.21±22.98
****Significance**		p=0.114	**p=0.014**	**p=0.040**
Do you intend to practice nursing as a profession?				
Yes	154(78.6)	30.58±11.99	30.47±12.01	61.05±23.42
No	42(21.4)	31.33±12.34	32.92±12.20	64.26±24.24
****Significance**		p=0.722	p=0.244	p=0.437
How would you like to take your theory classes in the future?				
By distance learning	132(67.3)	31.31±12.58	31.92±12.39	63.24±24.41
By face to face education	64(32.7)	29.56±10.84	29.09±11.22	58.65±21.60
****Significance**		p=0.340	p=0.124	p=0.202
How would you like to take your practice classes in the future?				
By distance learning	45(23.0)	34.60±13.87	34.60±13.90	69.20±27.44
By face to face education	151(77.0)	29.59±11.23	29.92±11.29	59.52±21.91
****Significance**		**p=0.014**	**p=0.022**	**p=0.015**
Did distance learning contain adequate knowledge for clinical practice?				
Yes	110(56.1)	29.40±12.62	29.91±12.27	59.32±24.38
No	86(43.9)	32.45±11.08	32.38±11.72	64.83±22.26
****Significance**		p=0.079	p=0.156	p=0.156
Did you feel adequate in clinical practice?				
Yes	83(42.3)	32.59±12.61	32.73±12.10	65.32±24.40
No	113(57.7)	29.38±11.47	29.72±11.94	59.11±22.70
****Significance**		p=0.066	p=0.085	p=0.068
Did you feel fear while performing procedures in clinical practice?				
Yes	96(49.0)	33.27±10.55	32.82±10.62	66.09±20.55
No	100(51.0)	28.32±12.90	29.25±13.12	57.57±25.57
****Significance**		**p=0.004**	**p=0.038**	**p=0.011**
Which kind of education is more effective in gaining clinical practice skills?				
Distance learning	30(15.3)	34.03±15.88	33.66±15.85	67.70±31.65
Face-to-face education	166(84.7)	30.15±11.16	30.51±11.24	60.66±21.75
****Significance**		p=0.104	p=0.189	p=0.133
Did nurses avoid giving you duty in clinical practice because of distance learning?				
Yes	104(53.1)	32.59±11.34	33.25±11.15	65.84±21.88
No	92(46.9)	28.65±12.51	28.45±12.61	57.10±24.67
****Significance**		**p=0.022**	**p=0.005**	**p=0.009**

NESS= Nursing Education Stress Scale ***Independent groups t-test p<0.05*

The students' total mean NESS score was 61.74±23.58, their mean score on the sub-scale of Practice Stress was 30.74±12.04, and their mean score on the sub-scale of Academic Stress was 31.00±12.06 (Table 3).

Table 3. Distribution of HESS total and subscale mean scores and maximum-minimum values

	$\bar{X}$	SD	Minimum-Maximum values
NESS Total	61.74	23.58	0-96
Practice Stress	30.74	12.04	0-48
Academic Stress	31.00	12.06	0-48

NESS: Nursing Education Stress Scale

In answer to the question 'What caused you professional difficulty in clinical practice?' 19.9% of the students participating in the study answered lack of trust in the nurses, 15.8% inexperience, 15.8% lack of knowledge and practice in clinical practice, 14.8% fear of practicing the profession and of harming patients, 13.3% difficulty carrying out procedures for lack of manual skills, 13.3% fear of COVID-19, 12.8% distance learning, 7.7% lack of trust by patients, and 2.6% too many students (Table 4).

As suggested solutions for clinical practice, 33.2% of the students suggested an increase in the hours of clinical practice, 19.4% being vaccinated, 16.3% more observation in the clinic, 10.8% self-confidence, 8.2% the nurses behaving well towards them, 5.6% an increase in laboratory practice, 4.6% support against students' fears, and 3.1% an increase in education on clinical practice (Table 4).

Table 4. Problems experienced by students in clinical practice, and their suggestions for solutions

	n	%
What caused you professional difficulty in clinical practice?		
Inexperience	31	15.8
Lack of self-confidence	25	12.8
The nurses didn't trust us	39	19.9
The patients didn't trust us	15	7.7
Distance learning	25	12.8
There were too many students	5	2.6
Lack of knowledge and practice in clinical practice	31	15.8
Fear of COVID-19	26	13.3
Fear of practicing the profession and of harming patients	29	14.8
Difficulty carrying out procedures for lack of manual skills	26	13.3
I had no problems	15	7.7
Our solution suggestions for clinical practice		
Increase the hours of clinical practice	65	33.2
The nurses should behave well toward us	16	8.2
Increase education regarding clinical practice	6	3.1
Self-confidence	21	10.7
Increase laboratory practice	11	5.6
Being vaccinated	38	19.4
More observation in the clinic	32	16.3
Provide support against students' fears	9	4.6

****More than one choice was marked.*

4. DISCUSSION

One of the main elements of nursing education is that clinical education turns theoretical knowledge into psychomotor skills (Jasemi, Whitehead, Habibzadeh, Zabihi & Rezaie, 2018). Raising quality in education is possible by updating the curriculum according to students' clinical practice experiences in the COVID-19 pandemic (Oducado & Estoque, 2021; Özkan, Taylan & İlaslan, 2021). In the present study, we examined the difficulties and stress levels faced by nursing students in clinical practice during the COVID-19 pandemic.

Most students who participated in the research were female and 20 years old or younger. Other studies on the present topic were seen to have similar sample groups (Can, Çuvalci & Hindistan, 2019; Köse, Ayhan, Taştan, İyigün & Özçakır, 2021). This is an expected result when it is considered that females more choose the nursing department and that students may have won a place in the nursing department in the year in which they entered the university exam.

It was found as a result of the study that the students experienced a moderate level of stress during their nursing education. Recent international studies have shown that nursing students experience different levels of stress during their education (Admi, Moshe-Eilon, Sharon & Mann, 2018; Baluwa, Lazaro, Mhango & Msiska, 2021; Suarez-Garcia, Maestro-Gonzalez, Zuazua-Rico, Sanchez-Zaballoz & Mosteiro-Diaz, 2018; Shariff & Azlan, 2021). Moreover, similar studies performed in Turkey support our findings (Büyükbayram & Ayık, 2020; Can, et al., 2019; Demirbağ, Bulut & Çalık, 2021; Ergin, Çevik & Pakiş, 2018; Fırat-Kılıç, 2018; Karabulut, Gurcayir & Yildiz, 2021; Köse, et al., 2021; Senturk & Dogan, 2018; Yılmaz-Karabulutlu et al., 2019). Unlike other departments, theoretical education and practical education are given concurrently in nursing education. It suggested that during the COVID-19 pandemic, continued clinical practice caused students to experience stress.

Our findings showed that female students experienced more stress than male students in a practical and academic sense. Similar studies support these results (Admi, Moshe-Eilon, Sharon & Mann, 2018; Büyükbayram & Ayık, 2020; Can, et al., 2019; Fırat-Kılıç, 2018; Suarez-Garcia, et al., 2018; Senturk & Dogan, 2018). Females having a more sensitive personality than males may also be related to the difference in stress levels.

Furthermore, the stress levels of second-year students were higher than those of students in other years. This result may be explained by the students in the sample group having their first clinical practice education in their second year rather than in their first year because of the pandemic. Clinical practice is one of the most important stress factors in nursing education (Can, et al., 2019). Our research results showed that performing clinical practice affected stress levels. An examination of the literature showed studies supporting our results (Admi, Moshe-Eilon, Sharon & Mann, 2018; Baluwa, Lazaro, Mhango & Msiska, 2021;Suarez-Garcia, et al., 2018). In addition, it was seen in a study by Ergin et al. (2018) that the clinical practice stress levels of second-year students were higher than those of students in other years. Different from the literature (Büyükbayram & Ayık, 2020; Shariff & Azlan, 2021), it was found in our study that students' socioeconomic levels and stress were related and that students whose income was less than or equal to their expenditure had higher levels of stress. Because socioeconomic status is an essential factor in coping with stress (Senturk & Dogan, 2018), we speculate that it affected the stress levels of the students in our sample.

In our research, as in the literature, students who had chosen the nursing department willingly had lower stress levels (Cantekin, Arguvanlı-Çoban & Dönmez, 2021). On the other hand, some studies (Fırat-Kılıç, 2018) have shown that the selection of department did not affect students' education stress levels. Our research found that the intention to work as a nurse after graduation did not affect stress levels. In a study by Demirbağ et al. (2021), it was found, different from our results, that those who intended to work in a hospital after graduation had higher stress levels. We think that these different results arise from different characteristics of the students forming the sample.

Stress levels were found to be higher in nurses who wanted to take theircoursee by distance learning in the future, who felt fear while performing nursing procedures in clinical practice, or who said that nurses avoided giving them duties on clinical practice because of distance learning. It was found in a study by Suarez-Garcia et al. (2018) that nursing students' feelings of inadequacy regarding practice affected the stress levels that they experienced. It was found in a study by Yılmaz and Büyüköztürk (2021) that the anxiety which students experienced when face-to-face education was suspended increased after they went into clinical practice.

Many students participating in the study reported that they had chosen the nursing department willingly. In similar studies in the literature also, the majority of students had selected the nursing department willingly (Büyükbayram & Ayık 2020; Ergin, et al., 2018; Karabulut, Gurcayir & Yildiz, 2021; Karaman, Çakmak & Yerebakan, 2021). It was found that nearly a quarter of the students were not thinking of working as nurses after graduation. In the study by Büyükbayram and Ayık (2020), it was found that more than half of the students did not want to work in the nursing profession after they graduated. In a study by Karabulut et al. (2021) however, it was found that more than half of the students wanted to work as nurses after graduation. In a study by Michel et al. (2021), it was found that very few nursing students were thinking of abandoning their education because of inadequate clinical education in the pandemic. It was determined in a study by Demirbağ et al. (2021) that a little more than half of the nursing students wanted to work in a hospital after graduation. Considering the literature, the reason why the students participating in our research were not thinking of practicing their profession after graduation may be the negative effect of the pandemic on practical education and the education stress caused to the students.

Examining the students' thoughts on the distance education they had in the pandemic, it was found that, similar to the literature (Karaman, et al., 2021; Kaya & Işık, 2021), the majority of them took distance learning as adequate for theoretical classes but not for practical lessons. Furthermore, many of the students stated that face-to-face education was more effective in gaining clinical practice skills and that education should be given face-to-face in the future. Similar studies support our research findings. In our study, students stated that distance learning negatively affected nursing educating. Moreover, education to gain manual skills should be given face to face in the future because of inadequate practical lessons. (Michel, Ryan, Mattheus, Knopf, Abuelezam, Stamp, Branson, Hekel & Fontenot, 2021; Yılmaz & Büyüköztürk, 2021).

More than half of the students in the study stated that they did not see themselves as adequate in clinical practice that they felt fear when performing nursing procedures during clinical practice, and that nurses avoided giving them duties in clinical practice because of distance learning. In the study by Michel et al. (2021), the students reported that they worried that they would not find work after graduation because of distance education. In the study by Jasemi et al. (2018), nursing department students stated that they had difficulty in their working lives because the workers did not allow them to carry out procedures or to give nursing care. In addition, the students reported that not being included in procedures by nurses in the clinic had a negative effect on their learning and motivation (Arkan, Ordin & Yılmaz, 2018). In the study by Yılmaz et al. (2017), approximately half of the nursing students stated that the stress they experienced during clinical practice was the fear of making a mistake during a procedure.

When the students were asked about the difficulties they had experienced in clinical practice, they mentioned a lack of trust in the nurses, inexperience, a lack of knowledge and training concerning clinical practice, fear of ability to perform the profession and of harming patients, difficulty performing procedures because of lack of manual skill, fear of COVID-19, distance learning, a lack of trust by the patients, and an excessive number of students. In a study by Achmad et al. (2021) nursing students reported that they were afraid of becoming infected and infecting their families during clinical practice. As suggested solutions, students talked about increasing the hours of clinical practice, being

vaccinated, more observation in the clinic, self-confidence, the nurses behaving well towards them, increased laboratory practice, students being protected against their fears, and improving education on clinical procedures. In the study by Yılmaz and Büyüköztürk (2021), the students mentioned as a solution increasing the number of clinical practice places and asking for support on the psychological difficulties they experienced.

5. CONCLUSION and SUGGESTIONS

Clinical practice is an integral part of nursing education; howeverr, it has become one of the factors causing stress in students during the COVID-19 pandemic. It is unclear when the pandemic will end, or what results it will have. Therefore, it is necessary to make changes to the nursing curriculum so that education does not come to a standstill. In addition, it is important to include students in the process and take into account the difficulties they face and their suggested solutions. According to the results of our research, a moderate level of stress was found in nursing department students, with a higher level of stress in female students who had chosen the nursing profession unwillingly, who experienced fear when performing nursing procedures, who were in their second year, or whose income was equal to or less than their expenditure. To get a healthy nursing education during the pandemic, it is suggested that psychological support and help should be provided to all nursing department students to prepare for clinical practice. Furthermore, priority should be given to the students with factors that increase their stress level, too provide them with behaviors for problem-solving, decision making, and coping with stress.

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6. REFERENCES

Achmad, B. F., Sutono, S., Setiyarini, S., Kusumawati, H. I., & Alim, S. (2021). Nursing students' challenges and experiences of undergoing clinical rotation program during coronavirus disease 2019 pandemic. *Open Access Macedonian Journal of Medical Sciences*, 9(G), 231-237. https://doi.org/10.3889/oamjms.2021.7295

Admi, H., Moshe-Eilon, Y., Sharon, D., & Mann, M. (2018). Nursing students stress and satisfaction in clinical practice along different stages: A cross-sectional study. *Nurse Education Today*, 68, 86-92. https://doi.org/10.1016/j.nedt.2018.05.027

Arkan, B., Ordin, Y., & Yılmaz, D. (2018). Undergraduate nursing students' experience related to their clinical learning environment and factors affecting to their clinical learning process. *Nurse Education in Practice*, 29, 127-132. https://doi.org/10.1016/j.nepr.2017.12.005

Aslan, H., & Pekince, H. (2021). Nursing students' views on the Covid-19 pandemic and their percieved stress levels. *Perspectives in Psychiatric Care*, *57*(2), 695-701. https://doi.org/10.1111/ppc.12597

Baluwa, M. A., Lazaro, M., Mhango, L., & Msiska, G. (2021). Stress and coping strategies among Malawian undergraduate nursing students. *Advances in Medical Education and Practice*, 12, 547. https://doi.org/10.2147/AMEP.S300457

Blackley, L.S., Morda, R., & Gill, P.R. (2019, October). Stressors and rewards experienced by men in nursing: A qualitative study. *In Nursing Forum*, *54*(4), 690-697. https://doi.org/10.1111/nuf.12397

Büyükbayram, Z., & Ayık, D.B. (2020). Hemşirelik öğrencilerinin hemşirelik eğitimi ile ilgili stres düzeylerinin belirlenmesi [Determination of nursing students' stress levels related to nursing education]. *Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, 4(2), 90-99. https://doi.org/10.46237/amusbfd.562097

Can, A., Çuvalci, B., & Hintistan, S. (2019). İç hastalıkları hemşireliği dersini alan ikinci sınıf öğrencilerinin stres düzeylerinin belirlenmesi [Determination of stress levels of second year students taking ınternal medicine nursing course]. *Ordu Üniversitesi Hemşirelik Çalışmaları Dergisi*, *2*(1), 22-32.

Cantekin, I., Arguvanlı-Çoban, S., & Dönmez, H. (2021). Covid-19 pandemisinde hemşirelik öğrencilerinin klinik uygulamalara yönelik algıladıkları stres düzeyi [The stress level perceived by nursing students towards clinical practices in the Covid-19 pandemic]. *Yükseköğretim ve Bilim Dergisi, 11*(3), 592-599.

Çelik-Eren, D., Korkmaz, M., Öz-Yıldırım, Ö., & Aydın-Avci, İ. (2021). Covid-19 pandemi sürecinde hemşirelik öğrencilerinin uzaktan eğitime karşı tutum ve memnuniyet düzeyleri [Attitudes and satisfaction levels of nursing students towards distance education during the Covid-19 pandemic process]. *Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi*, *24*(2), 246-254. https://doi.org/10.17049/ataunihem.862820

Demirbağ, B.C., Bulut, H.K., & Çalık, K.Y. (2021). Hemşirelik öğrencilerinin eğitim streslerinin değerlendirilmesi [Evaluation of educational stress of nursing students]. *Düzce Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi, 11*(2), 159-164. https://doi.org/10.33631/duzcesbed.749779

Ergin, E., Çevik, K., & Pakiş, Ç.S. (2018). Hemşirelik öğrencilerinin eğitimlerine ilişkin algıladığı stres ve stresle başetme davranışlarının incelenmesi [Investigation of the stress and coping behaviors of nursing students regarding their education]. *Hemşirelikte Eğitim ve Araştırma Dergisi*, 15, 16-22.

Fırat-Kılıç, H. (2018). Hemşirelik öğrencilerinin eğitim stresi ve mesleki benlik saygısı arasındaki ilişki [The relationship between nursing students' educational stress and professional self-esteem]. *Hacettepe Üniversitesi Hemşirelik Fakültesi Dergisi*, *5*(1), 49-59. https://doi.org/10.31125/hunhemsire.431130

Gray-Toft, P., & Anderson, J. G. (1981). The nursing stress scale: Development of an instrument. *Journal of Behavioral Assessment*, 3(1), 11-23. https://doi.org/10.1007/BF01321348

Jasemi, M., Whitehead, B., Habibzadeh, H., Zabihi, R.E., & Rezaie, S.A. (2018). Challenges in the clinical education of the nursing profession in Iran: A qualitative study. *Nurse Education Today*, 67, 21-26. https://doi.org/10.1016/j.nedt.2018.04.010

Karabulut, N., Gurcayir, D., & Yildiz, B.Z. (2021). Effect of stress on academic motivation and achievement of students in nursing education. *International Journal of Caring Sciences, 14*(1), 370.

Karaca, A., Yıldırım, N., Ankaralı, H., Açıkgöz, F., & Akkuş, D. (2014). Hemşirelik eğitimi stres ölçeğinin Türkçeye uyarlanması [Adaptation of the nursing education stress scale into Turkish]. *Hemşirelikte Araştırma Geliştirme Dergisi, 16*(2), 29-40.

Karaman, F., Çakmak. S., & Yerebakan, A.N. (2021). Covid-19 pandemisinde hemşirelik öğrencilerinin eğitimi: Uzaktan eğitim süreci ve etkileri [Education of nursing students in the Covid-19 pandemic: Distance education process and effects]. *İstanbul Gelişim Üniversitesi Sağlık Bilimleri Dergisi,* (15), 571-580. https://doi.org/10.38079/igusabder.982350

Kaya, Y. & Işık, R. (2021). Covid-19 pandemisi'nin ilk döneminde uygulanan zorunlu uzaktan eğitim sisteminin hemşirelik eğitimine katkısı ve zorlukları: Nitel bir çalışma [The contribution and challenges of the compulsory distance education system applied in the first period of the Covid-19 pandemic to nursing education: A qualitative study]. *Journal of Education and Research in Nursing*, *1*8(1), 76-84.

Köse, G., Ayhan, H., Taştan, S., İyigün, E., & Özçakır, A.N. (2021). Hemşirelik öğrencilerinde eğitim stresi algısı ile internet bağımlılığı arasındaki ilişki [The relationship between perception of educational stress and internet addiction in nursing students]. *Hacettepe Üniversitesi Hemşirelik Fakültesi Dergisi*, *8*(1), 58-64. https://doi.org/10.31125/hunhemsire.907830

Kürtüncü, M., & Kurt, A. (2020). Covid-19 pandemisi döneminde hemşirelik öğrencilerinin uzaktan eğitim konusunda yaşadıkları sorunlar [Problems of nursing students experience in distance education during the Covid-19 pandemic]. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi*, *7*(5), 66-77.

Michel, A., Ryan, N., Mattheus, D., Knopf, A., Abuelezam, N.N., Stamp, K., Branson, S., Hekel, B., & Fontenot, H.B. (2021). Undergraduate nursing students' perceptions on nursing education during the 2020 Covid-19 pandemic: A national sample. *Nurs Outlook, 69*(5), 903-912. https://doi.org/10.1016/j.outlook.2021.05.004

Oducado, R.M. & Estoque, H. (2021). Online learning in nursing education during the Covıd-19 pandemic: Stress, satisfaction, and academic performance. *Journal Of Nursing Practice*, *4*(2), 143-153. https://doi.org/10.30994/jnp.v4i2.128

Özkan, İ., Taylan, S., & İlaslan, E. (2021). The experiences of nursing students towards distance education during the Covid-19 pandemic. *International e-Journal of Educational Studies*, *5*(10), 106-117. https://doi.org/10.31458/iejes.942443

Rhead, M. M. (1995). Stress among student nurses: Is it practical or academic?. *Journal of Clinical Nursing*, *4*(6), 369-376. https://doi.org/10.1111/j.1365-2702.1995.tb00038.x

Shariff, N.M. & Azlan, M.R.M.M. (2021). Perceived stress level and its stressors among Malaysian undergraduate nursing students during Covid-19 pandemic. *International Journal of Care Scholars*, *4*(1), 26-31. https://doi.org/10.31436/ijcs.v4iSupplementary%201.215

Suarez-Garcia, J.M., Maestro-González, A., Zuazua-Rico, D., Sánchez-Zaballos, M., & Mosteiro-Diaz, M.P. (2018). Stressors for Spanish nursing students in clinical practice. *Nurse Education Today*, 64, 16-20. https://doi.org/10.1016/j.nedt.2018.02.001

Senturk, S., & Dogan, N. (2018). Determination of the stress experienced by nursing students' during nursing education. *International Journal of Caring Sciences, 11*(2), 896-904.

Yağan, S.A. (2021). Üniversite öğrencilerinin Covid-19 salgını sürecinde yürütülen uzaktan eğitime yönelik tutum ve görüşleri [Attitudes and opinions of university students towards distance education conducted during the Covid-19 pandemic]. *Akademik Platform Eğitim ve Değişim Dergisi*, *4*(1), 147-174.

Yılmaz-Karabulutlu, E., Oruç, F.G., & Turan, G.B. (2019). Öğrencilerin hemşirelik eğitimi sürecinde yaşadıkları stresin profesyonel benlik gelişimlerine etkisi [The effect of the stress experienced by students in the nursing education process on their professional self-development]. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi*, *8*(1), 10-17.

Yılmaz, Ş., & Büyüköztürk, M. (2021). Son sınıf hemşirelik öğrencilerinin koronavirüs salgını sürecinde klinik uygulamalarda yaşadıkları kaygılar [Concerns experienced by senior nursing students in clinical practice during the coronavirus pandemic process]. *Black Sea Journal of Health Science*, *4*(3), 257-263. https://doi.org/10.19127/bshealthscience.906194

Yılmaz, M., Yaman, Z., & Erdoğan, S. (2017). Öğrenci hemşirelerde stres yaratan durumlar ve baş etme yöntemleri [Situations that cause stress in student nurses and coping methods]. *Mersin Üniversitesi Sağlık Bilimleri Dergisi*, *10*(2), 88-99. https://doi.org/10.26559/mersinsbd.285766

Research Article

Teaching of Make Prototype Step of Design Process by E-tutors in Open and Distance e-Learning Context*

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Abstract

The ODeL model is noted for its unique approach to courses especially that aimed at producing future entrepreneurs. The make prototype part of the design process is viewed as a foundation for entrepreneurship education in this article. An objective was set to see how e-tutors' topic expertise affects their capacity to help students envision the make prototype step of the design process in order to attain this goal. 350 postgraduate students enrolling in a semester module in 2020 were the subject of the research. In order to assist students with the make of the make prototype stage of the design process in an ODeL context, an online observation tool was utilized to study the expertise of e-tutors. The data acquired from five different e-tutor websites was evaluated. According to the findings, e-tutors in ODeL settings were unable to conceptualize the make prototype stage of the design process. Suggestions: An alternative technique for e-tutor appointments is proposed based on the current concept.

Keywords: Make prototype, design process, e-tutoring, open and distance e-learning

1. INTRODUCTION

Higher Education Institutions (HEIs) are under constant pressure to make their curricula more relevant, particularly those that focus on labour markets. An example of a recent demand for HE frameworks was the need to assess all curricular offerings and make curricular structure adjustments Eguia (2022). The design process approach Luka, which is delivered in HE institutional frameworks with an emphasis on the development of critical labour market skills, is one such curriculum (2020). Its emphasis shifted to innovation in other spheres of education, such as technology Pande and Bharathi (2020). The method was developed with a focus on human centeredness, keeping in mind that it is a new approach and practice in the innovation domains, including education Magistretti, Ardito and Pertuzzelli (2021). To summarize, a design problem begins with a problem and finds a legitimate solution, as stated by Gaborov and Ivetic (2022). A momentum built around the concept based on its human emphasis, and recently (Auernhammer & Roth, 2021; Dell'Era, Magistretti, Cautela, Verganti & Zurlo, 2020; Magistretti, et al. 2021; Roth, Globocnik, Rau & Neyer, 2020; Caputo, Pizzi, Pellegrini & Dabic, 2021) became part of the narrative. According to Dell'Era et al, (2020), the design process was growing. However, Roth et al. (2020) cautioned that little is known about whether the design approach leads to classroom innovation. Given the varied narratives, it is necessary to comprehend the various perspectives on the design process that exist in literature.

From literature, it is amass on how the design process is explained. In this paper, it was important to find an explanation that would address two issues of "solving problems and finding solutions". Two authors, (Caputo, Pizzi, Pellegrini, & Dabic, 2021; Dam & Siang, 2020) contributed to a better understanding of the term, is a continuous process in which a user's assumptions are tested and challenges are reimagined to provide new tactics and solutions Dam and Siang (2020). The design

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process is a recursive approach to understanding and solving problems that has a reputation for being particularly well adapted to handling complicated problems with no obvious solutions Pellegrini, (2021). The application of what is known about the design process to the realization of skills for the labour market is crucial in order to proceed to the attention that was previously garnered from the substantial amount of literature on what is known about the design process. The introduction of e-tutoring as a mechanism for student academic assistance and development in higher education is critical for skills to become relevant in labour markets. This line of reasoning supports (Ece & Kazazoğlu, 2021; Tuncay, 2021; Zalat, Hamed, & Bolbol, 2021)'s assertion that pupils would benefit from such an undertaking, particularly in light of the COVID-19 pandemic's negative impacts. True, because e-tutoring provides students with substantial fundamental benefits such as convenience, ease of participation, lower costs, and technology-driven benefits (Gherhes, Stoian & Farcasiu, 2021). The efficacy of e-tutoring is growing, and there is a demand for adequately qualified and well-prepared e-tutors for various modules in higher education. In this study, a well-prepared e-tutor must still be built because it is entrusted with assisting students with the design process, which is taught in procedural steps.

Due to the difficulties in teaching the design process steps, this paper focused on the make (prototype) stage of the design process. The make prototype stage is the fourth stage of developing the initial models, according to literature, where the initial specific procedures were offered to reach a preliminary design that is accurate according to solution visualization with thorough descriptions of the model Aldalalah (2022). At this stage, according to Yalzin (2022), groups choose and illustrate the best solution to the problem discovered during the idea creation phase, and prototypes are created by adhering to the children's drawings as closely as possible. In the make prototype phase, developers Vuillermin and Huck-Sandhu (2021) put their ideas to the test by bringing them to life, where they are tested to quickly obtain feedback and gain deeper insights into their thoughts and behaviours. The make prototype phase ought to provide valuable feedback about the product's function and practicality. In this paper, it is still unclear how much assistance the students receive from their e-tutors, especially since they are working in a virtual environment and are focused on the make prototype stage of the design process. All of this is to say that (Aldalalah, 2022; Vuillermin & Huck-Sandhu, 2021; Yalzin, 2022) provided a foundation from which to build an understanding of what is known about the make prototype stage within the design process.

2.1. Problem of the Study

'How do e-tutors' teach the make prototype step of the design process?. This goal was based on the following research question.

2.2. Research Question

How did the e-tutors' content knowledge effect the students' understanding of the design process's make prototype stage?

2.3. Research Objective

To evaluate e-tutors' skills to teach students about the make prototype stage in order to help them comprehend how it contributes to the design process.

2. METHOD

2.1. Research Design

This study used a quantitative way to address the main research question, allowing students to describe how they believe their e-tutor abilities to apply their topic knowledge to teach the make prototype stage of the design process. The quantitative data was employed as a scope and depth of comprehension and confirmation of the data gathered in the quantitative approach Bryman (2012).

2.2. Participants

This study included a total of 350 students that were enrolled in a module. The sample selection was based on the year's enrolment of the honours students. Convenient sampling was also used. The primary goal was to provide detailed accounts based on a quantitative analysis of how their e-tutors teach the design process. During the teaching of the make prototype stage of the design process, e-tutors clarified and attempted to defend viewpoints that gave information from students on their selection, usage, and general application of their methodologies.

2.3. Research Instruments

To satisfy the paper's objectives, data was collected utilizing an observation-based research instrument built by the paper's researcher. Five e-tutor postings and their students' responses were included in the instrument. The Learning Management System was used to track the number of postings per e-tutor (LMS). There were multiple posts in the system depending on the e-message tutors to the students. Those that related to content knowledge for the make prototype nature were chosen and recorded in frequency from the various postings. It was recorded the number of times a posting occurred. Finally, for each of the five e-tutors, the data was converted, improved, and converted into tables. In the event of a critique of the instrument, this is a practical instrument that best matched the role it was meant for. The raw data obtained in the LMS was printed and delivered as hard copies to senior colleagues in the department for verification reasons in order to validate the instrument

2.4. Data Analysis

From a data collection of observations, descriptive data were obtained. The analysis in this paper concentrated on the total number of postings from the five e-tutors. For instance, it could be assumed that three out of five e-tutors posted for the item generated for the paper from a specified table. An conclusion will be drawn based on what is visible from each table in such a description. In order to clarify certain parts of comprehending e-tutor skills to teach the make prototype stage of the design process in a virtual environment, three tables were employed. The ability of e-tutors to envision the make prototype stage of the design process was studied in Table 1. Table 2 e-tutor skills to aid students' present thoughts about the make prototype stage of the design method provided the second clarity in the paper. Table 3 established e- tutor skills to aid students during the make prototype phase, which was the final table for the paper.

3. FINDINGS

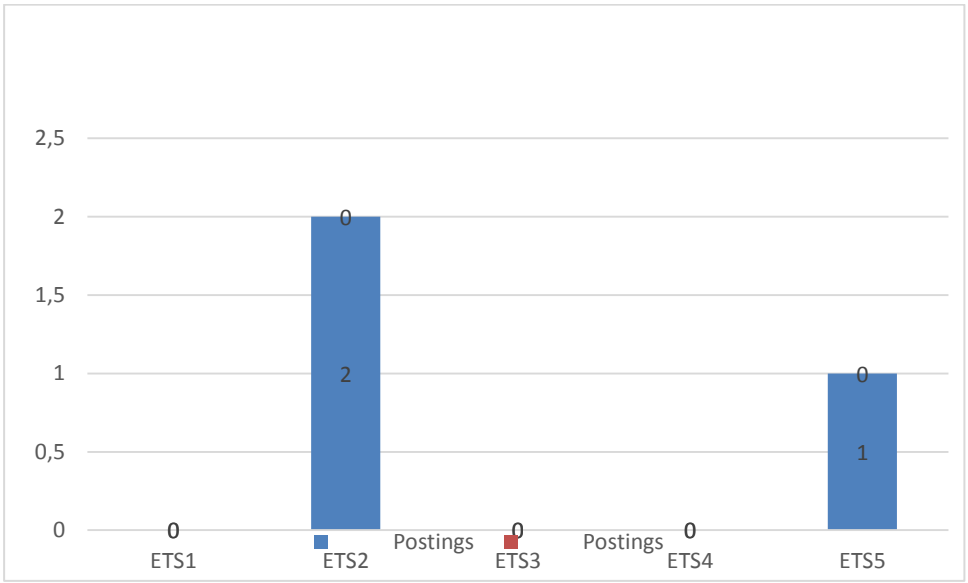

Figure 1. e-tutor abilities conceptualize the make prototype stage of the design process

Figure 1 shows the responses to an item created to assess e-tutors' ability to conceive the design process's make prototype step. According to the table, three out of five e-tutors (ETS1, ETS3, and ETS4) did not post for the item. Another observation revealed that the students had only two e-tutors (ETS2 and ETS5). There were no postings in relation to the students' responses to the two e-tutors, according to the statistics. These findings imply that e-tutors were unable to aid students in conceptualizing the design process's make prototype stage. At the same time, based on the students' findings, one obvious argument that can be made about them is that none of them engaged in all of the postings. The students' refusal to respond to the postings could indicate a lack of comprehension, which could affect their conceptualization of the make prototype step of the design process.

Figure 2 e-tutor abilities to assist students present ideas about the make prototype stage of the design process.

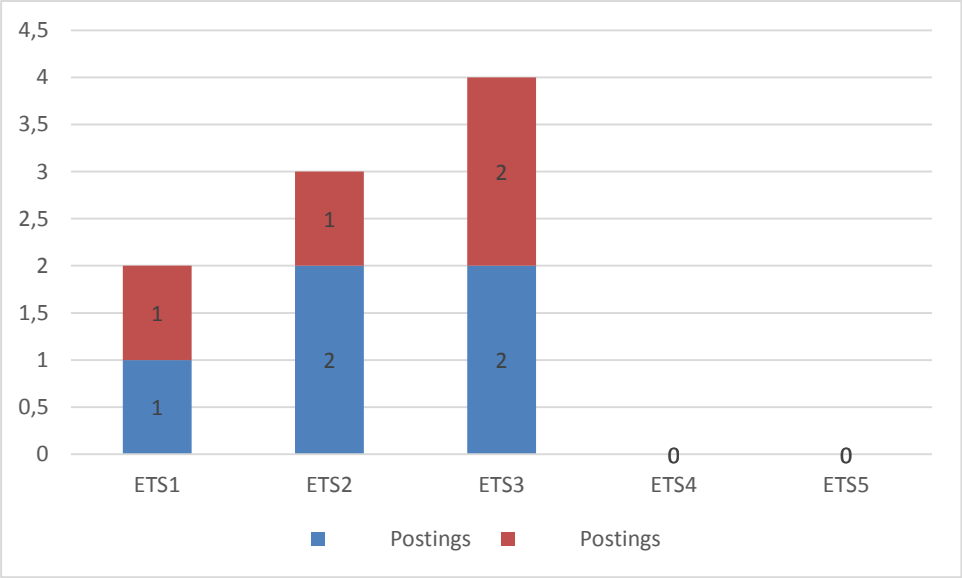

Figure 2. e-tutor abilities to assist students present ideas about the make prototype stage of the design process

Figure 2 shows the responses to a question designed to see if e-tutors can help students convey their ideas during the make prototype stage of the design process. According to the observations, three e-tutors (ETS1; ETS2; and ETS3) posted for the students in more than half of the cases (ETS1; ETS2; and ETS3). With two e-tutor postings each, ETS2 and ETS3 had the maximum number of e-tutor postings. It's also clear that ETS3 received the most answers from online students, with two postings. However, these findings were countered by the fact that ETS4 and ETS5 did not post for the students. Through this analysis, it is clear that more than half of the students were given assistance in presenting their finest ideas for the make prototype stage of their design process projects. The students benefited from their interactions with such e-tutors, which is at the heart of this comparison.

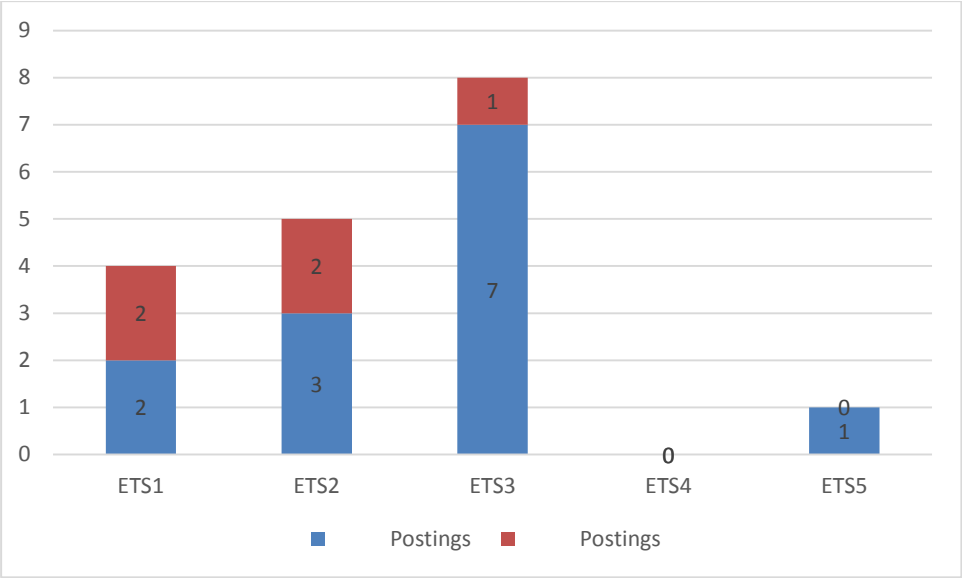

Figure 3. e-tutor abilities to guide students for the process of the make prototype phase

Figure 3 shows the responses to an item designed to determine whether e-tutors have gained the ability to lead students through the make prototype phase. Four e-tutors (ETS1; ETS2; ETS4; and ETS5) were observed out of five, which is more than half of the e-tutors advertised for the students. There's also a breakdown of how students responded to the e-tutors. ETS3 has the most e-tutor listings (seven), followed by ETS2, which had three. Similarly, in ETS1 and ETS2, an equal number (one posting) of online students' responses were observed. The fact that e-tutor sites had a higher number of postings indicates that students had successfully acquired a variety of abilities that might guide them through the make prototype phase of the design process. Another conclusion that can be drawn about students who are assisted by the e-tutors who were observed is that they have enough abilities that have a favourable impact on student engagement, as evidenced by the two postings that were evident from the students' responses.

4. DISCUSSION

The development of this work was guided by a specific single purpose. The use of three tables was broadened to achieve this purpose. In this work, the discussions at the three tables were reversed, beginning at Figure 3 and ending at Figure 1. This investigation is based on a construct to determine whether students' tutors had acquired the ability to instruct students in a virtual environment throughout the make prototype phase of Figure 3's procedure. The discussion that follows is predicated on a high regard for the paper's goal. It has been discovered that e-tutors outperform the average when it comes to learning how to assist students through the make prototype step of the design process in a virtual environment. The findings were in line with recent research by Guaman-Quintanilla, et al. (2022), who found that facilitators in a design thinking course considerably improved their guide abilities as they progressed to the make prototype stage, where they show a lot of inventiveness. These findings were consistent with those of Koroglu and Yildiz (2021), who found that students had a good time, that brainstorming for the make prototype stage went smoothly, that they were able to determine the ultimate goal from their abilities, that they were able to determine the needs and solutions for the make prototype stage of the design process, and that they had a good time during the guidance, which was most entertaining. The findings (Guaman-Quintanilla, et al. 2022; Koroglu & Yildiz, 2021) were supported by reports (Almaghaslah & Alsayari, 2022; Yedra & Aguilar, 2022), which found that students who were paired to assess the success of their make prototype activities showed significant improvements in their overall performance. Almaghaslah and Alsayari (2022) validated Yedra and Aguilar's findings that during the application of a software system for

students with dyslexia towards the development of content levels for make prototypes, the students were able to interact with the playful application part, which gave them the option of interacting with the make prototype's playful activities. (Almaghaslah & Alsayari, 2022; Guaman-Quintanilla, et al., 2022; Koroglu & Yildiz, 2021; Yedra & Aguilar, 2022) it is determined that students benefited from the strategies that made unique demands on how the make prototype stage is taught, especially in a virtual environment. Furthermore, the findings of Colombelli, et al. (2022) added to what was previously said, implying that students' perspectives regarding entrepreneurial education and the types of abilities gained from a make prototype program in which they participated were positively influenced. Importantly, these children were involved in Constructivism on a regular basis. Another conclusion is that the cohort of pupils coached by the sample e-tutors would be able to meet Constructivism's cognitive needs. Luka (2020) cited these events in literature as the development of crucial labour market skills for students who were assisted by e-tutors in the make prototype step of the design process.

Another piece of evidence from Figure 2 shows that there were positive outcomes based on a construct that was created to see if e-tutors can help students' express ideas during the make prototype stage of the design process. The design process on targe as a curriculum to be taught has made positive development, according to the construct report, in the field of the make prototype phase. This confirms what was previously known from the theoretical framework: students who received instruction using techniques that target the make prototype stage of the design process became active participants in virtual environment experiences as they were actively constructing knowledge. Being active participants could be interpreted as a commitment to human-centeredness. Magistretti (2021) uses buzzwords like practice and innovation to see if students gain from the ways they were helped to submit their best ideas regarding the make prototype stage of the design process. Students said they were imaginative after being given the core information and abilities for the prototype phase of the design process, Eguia (2022). Those in the Liu, et al. (2022) report agreed with an earlier report in Eguia (2022) that they were positively influenced in pre-professional roles where they learned to adapt from being a student to a professional person under the guidance of their teachers toward their abilities toward presenting about the make prototype stage of the design process. Robins and Fu (2021) also found that using innovation design thinking for prototyping methods improves students' innovative performance. This study looked at the evidence for teaching the make prototype part of the design process, and it was found to be conclusive that virtual students benefit from having e-tutors help them express ideas regarding the make prototype phase of the design process. According to Aldalalah (2022), the e-learning course functioned well in providing possibilities for all students who participated in the building of the prototype to freely comment on it due to its ability to provide immediate feedback. Children gained important skills during the make prototype phase, according to another report by Yalzin (2022), where it was stated that children were able to transfer what they learned during the make prototype phase to their real lives and use what they learned at schools to solve other problems at home. Another study by Chan and Nagatomo (2022) indicated that students who worked on a corrugated cupboard had higher confidence in overcoming obstacles during the make prototype phase of the design process than students in other classes. According to (Aldalalah, 2022; Chan & Nagatomo, 2022; Eguia, 2022; Magistretti, 2021; Robins & Fu, 2021; Yalzin, 2022); Martinez and Crusat's (2019), qualitative findings, students who worked on innovative solutions to real-world problems showed that the program they were a part of had a good impact on their propensity to become entrepreneurs.

The final paper presentation was based on Figure 1, which aimed to test if e-tutors could understand the design process' make prototype stage. The fact that e-tutors were unable to conceive the make prototype stage of the design process resulted in a less favourable assessment on the construct. The less favourable results were in contrast to what was previously thought to be the

foundation of this article, which stated that constructivism would best suit active students engaged in the production of knowledge for the make prototype stage of the design process. The point made here concerning the idea is not unique, but Roth et al. (2020) previously said that it is still unknown whether how the make prototype phase is taught in virtual classrooms has an impact on both innovation and as a vital labour market supplier. Additional research (Akgul, et. al. 2021; Chan & Nagatomo, 2022; Galoyan, et. al. 2022) bolstered the distinctions made by Roth (2020). According to Akgul, et. al. (2021), the participants were frustrated by time limits and certain challenges caused by a lack of clear time guidelines on when to complete the make prototype phase of the design process, particularly when they were working in a virtual environment. According to Chan and Nagatomo (2022), some students felt the assignment based on the make prototype phase to be difficult and that the content was too much for them. Students reported experiencing constraints from their make prototype project materials when their original solutions were revised to accommodate changes in the design approach, according to Galoyan, et al. (2022).

Additional study was undertaken on the make prototype stage of the design process (Ajit, et al. 2022; Murphy, et al. 2021; Sorby & Panther 2021). Due to a lack of sketching skills, Ajit, Lucas, and Kanyan (2022) observed that the pupils lacked the ability to produce and convey ideas on spatial visualization capacities. The report (Ajit, et al., 2022) with a claim where the students were to present on developing a robot that picks up litter for their prototypes, they noted that the iterative phases of the make prototype stage were difficult. Similar findings were found in another study of students' product creation during the make prototype phase, when it was discovered that they lacked comprehension and planning during a brief project and product development process Murphy, et al (2021). The same findings were reported by Sorby and Panther (2020) earlier this year, who claimed that pupils lacked spatial vision skills, which are a crucial cognitive aspect in student achievement of the make prototype stage.

5. CONCLUSION

What effect did the e-tutors' gained content knowledge have on the students' understanding of the make prototype stage of the design process, which was the basis for major paper discussions? These were motivated by a single goal: to evaluate e-tutors' ability to teach the make prototype stage to students in order to help them grasp its role in the design process. The build, whose goal was to investigate if e-tutors could comprehend the make prototype stage of the design process, yielded a negative result. Some unfavourable consequences were reported, along with an indication that e-tutors lacked the ability to conceive the make prototype stage of the design process, resulting in a less favourable evaluation. The findings are based on initial processes that were spelled out regarding what the design process curriculum should achieve from students who were taught the make prototype stage. The derailment stems from a misperception that the design process is intended to have two major effects: innovation and possibilities to become a key labour market provider. The incapacity of students to become innovative has major implications for future employment chances, as the labour market will face certain gaps due to a lack of cognitive capacities for the critical stage of making a prototype during the design process. This is the case since the make prototype phase is where ideas are put to the test by bringing them to life, according to Vuillermin and Huck-Sandhu (2021). Further, there is a case to be made that in order to attain fruition from putting ideas to the test and bringing them to life, it is critical to remember that it must be done from a human-centered perspective. Magistretti is a fictional character that appears in the year 2021. Dell'Era et al. (2020) said that the design process was growing because of its focus on the human element. However, the report from the construct for the paper was not that positive. According to the literature, Roth, et al. (2020) found that it is still unknown whether how the make prototype stage is taught has an impact on both innovation and as a key labour market provider. At the same time, Galoyan, et al. (2022) observed that the same

students who must participate in the labour market had constraints as a result of their make prototype project. Part of this reasoning was based on Chan and Nagatomo's (2022) observation that some students considered their assignment based on the make prototype phase to be difficult.

The students in the case study were similar to those who reacted to this construct by inferring that they received less support in developing abilities to envision the design process's produce prototype stage. The findings were supported by Akgul, et. al. (2021), who noted that the participants were frustrated since they were given no clear time restrictions on when to complete the make prototype phase of the design process, especially when they were working in a virtual setting. To summarize, the students who are helped by e-tutors will not benefit from the ideals set for the design process, where the focus is on labour markets and inventive abilities from design process students in particular, to see who must benefit from being taught in a virtual context.

The paper's aim revealed certain undesirable consequences, which were reported with an indicator that resulted in a less favourable evaluation on the construct. The ability of e-tutors to conceive the make prototype stage of the design process was revealed.

This research was carried out at an ODeL institution with a global student population of 300,000 students. Out of the whole student population, this study concentrated on 350 postgraduate students who registered for a module (n=500), which proved to be a constraint. Another issue was that, despite the fact that this article focuses on a single college, the same ODeL institution positioned its qualifications across seven colleges and institutions. Despite the fact that departments teach a wide range of modules, the fact that this research focused on only one institution and one module within a department exacerbated the constraint. Because just five e-tutors participated in this study, the institutional professional plan for e-tutors provides for e-tutors across the institution, colleges, and departments, which might be deemed a large number of e- tutors. An instrument became a limitation because it was produced and used as a practical tool for a certain objective. The document then featured a list of restrictions, with no indication that the paper would be treated lightly or with little power. Finally, in order to avoid generalizing the findings, it is vital to analyse these restrictions and pay attention to them so that they may be applied to new investigations.

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The data used in this study was confirmed by the researchers that it belongs to the years before 2020.

6. REFERENCES

Ajit, G., Lucas, T., & Kanyan, R. (2022). Design and technology in Malaysian schools: A perspective on challenges. *Malaysian Journal of Social Sciences and Humanities, 7*(1), 335-351. https://doi.org/10.47405/mjssh.v7i1.1219.

Akgul, T., Brown, J., Milz, B., & Messina, K. (2021). Design thinking applied in higher education: exploring participant experiences. *Journal of Design Thinking, 2*(1), 37-44.

Aldalalah, O.M.A.A. (2022). Employment the world cloud in brainstorming via the web and its effectiveness in developing the design thinking skills. *International Journal of Instruction, 15*(1), 1045-1064. https://doi.org/10.29333/iji.2022.15159a

Almaghaslah, D., & Alsayari, D. (2022). Using design thinking method in academic advising: A case study in a college of pharmacy in Saudi Arabia. *Healthcare, 10*(83), 1-10. https://doi.org/10.3390/healthcare.10010083

Aumernhammer, J., & Roth, B. (2021). The origin and evolution of Stanford university's design thinking: from product design to design thinking in innovation management. *Journal of Product Innovation Management*, 1-22. https://doi.org/10.1111/radm.12254

Caputo, A., Pizzi, S., Pellegrini, M.M., & Dabic, M. (2021). Digitalization and business models: where are we going? A science map of the field. *Journal of Business Research*, *22*(2), 383-402.

Chan, M.N., & Nagatomo, D. (2022). Study of STEM for sustainability in design education: Framework for student learning outcomes with design for disaster project. *Sustainability*, 14, 2-15. https://doi.org/10.3390/su14010312

Dam, R.T., & Siang, T.Y. (2020). 5 stages in design thinking process. Interaction design foundation. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process\.

Dell'Era, C., Magistretti, S., Cautela, C., Verganti, R., & Zurlo, F. (2020). Four kinds of design thinking: from ideating to making, engaging and criticizing. *Creativity and Innovation Management, 37*(3), 197- 208.

Ece, E., & Kazazoğlu, S. (2021). A study on online EFL instructors' teaching satisfaction during pandemic. *Journal of Computer and Education Research, 9* (18), 1084-1097. https://doi.org/10.18009/jcer.1017362

Eguia, R. (2022). Colective knowledge and skills of planning and executing future-proof curriculum design of outcomes-based graduate education. *International Journal of Multidisciplinary: Applied Business and Education Research*, *3*(1), 56-65. https://doi.org/10.11594/ijmaber.03.01.07

Galoyan, T., Barany, A., Donaldson, J.P., Ward, .N., & Hammarich, P. (2022). Connecting science, design thinking and computational thinking through sports. *International Journal of Instruction, 15*(1), 601-618. https://doi.org/10.29333/iji.2022.15134a

Gaborov, M., & Ivetic, D. (2022). The importance of integrating thinking design, user. *Technical and Educatıonal Sciences Jates*, *12*(1),1-17. https://doi.org/10.24368/jates.v12i1.286.

Gherhes, V., Stoian, C.E., & Farcasiu, M. (2021). E-learning vs. face to face learning; analyzing students' preferences and behaviuors. *Sustainability*, 13, 48-81. https://doi.org/10.3390/su13084381.2021

Guaman-Quintanilla, S., Everaert, P., Chiluza, K., & Valcke, M. (2022). Impact of design thinking in higher education: a multi-actor perspective on problem solving and creativity. *International Journal of Technology and Design Education*, https://doi.org/10.10007/s10798-021-09724-z

Koroglu, M. N. & Yildiz, B. (2021). Design thinking in mathematics education: The minecraft case. *Technology Innovation and Special Education Research*, *1*(2), 150-179.

Liu, W., Liu, Y.Z., & Li, Y. (2021). Exploring maker innovation: a multidisciplinary engineering design perspective. *Sustainability*, *14*(295), 2-12.

Luka, I. (2020). Design thinking in pedagogy. *Journal of Education Culture and Society*, *5*(2), 63-74. https://doi.org/10.15503/jecs20142.63.74

Magistretti, S., Ardito, L., & Pertuzzelli, A.M. (2021). "Framing the micro foundation of design thinking as a dynamic capability for innovation: reconciling theory and practice. *Journal of Product Innovation Management*, 1-23. https://doi.org/10.1111/jpim.12586

Magistretti, S., Dell'Era, C., Verganti, R., & Bianchi, M. (2021). The contribution of design thinking to the R of R&D in technological innovation. *R & D Management*, 1, 108-125. https://doi.org/10.1111/RADM.12478

Martinez, M., & Crusat, X. (2019). Work in progress. The innovation journey: a challenge-based learning methodology that introduces innovation and entrepreneurship education on entrepreneurial outcomes. *Journal of Small Business and Enterprise Development*, 15, 382-396.

Pande, M., & Bharathi, S. V. (2020). Theoretical foundations of design thinking- A constructivist learning approach to design thinking. *Thinking Skills and Creativity*, 36, 100637. https://doi.org/10.1016/j.tsc.2020.100637

Robins, P., & Fu, N. (2022). Bling faith or hard evidence? Exploring the indirect performance impact of design thinking practices in R&D. *R&D Management*.

Roth, K., Globocnik, D., Rau, C., & Neyer, A. (2020). Living up to the expectations: The effect of design thinking on project success. *Creativity and Innovation Management*, 29, 667-684. https://doi.org/10.1111/caim.12408

Sorby, S.A., & Panther, G.C. (2020). Is the key to better PISA math scores improving spatial skills? *Mathematics Education Research Journal*, 1-21.

Tuncay, N. (2021). Online education skills of teachers: Access, age, gender and language gap. *Journal of Computer and Education Research*, *9* (17), 1-15. https://doi.org/10.18009/jcer.772839

Vuillermin, F., & Huck-Sandhu, S. (2021). Strategic planning in dynamic environments: how design thinking can complement corporate communication. *Journal of Design Thinking*, *2*(2), 2-12.

Yalzin, V. (2022). Design thinking model in early childhood education. *International Journal of Psychology and Educational Studies*, *9*(1), 196-210. https://dx.doi.org/10.52380/ipes.2022.9.1.715

Yedra, J., & Aguilar, M, A, A. (2022). Design thinking: methodological strategy for the creation of a playful application for children with dyslexia. *Informatics*, *9*(1), 2-17. https://doi.org/10.3390/informatics9010001

Zalat, A.K., Hamed, M.S. & Bolbol, S. A. (2021). The experiences, challenges and acceptances of e-learning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PloS One, 16*(3), 248-279.

Review Article

Perceived Faults that Exist in Laws Governing the Appointment of School Principals in South African Schools *

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Abstract

The purpose of the article is to explore the faults that exist in the laws governing the appointment of school principals in schools in South Africa. The article advances an argument that there are numerous flaws in the laws that regulate the appointment of school principals in schools. The article will contribute to the revision and strengthening of the laws that are used in the appointment of school principals. Some sections of South African Schools Act 9) SASA regulate the appointment of school principals and are used to militate against the good intentions of the Department of Basic Education (DBE) to have the best suitable candidates appointed as school principals. The appointment processes of educators in schools are seen as fraught with fraud and corruption. A report emerged in the year 2016 that the process of selecting candidates for appointment in the Education Sector is riddled with inconsistencies. The report emanated from the probe by a Ministerial Task Team into allegations of selling of teachers' posts. Principals should be selected by means of experienced panels inclusive of a DBE representative. It was recommended that Cadre Deployment be done away with. The appointment of candidates as principals was supposed to be made purely on the basis of merit in terms of the report.

Keywords: Fault, South Africa, system, appointment, principal

1. INTRODUCTION

Uslu and Çetin (2022) believe that individuals are expected to be equipped with basic moral values and to have the qualifications required by the necessities of the time. One of the first policies that led to law were formulated post-1994 in the field of education is the South African Schools Act, Act No. 84 of 1996 (SASA) with the sole purpose of democratising schools and school governance (de Clercq, 2020). This was a conscious move by the ruling party, the African National Congress (ANC), as a response to the many pre-1994 struggles against the bureaucratic and oppressive school systems that affected mainly the blacks in a very negative way. This change in the manner that things were done led to issues of governance in schools being placed purely in the hands of the School Governing Bodies (SGBs) in terms of the law. It was through the SGBs that the principle of the 'government of the people by the people' was to find expression in schools. The SGB is made up of parents, teachers, learners and other non-teaching staff members in the school. The policy dictates that there should be more parents than all the other components combined by at least one parent in the SGB. Part of the functions of the SGB, as contemplated in Section 20 (1) (i) of SASA is to make a recommendation as to who should be appointed as the principal of the school. The recommendation is the outcome of a process that begins with the advertisement of the post by the Department of Basic Education (DBE), followed by the sifting, the shortlisting and the interviews that are conducted by a panel selected from

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the SGB. Based on the recommendation of the SGB, it is the Head of Department (HOD who makes the appointment. Under no circumstances can the HOD not appoint the candidate recommended by the SGB unless there are valid reasons for not appointing the recommended candidate.

Studies conducted point to lack of knowledge and skills on the part of SGBs to perform duties assigned to them in terms of SASA (Setlhodi, 2020). In support of Setlhodi (2020), Dube and Tsotetsi (2020) also attest to a lack of capacity and the requisite competency for SGBs to perform their duties. This is particularly the case with the parent component of the SGB whose members are either illiterate or non-literate. The performance of School Principals is assessed on the basis of 12 Performance Standards in terms of Integrated Quality Management System (IQMS). 4 of these Performance Standards (Performance Standards 9-12) apply only to School Principals and do not apply to teachers at levels below. These Performance Standards relate, in the main, to issues of Leadership, Communication, Servicing the Governing Body, Strategic Planning, Financial Planning, Decision Making and Accountability. It is improbable for SGB Members who do not have capacity to zoom into those critical competences when conducting interviews for the position of a School Principal. This makes the SGBs' choice of a suitable candidate for appointment as principal to be based on issues that have nothing to do with competency, but nepotism and other fraudulent practices. This is a situation that necessitates a need to have the responsibility entrusted in the hands of the SGBs in regard to the appointment of school principals shifted to people who are in possession of the necessary capacity in terms of the law.

The appointment process of educators in schools is seen as fraught with fraud and corruption. A report emerged in the year 2016 that the process of selecting candidates for appointment in the Education Sector is riddled with inconsistencies. The report emanated from the probe by a Ministerial Task Team into allegations of selling of teachers' posts. In a statement that the Minister of Basic Education made following the interim report that proceeded the final one in 2016, she pointed out that 'there is corruption and undue influence in the appointment of teachers and school principals' (BusinessTech, 17 December 2015). This is the sentiment that resonated in the final report that was issued in 2016 as well. The interim report further showed that Government Systems created a situation that allowed an exploitation of the system which compromised appointments in critical posts such as those of school principals. The report does not go into detail to explain what this situation in the Government System is all about. This article is intended to explore the situation in detail and come up with informed findings and recommendations. A recommendation in terms of that report was that the SGB powers to make recommendations for the appointment of post level 2 teachers and above be taken away. It was further recommended that principals should be selected by means of experienced panels inclusive of a DBE representative. It was recommended that Cadre Deployment be done away with. The appointment of candidates as principals was supposedly to be made purely on the basis of merit in terms of the report.

The appointment of a teacher to be a principal of a school is regulated through legislation. It is this legislation which in terms of the argument advanced in this article has gaps that allow for the appointment of candidates that do not have the requisite leadership abilities and competencies to become school principals. Section 20(1) (i) of the South African Schools Act, Act 84 of 1996 (SASA) dictates that the SGB 'must recommend to the Head of Department the appointment of educators at the school'. This means that Head of Department cannot make any appointment whatsoever that is not based on the recommendation of the SGB. Section 7(1) (a) of the Employment of Educators Act, Act No.76 of 1998. (EEA) categorically states that 'in the making of any appointment or the filling of any post on any educator establishment under this Act due regard shall be taken into account of the ability of the candidate'. It is in regard to this 'ability of the candidate' that an argument is made in this article that a flaw exists in the legislation regulating the appointment of a school principal. The legislation does not take into consideration the capacity levels of the majority of the SGBs in the country that

need serious attention. The legislation does not stipulate how this ability must be ascertained in the selection processes. At the same time, it is apparent that the SGBs, particularly the illiterate parent components thereof in the deep rural areas of the country, do not have the expertise required of them to be able to select the best candidate for the position of the principal. One other issue that is of serious concern regarding the laws governing the appointment of school principals in South Africa is the fact that teachers are not subjected to any form of formal training in Leadership and Management in terms of the law before they become school principals. They are normally appointed on the basis of their experience as teachers and the leadership charisma they show during the interviews. Alternatively, some teachers are appointed as principals in certain schools as a way of rewarding them for the track record they have in producing good results in the subjects that they teach. The argument that this article advances in this regard is that criteria such as these are not adequate for deciding as whether the teacher is suitable for appointment as school principal or not.

The research draws mainly on literature review, and partly on the unpublished doctoral thesis of the author(s). The article argues that the legislation needs to be revisited in order to address these critical shortfalls. Naidoo (2019) points out that the Minister of Basic Education proposed that applicants undergo competency tests before appointment as principals. This noble idea from the Minister never saw the light of the day however. This would have gone a long way in ensuring that only suitably qualified candidates are hired as school principals. The article argues that an amendment needs to be effected in the legislation in order to address this critical concern.

1.1 Purpose of Research

To explore the faults that exists in the laws governing the appointment of school principals in schools in South Africa. The article advances an argument that there are numerous flaws in the laws that regulate the appointment of school principals in schools.

2. METHODOLOGY

The research draws mainly on literature review, and partly on the doctoral thesis of the first author under the supervision of second author. The article argues that the legislation needs to be revisited in order to address critical shortfalls in the appointment of principals. Interpretive paradigm was used in the writing of the arguments in the article.The methodology used in this study is the Thematic Analysis Approach. Castleberry and Nolen (2018: 807-815) refer to a form of qualitative analysis called Thematic Analysis (TA). TA is a method of identifying, analysing, and reporting patterns (themes) within data. It is described as a descriptive method that reduces the data in a flexible way that dovetails with other data analysis methods. In this study, the themes that were developed from the review of literature were then followed by a process of in depth interpretation of each theme. A report with Principles and Recommendations was then compiled.

The thematic analysis that was done was preceded by Literature Review. Literature review entails the selection of available documents, both published and unpublished, on the topic at hand (Hart 2018: 21). Such documents contain information, ideas, data and evidence written from a particular standpoint to fulfil aims or express certain views on the nature of the topic and how it is to be investigated. This includes the effective evaluation of these documents in relation to the research being proposed. Leite, Padilha and Cecatti (2019: 1) point out that a sophisticated literature review (LR) can result in robust discussions by scrutinising the main problem examined by the academic study, anticipating research hypotheses, methods and results. It maintains the interest of the audience in how the discussions will provide solutions to the current gaps in a particular field. In the case of this study, LR was meant to assist the researchers in identifying gaps in the appointment processes of

principals in schools. Through literature review, ideas as to how the gaps that were identified could be addressed were then generated.

3. FINDINGS

The study is informed by the perception that exists among school communities that the appointment of school principals in South Africa is fraught with fraud and corruption. It is also informed by the literature review that has been conducted by the researcher on the subject. The available literature points it out clearly that for candidates to be recognised and get appointed as principals they have to engage in unlawful acts which include bribery, nepotism and sex for jobs scandals. It seems that the pieces of legislation that are in place for these appointments are not good enough to circumvent these corrupt and unlawful acts.

For the purpose of this article it is important to delve a little bit into explaining what the concepts of 'fraud and corruption' mean. Fraud is an action committed intentionally in the form of lies, cheating, forgery, embezzlement, information misrepresentation, and removal of evidence, distortion of facts, and manipulation for personal gain or to damage another individual. It is a crime embracing diverse means that human ingenuity can devise to gain advantage over another by false representations (Siahaan, Umar, & Purba 2019). The scourge of fraud and corruption in appointment processes is rising at a very fast rate as bureaucratic operations continue to grow. This is despite preventive actions and security measures being deployed, because fraudsters are learning and finding new ways to get around fraud prevention systems (Błaszczyński, de Almeida Filho, Matuszyk, Szeląg, & Słowiński, 2020). Documents are falsified, and it is not easy to detect the falsification thereof. Fraud detection is not an easy expertise to master. By fraud detection is meant the technique of identifying fraudulent activities (Maddila, Ramasubbareddy, & Govinda, 2020). Fraud detection is usually compared to finding a needle in a haystack and remains a challenging task to pursue because fraudulent acts are buried in massive amounts of normal behaviour as true intentions may be disguised in a single snapshot (Liu, Guo, Zuo, Wu & Guo. 2020). Criminal attacks have drastically increased over the years which make its detection increasingly vital (Maddila et al., 2020). Harrison, Dilla, and Mennecke (2020) describe online fraud as a problem with significant consequences, and little is known about the decision processes that perpetrators follow for engaging in fraud.

Wango and Gatere (2016) define fraud as a deliberate deception for personal gain or harm to another individual. They also claim that fraud is a crime, as well as a civil law violation. The most common forms of fraud are regulatory offences and breaches of contracts (Leon & Ken 2019). Traditional forms of fraud include embezzlement, insider-trading, self-dealing, lying, non-disclosure of information, corruption and cover-ups (Ozili, 2020). Other forms of fraud include billing for unnecessary equipment, or phantom supplies and invoicing more expensive equipment than was actually delivered to clients (Johnson, Johnson, & Policastro, 2019).

Corruption; it is the behaviour of persons entrusted with public or private responsibilities, who neglect their duties to achieve unjustified benefits. That includes: (1) channeling funds into personal use; (2) patronage; (3) bribery and extortion; (4) giving preferential access to services or goods; (5) influencing outcomes and (6) favouritism irrespective of merit (Calderon & Ancho, 2018). Luna-Pla and Nicolás-Carlock (2020) describe corruption as a systemic and adaptive phenomenon that requires comprehensive and multidisciplinary approaches for its effective prevention and combat. They also states that traditional approaches lack analytical tools to address the structural and dynamic aspects that characterize modern social, political and technological systems in which corruption occurs. Lima and Delen (2020), who support Luna-Pla and Nicolás-Carlock (2020), consider that corruption is still ubiquitous and perceived as one of the biggest challenges of modern societies. A large body of academic studies has attempted to identify and explain the potential causes and consequences of corruption, at varying levels of granularity, mostly through theoretical lenses by using correlations and regression-based statistical analyses (Lima & Delen, 2020). Mohamebhai

(2020) argues that no sector appears to be immune from fraud and corruption, not even those that have a direct impact on society's welfare: health, education, sports, politics, or religion. Corruption has remained one of the most significant problems in the post- authoritarian societies, yet there are institutions in place to combat the rampant corruption (Khmelko & Bonnal, 2020). It is a proxy of low detection of opportunistic behaviour which influences managers' decisions (Marchini, Mazza, & Medioli, 2019). This makes corruption extremely difficult to avert and combat decisively. Inshyn, Basai, Basai, Soroka and Stremenovskyi (2020) concede that corruption is a negative global phenomenon in modern conditions, which has penetrated into all areas of the state's functioning, causing significant damage to its development. Corruption affects the stability and security of society, and compromises democratic institutions and values. One of the main and most important actions in the prevention and combating of corruption is the legal approval procedure for the selection of public authorities. Exposure and punishment of perpetrators of corruption can play a major role in the prevention and combating of corrupt activities.

Schools as education institutions are not immune to fraud and corruption when it comes to the appointment of principals. Ahiaku (2019) contends that the procedure for selection and interviews for the appointment of principals is manipulated to favour certain candidates over others, with corruption and nepotism as major factors responsible for the dissatisfaction of other stakeholders. Supporting these claims, Dube and Tsotetsi (2020) say that the appointment of principals in South Africa has, over the years, become politicised and unionised to the extent that it is contextualised within comradeship narratives. Therby, they point out, an understanding has emerged that rejects the qualifications and qualifications necessary to defend the quality education necessary to empower people. Khumalo (2021: 8) lays bare the scourge of corruption in the appointment of school principals by stating that "The practice of selling posts whether through the exchange of money or other favours such as sexual favours is wide-spread though under-reported. The under-reporting can be attributed to the fact that the seller and the buyer of the post operate in high secrecy and in some instances with intimidation… ". In support of Khumalo (2021), Zengele (2019) also cites instances where some South African Democratic Teachers' Union (SADTU) officials have even sold management positions. Zengele (2019:1) insists that "when government education agencies do not heed the warnings of researchers, they not only fail to plan, but they end up planning to fail. This is because of the existing gap between research, policy formulation and implementation". The state of affairs as presented in this paragraph is a clear indication that there is indeed a need for policies and law on appointments of teachers and school principals to be amended. This should be done for the purpose of closing the gap that allows for the appointment of candidates that do not meet the requirements to be appointed as school principals. There are therefore flaws in the laws governing the appointment of school principals that need to be addressed. This can be done by promulgating laws that take the responsibility of making recommendations for the appointment of school principals away from the SGBs and giving them to individuals with professional expertise in the field of education. These would include Circuit Managers, Chief Education Specialists and District Directors.

Corruption in the appointment of principals in schools is not unique to South Africa. Asiyai (2020) alludes to a rampant appointment of underqualified teachers in Nigeria by individuals and groups involved in appointment processes who are hell-bent on taking bribes in order to enrich themselves through corrupt practices. Kum and Julius (2020) attest to the effect that in Cameroon the appointment of school leaders on grounds of personal relationships, political affiliation, ethnicity, or some indices of culture and tradition have become the order of the day.

4. DISCUSSION

There are many reasons why people commit fraud; and these apply in the appointment of principals in schools just as they apply in other organisations. These reasons are as follows:

4.1 Elements of the Fraud Diamond Theory

Rustiarini, Sutrisno, Nurkholis and Andayani (2019) ascribe the reasons for government employees to commit fraud to four elements which they explain by way of what they refer to as the Fraud Diamond Theory. According to this Theory, the four factors that lead to the commission of fraud by public officials are pressure, opportunity, rationalisation and capability. The four factors are the elements of the Fraud Diamond Theory. These are the factors that trigger the commission of fraud and corruption by employees, both in the private sector and government sector. The pressure alluded to relates to personal problems such as the cost of marriage, divorce, medical bills affecting the individual official concerned. Other problems relate to such factors as bankruptcy, uncontrolled debt, individual egocentric motivation such as the desire to get prestige or a higher paying job, obsession with power, and the fear of losing social status. By opportunity is meant the total set of circumstances that make the climate conducive for the commission of fraud and corruption. Opportunities exist when the control systems present flaws that make it easy for employees to commit fraud and corruption. Fraud is not likely to occur where there is no opportunity, even if the individual has high pressure to commit fraud.

Rationalisation occurs when employees are able to come up with reasons that sound acceptable enough to justify their flouting of procurement measures that are procedural and lawful. Ex-post facto approvals, in procurement processes for example, which mean the approval of procurements that have already been made, are clear examples of loop holes in the systems of government institutions. Such approvals are common in instances where institutions find themselves having to procure and acquire goods or services as a matter of urgency as a result of a disaster that catches the institution off-guard. Lastly, individuals who are motivated to commit fraud must also have the capability to exploit existing fraud opportunities. Capability is thus another attribute that each fraud perpetrator must possess to be able to commit fraud. It takes virtues like courage, self-confidence, audacity and fearlessness to break the law on the part of the employee to commit fraud and corruption. Employees with capability to commit fraud and corruption are usually endowed with intelligence that is high enough to help them come up with strategies for a calculated risk.

Perpetrators of fraud are usually internal procurement staff members who work within the organization. They collude with outside suppliers to deceive the employer in exchange for personal benefits such as kickbacks, bribes, gifts or other benefits.

4.1.1 Politicization of the Civil Service

Desta (2019) identifies one of the main underlying causes of corruption in the civil service of developing countries as the politicization of the civil service. The author asserts that this politicization is further aggravated by poor pay, lack of accountability and transparency, weak law enforcements mechanisms, lack of merit-based career advancement, and excessive/ opaque regulations. Cadre deployment championed by politicians leads to corrupt practices such as bribery, embezzlement, fraud, extortion, abuse of power, conflict of interest, insider trading, abuse of privileged information, favoritism, collusion with business interests, procurement contract/bid rigging and influence peddling (Desta, 2019). Similarly, Shava and Chamisa (2018) state that the increasing deployment of politically connected individuals in local municipalities and other public entities has a serious effect on levels of corruption in government. In South Africa, ever since the inception of the cadre deployment policy, numerous cases of corruption such as the abuse of public funds and poor development of local communities have been documented. Therefore, cadre deployment has contributed immensely to increased corruption and has proved to be a major obstacle to the realisation of the goals and objectives of a developmental state in all spheres of the economy. It is through cadre deployment that candidates that do not have the requisite qualifications are appointed into senior positions at the expense of competency levels expected of appointees in those positions. In support of Desta (2019), describes corruption as a multidimensional phenomenon that encompasses abuse of power,

misappropriation of public resources, fraud, bribes, collusion, and other rent seeking activities undertaken for private gain, monetary and non-monetary, by both the politicians and the civil service. Hence, Mutangili (2019) portrays the picture very well by saying that corruption in government institutions is persistent in all countries of the world because institutions such as the legislature (politicians so to speak) have become the major perpetrators of corruption themselves. They are in fact the conduits through which corrupt activities flow. In addition, the rule of law and adherence to formal rules are not rigorously observed, patronage becomes the standard practice, the independence and professionalism of the public sector gets eroded, and the average civilian finally accepts corruption as an inevitable facet of life. All of these emerge as the results of political influence (Mutangalı, 2019).

4.1.2 Moral Degeneration and Deterioration in Ethical Standards

Yap, Lee, and Skitmore (2020) point out that "Lack of ethical standards" is rated the third most critical cause contributing to corrupt practices. They argue that a number of causes are perceived to be significant, with the most critical causes being avarice, relationships between parties, lack of ethical standards, an intense competitive nature, and the involvement of a large amount of money. Moral degeneration and greed among politicians and government officials have been singled out as some of the causes of corruption (Kabiru, 2019). Moral decay manifests itself in the form of the absence of a culture of integrity, honesty, sincerity, hard work, love for others, and commitment to serve as best as possible the interests of the people on the part of civil servants. Moral decay and deterioration in ethical standards have become the major cause of fraud and corruption in developing countries. This results in the abundance of the natural and the human resources that many of these countries are blessed with being grossly compromised. Guerrero-Dip, Portales, and Heredia-Escorza (2020) argue that personal ethical standards are a major causative factor in the commission of fraud and corruption, and key to those ethical standards is to know what constitutes, and what does not constitute good behaviour; and to understand it as essential to do good all the time. Deterioration in ethical standards thus implies two things: Firstly, a deliberate intent on the part of the individuals concerned not to do good even though they know what good entails; and secondly, a deliberate neglect of the understanding they have of why it is essential to do good at all times. It implies refusal or unwillingness to be guided by the moral "compass" of ethical standards referred to above.

4.1.3 Flawed Legal Systems and Lack of Accountability

In most countries of the world, the scourge of fraud and corruption is attributable to a flawed legal system and a lack of accountability which is exacerbated by ineffective law enforcement within bureaucracies (Yap et al., 2020). Also, Sagar (2019) ascribes the scourge of fraud and corruption to lack of accountability, opportunity to commit crime, peer support, greed, loopholes in legal structures, and lack of appropriate reporting mechanisms. Inadequate supervision and lack of internal auditing lead to white-collar crimes (Sagar, 2019). Corruption which has become endemic in developing countries is mainly because of the lack of accountability of governments, lack of oversight, inactive civil society, and lack of anti-corruption action plans (Nurunnabi, 2020). In all developing countries, laws that are aimed at curbing and combating fraud and corruption do exist, but there is either lack of will or capacity to enforce them. Alternatively, it may be that these laws have loopholes that make it difficult for law enforcement agencies to apply law effectively. After the alleged State capture in South Africa became public knowledge, it was a shock to discover how broken down the crime-fighting agencies really were. For instance, it came to light that the weak leadership in institutions such as the National Prosecuting Authority (NPA) grossly undermined the effectiveness of the broader criminal justice system in South Africa. The frail management of the NPA could have been the result of "the concentration of powers given to the president to appoint and remove an official" (Storm, 2020). This is possibly one of the flaws in the legal system that may have contributed to the NPA not implementing consequence management on perpetrators of fraud and corruption the way it should have done. Maybe there is a need to revisit the legal framework that regulates the appointment of the

Head of the NPA and Heads of Chapter 9 Institutions like the Public Protector (PP), the Auditor General (AG), the South African Human Rights Commission (SAHRC), etc. As stated in Chapter 9 of the Constitution of the Republic of South Africa, the purpose of the Chapter 9 Institutions is to safeguard and strengthen democracy. Institutions subject to Chapter 9 are answerable to the National Assembly. On the recommendation of the National Assembly, the State President appoints or dismisses the heads of the Chapter 9 Institutions. The alternative option might be to designate an independent organization with no relation to the government as having the authority to deal with fraud and corruption. If not, the issue with law enforcement as envisioned may result from the State acting as both a player and a referee simultaneously.

4.1.4 Economic Hardships and Performance-Based Compensation of Employees

Jaakson, Johannsen, Pedersen, Vadi, Ashyrov, Reino, and Sööt (2019) refer to economic hardships as another root cause for fraud and corruption, particularly in so far as it relates to private-to-private organisations. There are two dimensions involved in this economic hardship. The first is that the employees of a particular organisation will do everything they can to receive the preferential treatment of another organisation that their organisation does business with. Various pharmacies for instance will rely on one supplier organisation for pharmaceutical supplies. When that supplier organisation has a limited supply of a particular item, it will reserve that item for that one pharmacy it prefers over others. In order to enjoy this kind of treatment, the employees of the receiving organisation will resort to corrupt measures, including bribery, to win the preferential treatment of the supplier organisation. This happens when organizations also set aggressively high-performance targets for their employees. The second dimension relates to the way the employees are compensated. Performance-related-compensation can lead to fraud and corruption. In cases like these, the amount that the employees receive as remuneration is based on the level of performance that the employees are able to demonstrate. Again, in this case, organisations set high performance targets for employees. Employees, in circumstances like these, become so exhausted from having to double or triple their efforts to meet the set targets that they resort to bribing. In this regard; they resort to bribing so as to solicit preferential treatment from the clients or suppliers. It's a situation that creates an environment in which employees are inevitably tempted to cheat. This is precisely because exhaustion reduces an individual's self-control, which is necessary if one wants to resist temptation to act dishonestly. Employees tend to feel that in order to receive the highest remuneration possible, they have no choice but to breach the ethical standards set by the organisation. The discovery of fraud might have a detrimental domino effect on the organisations. Oganizations may experience a public boycott, shareholders leaving, creditors suing the company, and media attention after an initial eruption of fraud issues, all of which could endanger its reputation and image (Awalluddin, Nooriani, & Maznorbalia, 2022)

The above is a comprehensive review of literature on the issue of flaws in the Legal Framework regulating to the appointment of principals in schools. There seems to be flaws in the laws and policies regulating the appointment of principals in schools. The flaws lead to people involved in the appointment processes committing acts of fraud and corruption. Reasons for these acts include the Four Elements of the Fraud Diamond Theory as explained above, Moral Degeneration and Deterioration in Ethical Standards, Flawed Legal Systems and Lack of Accountability, as well as Economic Hardships and Performance-Based Compensation of Employees.

Given the glaringly high rate of fraud and corruption around the appointment processes for candidates into positions of principals in schools, it seems that something different needs to be done to curb the situation. Studies conducted show that SGBs do not have the necessary capacity to manage the appointment processes efficiently; and free of fraud and corruption. This is mainly because of the literacy levels of the parent component in the SGB which are too low. The recommendation in this regard is that the prerogative to select candidates for appointment should be taken away from the

SGBs. This should be done through amendments in the laws regulating the appointment of principals in schools. The law should be amended to give these powers to independent panels composed of educationists who have no personal interests in appointment issues of principals in schools. Circuit Managers, in their capacity as line managers for school principals, should constitute parts of those independent panels. Cadre deployment should be done away with; and this must be legislated. Alternatively, the law should be amended to allow the election into the SGBs parents who do not necessarily have learners in the school in communities where they are. This will make it possible for parents from the ranks of the educated elite to be elected into the SGBs, in which case the necessary capacity will be ensured. From the ranks of these parents the possibility is that there will be people who are educated enough to be able to understand what professional capacities the candidates should possess to be appointed as school principals.

Above all, only suitably qualified candidates must be appointed as principals. This will in turn ensure the effective management of virtually everything in schools by principals. A recommendation is also made to the effect that both Circuit Managers and principals should be subjected to extensive training on leadership. Candidates for appointment as principals should, in terms of the law, undergo competency tests before their subsequent appointment. This measure will ensure that the candidates appointed as principals fully meet the requirements for such appointments.

5. RECOMMENDATIONS

It is recommended that circuit managers should form part of the interview and selction of school principals in school. Literate parents should be elected into the School Governing Body and to fom part of the panel. The laws governing the schools should be amended to include circuit managers in the panel of appointing principals in schools. Law should be amended to allow the election into the SGBs those parents who do not necessarily have learners in the school in communities. The cadre deployment policy should be scrapped in the appointment of school principals.

6. CONCLUSION

The paper contributes to a conscious and purposeful formulation, adoption and implementation of policies that ensure the appointment of only competent candidates as principals of schools. Such appointments will be based on merit rather than cadre deployment and other ulterior motives. This will lead to both efficiency and effectiveness in the manner schools are run in so far as leadership and management is concerned. School functionality and learner performance will also be greatly enhanced. There will also be a remarkable reduction on the levels crime in the appointment of school principals in South Africa; including incidents of nepotism, bribery, fraud and corruption. Studies that have been conducted indicate in no uncertain terms that the SGBs in general do not have the requisite capacity to manage the appointment processes of principals in schools. This is precisely because the majority of SGBs, particularly the parent component thereof, are not educated. They have no idea what competencies the prospective appointees should possess. These competencies include their capacity to manage Interpersonal Relations, ability to exercise leadership, knowledge of the Curriculum Statement that the principal must deliver on, the Methodology of Delivering that curriculum Statement, Project Management, Conflict management and other responsibilities of the principal. One recommendation that stands out from this study therefore, is that appointment processes must be managed by Independent Panels. Such panels must be made up of Education Specialists with no personal interests in the appointments concerned. The other recommendation is that the Department of Basic Education (DBE) should come up with Accredited Leadership Courses that all teachers aspiring to be school principals must go through. This will assist the DBE to know which candidates have the requisite qualities, and which candidates do not have, even before the selection processes are

rolled out for a particular post. All these recommendations must be promulgated into law, so that the necessary amendments are made in the relevant Acts, SASA or Employment of Educators Act, Act no. 76 of 1998 (EEA) as the case may be.

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5. REFERENCES

Ahiaku, P. K. A. (2019). Measuring the effectiveness of school management team: A qualitative analysis of the stakeholders' views. *AFFRIKA Journal of Politics, Economics and Society*, *9*(2), 33-45. https://doi.org/10.31920/2075-6534/2019/9n2a2

Asiyai, R. I. (2020). Corruption in secondary schools: Administrative strategies for its' management. *Journal of Educational and Social Research*, *10*(1), 106-106. https://doi.org/10.36941/jesr-2020-0010

Awalluddin, M. A., Nooriani, T. I. T., & Maznorbalia, A. S. (2022). The relationship between perceived pressure, perceived opportunity, perceived rationalization and fraud tendency among employees: A study from the people's trust in Malaysia. *Studies in Business and Economics*, *17*(2), 23-43. https://doi.org/10.2478/sbe-2022-0023

Błaszczyński, J., de Almeida Filho, A. T., Matuszyk, A., Szeląg, M., & Słowiński, R. (2020). Auto loan fraud detection using dominance-based rough set approach versus machine learning methods. *Expert Systems with Applications*, 113740. https://doi.org/10.1016/j.eswa.2020.113740

Calderon, A.B.B., & Ancho, I.V. (2018). Examining malpractice in the education context. *Journal of Research, Policy & Practice of Teachers & Teacher Education (JRPPTTE)*, *8*(2), 95-103. https://doi.org/10.37134/jrpptte.vol8.no2.9.2018

Castleberry, A., & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in Pharmacy Teaching and Learning*, *10*(6), 807-815. https://doi:10.1016/j.cptl.2018.03.019

De Clercq, F. (2020). The persistence of South African educational inequalities: The need for understanding and relying on analytical frameworks. education as change, 24, 1-22. https://doi.org/10.25159/1947-9417/7234

Desta, Y. (2019). Manifestations and causes of civil service corruption in developing countries. *Journal of Public Administration and Governance*, *9*(3), 23-35. https://doi.org/10.5296/jpag.v9i3.14930

Dube, B., & Tsotetsi, C. (2020). The ambivalence of comradeship in the appointment of principals: A threat to the provision of quality education. *South African Journal of Education*, 40, 1-10. https://doi.org/10.15700/saje.v40ns2a1733

Guerrero-Dip, J.G., Portales, L., & Heredia-Escorza, Y. (2020). Impact of Academic integrity on the workplace ethical behaviour. *International Journal for Educational Integrity*, *16*(1), 1-18. https://doi.org/10.1007/s40979-020-0051-3

Harrison, A.J., Dilla, W.N., & Mennecke, B.E. (2020). Relationships within the Fraud Diamond: The decision processes that influence fraudulent intentions in online consumer Fraud. *Journal of Information Systems*, *34*(1), 61-80. https://doi.org/10.2308/isys-52627

Hart, C. (2018*). Doing a literature review: Releasing the research imagination*. London: Sage.

Inshyn, M.I., Basai O.V., Basai, N.M., Soroka, O.O & Stremenovskyi, SM. (2020). Preventing and combating corruption (economic crime): Examples of EU and Ukraine governance. *International Journal of Management*, *11*(4), 532 -544.

Jaakson, K., Johannsen, L., Pedersen, K.H., Vadi, M, Ashyrov, G., Reino, A., & Sööt, M.L. (2019). The role of costs, benefits, and moral judgments in private-to-private corruption. *Crime, Law and Social Change*, *71*(1), 83-106. https://doi.org/10.1007/s10611-018-9790-y

Johnson, T.L., Johnson, N.N., & Policastro, C. (2019). *Deviance amongst physicians: Fraud, violence, and power to prescribe*. New York: Routledge.

Kabiru, S.A. 2019. Causes of corruption in Nigeria: Implication for national development. *Studies, 1*(4), 20-27. https://doi.org/10.26677/TR1010.2019.115

Khmelko, I., & Bonnal, M. (2020). Corruption and legislatures: Exploring perceptions of Ukranian legislators. *Public Integrity*, *22*(4), 344-359. https://doi.org/10.1080/10999922.2019.1596724

Khumalo, S.S. (2021). A critical examination of the recruitment processes of the South African principals from the rawls perspective: A conceptual argument. *Cogent Social Sciences*, *7*(1), 1918879. https://doi.org/10.1080/23311886.2021.1918879

Kum, H.A., & Julius, N.B.M. (2020). Unable to lead, unwilling to be led: Contesting the villainization of school leadership appointments in Cameroon. *Journal of Education and Social Policy*, *7*(3), 1-11. https://doi.org/10.30845/jesp.v7n3p1

Kulakowska, M. (2020). Interpretive theories in political science. *Teoria Polityki*, 4, 31-41. https://doi:10.4467/25440845TP.19.014.11780

Lambert, M. (2019). *Grounded theory. practical research methods in education: An early researcher's critical guide*. New York: Routledge.

Lima, M.S.M., & Delen, D. (2020). Predicting and explaining corruption across countries: A machine learning approach. *Government Information Quarterly*, *37*(1), 101407. https://doi.org/10.1016/j.giq.2019.101407

Leite, D.F.B., Padilha, M.A.S., & Cecatti J.G. (2019). Approaching literature review for academic purposes: *The Literature Review Checklist. Clinics*, *74*(25), e1403-e1403. https://doi.org/10.6061/clinics/2019/e1403

Liu, G., Guo, J., Zuo, Y., Wu, J., & Guo, RY. (2020). Fraud detection via behavioural sequence embedding. *Knowledge and information Systems*, *62*(7), 2685-2708. https://doi.org/10.1007/s10115-019-01433-3

Leon, K.S., & Ken I. (2019). Legitimised fraud and the state–corporate criminology of food–a Spectrum–based theory. *Crime, Law and Social Change*, 71, 25-46. https://doi.org/10.7282/t3-fn50-a866

Luna-Pla, I., & Nicolás-Carlock, J.R. (2020). Corruption and complexity: A scientific framework fo the analysis of corruption networks. *Applied Network Science*, *5*(1), 1-18. https://doi.org/10.1007/s41109-020-00258-2

Maddila, S, Ramasubbareddy, S., & Govinda, K. (2020). Crime and fraud detection using clustering techniques. In *Innovations in computer science and engineering*. Singapore: Springer.

Marchini, P.L., Mazza, T., & Medioli, A. (2019). Corruption and sustainable development: The impact on income shifting in European international groups. *Corporate Social Responsibility and Environmental Management*, *27*(2), 717-730. https://doi.org/10.1002/csr.1839

McCann, T., & Polacsek, M. (2020). Understanding, choosing and applying grounded theory: part 1. *Nurse Researcher*, *28*(1), 36-41. https://doi:10.7748/nr.2018.e1592

Mohamebhai, G. (2020). The scourge of fraud and corruption in higher education. In Corruption in higher education, In: Chisita, Collence Takaingenhamo, Enakrire, Rexwhite Tega, Durodolu, Oluwole Olumide, Tsabedze, Vusi Wonderboy, Ngoaketsi, Joseph M (Editors) *Handbook of research on records and information management strategies for enhanced knowledge*. IGI Global: India.

Mutangili, S.K. (2019). Corruption in public procurement in Kenya: Causes, consequences, challenges and cures. *Journal of Procurement & Supply Chain*, *3*(1), 63-72.

Naidoo, P. (2019). Perceptions of teachers and school management teams of the leadership roles of public school principals. *South African Journal of Education*, *39*(2), 1-14. https://doi.org/10.15700/saje.v39n2a1534

Nurunnabi, M. (2020). *Revisiting accountability: corruption in health care in developing countries*. Singapore: Springer.

Ozili, P.K. (2020). *Advances and issues in fraud research. A commentary*. Germany: University Library of Munich.

Rustiarini, N., T., S., Nurkholis, N., & Andayani, W. (2019). Why people commit public procurement fraud? The fraud diamond view. *Journal of Public Procurement, 19*(4), 345-362. https://doi.org/10.1108/JOPP-02-2019-0012

Sagar, A. (2019). the concept of white-collar crime: Nature, causes, political and legal aspects in accountability and way forward. *Journal of Political Studies*, *26*(1), 1-10. https://prdb.pk/article/the-concept-of-white-collar-crime-nature-causes-political-3314

Siahaan, M., Umar, H., & Purba, R.B. (2019). Fraud star drives to asset misappropriation moderated by internal controls. *Journal of South West Jiaotong University*, *54*(4), 1-10. https://doi.org/10.35741/issn.0258-2724.54.4.24

Setlhodi, I.I. (2020). Collaboration practices between the two tiers of school leadership in eradicating underperformance. *South Africa Journal of Education*, *40*(3), 1-11. https://doi.org/10.15700/saje.v40n3a1796

Shava, E., & Chamisa, S.F. (2018). Cadre deployment policy and its effects on performance management in South African local government: a critical review. *Politeia*, *37*(1), 1-18. https://doi.org/10.25159/0256-8845/3849

Storm, A. (2020). The development of an independent anti-corruption agency to combat corruption in South Africa. *Just Africa*, *5*(1), 54-70.

Uslu, S. & Çetin. M. (2022). Character and values for world citizenship: the case of social studies prospective teachers. *International e-Journal of Educational Studies (IEJES), 6* (11), 56-69. https://doi.org/10.31458/iejes.1036273

Wango, G., & Gatere, A. 2016. Integrity and financial accountability in schools: Role of principals' of schools in Kenya. *International Journal of Education and Research, 4*(4), 1-14.

Yap, J.B.H., Lee, K.Y., & Skitmore, M. (2020). Analysing the causes of corruption in the Malaysian construction industry. *Journal of Engineering, Design and Technology*. Brisbane: Emerald Publishing Limited.

Zengele, T. (2019).The nexus between research, policy and implementation. *e-Bangi*, *16*(7), 1-11.

Research Article

Pre-Service Science Teachers' Views on the Use of Indigenous Chemistry Knowledge in Chemistry Metacognition [*]

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Abstract

This study focused on the views of pre-service science teachers on the use of indigenous chemistry knowledge in chemistry metacognition. A descriptive qualitative case study design using the interpretive paradigm was employed. The social constructivist theory guided the study as cognitive functions are dependent on social interactions with other individuals and the environment. Purposively sampled 29 pre-service science teachers were the respondents who had no previous tertiary chemistry education experience. Data was collected using focus group interviews, observation and document analysis. Constant comparison analysis was used for data analysis. The study shows that; (a) pre-service science teachers know and practice indigenous chemistry knowledge in agriculture, food preservation, food processing, health-care and environmental conservation. (b) Indigenous chemistry knowledge can be effectively used in chemistry metacognition when there is an awareness of chemistry concepts / ideas in indigenous chemistry knowledge. (c) There is a positive attitude towards the use of indigenous chemistry knowledge in chemistry metacognition. The recommendation is that chemistry curriculum developers at teachers' colleges must harness the multicultural indigenous chemistry knowledge from pre-service science teachers for establishment of a course in indigenous chemistry knowledge at the tertiary institutions.

Keywords: Chemistry metacognition, cultural relevance, ideal chemistry education, indigenous chemistry knowledge, pre-service science teachers

1. INTRODUCTION

1.1. Indigenous Chemistry Knowledge and Chemistry Metacognition

Chemistry education is based on western and eastern oriented generation and dissemination of information that does not value indigenous chemistry knowledge (Dziva, Mpofu & Kusure 2011; Shumba, 2014). Whilst Chemistry is a subject that is abstract to both teachers and learners because it is taught in way not related to the indigenous knowledge and practices (everyday life experiences) of the learner resulting in poor academic performance (Ugwu & Diovu, 2016). Indigenous knowledge is knowledge, which has evolved in a particular society's context and is unique (Senanayake, 2006) used in that society's context daily (Austin & Hickey, 2011). Indigenous chemistry knowledge is chemistry knowledge, which has evolved in a particular society's context and is used in that society's context daily. The chemistry that is seen as abstract is actually practised using resources from the environment in the context of indigenous chemistry knowledge at levels that differ of human societies in the world unknowingly (Ugwu & Diovu 2016).

Chemistry learners are exposed to the cultural beliefs and indigenous knowledge from their culture. All leaning occurs through culture in the social context (Aikenhead & Jegede, 1999). The cultural prior knowledge from the learners' culture has a significant impact on the learning of formal

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(school) chemistry concepts and this cultural prior knowledge determines the learners' preferred learning style (Baker & Taylor, 1995). Learners' construction of meaning is done through indigenous Chemistry knowledge (prior Chemistry knowledge) (Aikenhead & Jegede, 1999). Aspects of culture of non-western science learners such as indigenous knowledge (traditional and empirical knowledge), ways of knowing as well as indigenous world views should be seen and incorporated as science learning foundations (Dziva, Mpofu & Kusure 2011).

Metacognition is recognition of the value of prior knowledge with an accurate assessment of the demands of a challenging learning activity or goal and what understanding and skills are needed as well as the intelligence required to make the right deduction on how to use one's elaborate and systematic knowledge in a specific situation reliably and efficiently (Taylor, 1999). Chemistry metacognition is the recognition of the value of indigenous Chemistry knowledge (prior-knowledge) with an accurate assessment of the demands of a western Chemistry challenging learning activity and what understanding and skills are needed as well as the intelligence required to make the right deduction on how to use one's elaborate and systematic indigenous Chemistry knowledge in a specific situation reliably and efficiently. Metacognition promotes independent Chemistry knowledge, knowledge that is more permanent, motivates learners and improves educational achievement across different ages, intellectual abilities and subject areas (Louca, 2003; Somerville, 2017). Abilities of metacognition assist learners to transfer acquired Chemistry knowledge, skills and affective states to another context or learning task.

1.2. Research on Indigenous Knowledge and Chemistry Education

In the Asian country of Indonesia, Rahmawati and Ridwan (2017) did a study at secondary school level on the empowerment of learners' chemistry learning through an integration of learners' ethnochemistry in teaching that was culturally responsive. The results of their study were that learners developed; higher order thinking skills (creativity in problem-solving), self-confidence, stimulated responsibility and task completion, empathy for other learners, improved communication amongst themselves, curiosity and motivation. These led to the conclusion that learners were empowered in chemistry learning by the integration of ethnochemistry. Ugwu and Diovu (2016) studied the integration of indigenous practices and knowledge in chemistry teaching, learning and learners' academic achievement at senior secondary school level in the African country of Nigeria. The findings of their study were that the integration of indigenous practices and knowledge in chemistry teaching and learning improved chemistry concepts understanding and improved learners' achievement in chemistry. In Zambia, an African country that shares a border with Zimbabwe, Singh and Chibuye (2016) did a study on the effect of ethnochemistry knowledge and practices on learners' attitudes towards chemistry at secondary school level. The findings of the study showed that incorporation of ethnochemistry knowledge and practices in chemistry, improved learners' attitudes towards chemistry positively.

Most studies that have been conducted on indigenous chemistry knowledge (ethnochemistry) and chemistry education have focused on the effect of integration of indigenous chemistry knowledge on the performance of learners in chemistry and learners' attitudes towards chemistry. A study on the views of learners on the use of indigenous chemistry knowledge in chemistry metacognition has never been done before. Therefore, a gap exists in knowledge, which this study sought to fill by exploring the perceptions of pre-service science teachers on the use of indigenous chemistry knowledge on chemistry metacognition. The teaching and learning at teachers' colleges is conceptualised from the western and eastern philosophical orientations that are based on a universal approach towards knowledge generation and dissemination (Shumba, 2014). The ideal chemistry teaching and learning should be done from the African philosophical orientation that is locally contextualised and culturally

relevant in terms of knowledge generation and dissemination that meets the needs and provides practical solutions to the everyday life chemical challenges and problems of the community.

1.3. Research Questions

The study is guided by the following research questions:

- Which indigenous Chemistry knowledge is known and practised by pre-service science teachers?
- How can indigenous Chemistry knowledge be effectively utilised in Chemistry metacognition?
- What are the attitudes of pre-service science teachers towards the use of indigenous Chemistry knowledge in Chemistry metacognition?

2. METHOD

2.1. Research Design

A descriptive qualitative case study design using the interpretive paradigm was employed to study the views of learners towards the use of indigenous Chemistry knowledge in Chemistry metacognition. A descriptive case study design is concerned with interpretation and description of situations, circumstances, conditions and events that are contemporary in nature and from a social constructivist perspective (Merriam, 1998). A qualitative research approach focuses on peoples' meaning systems, experiences and beliefs from their perspective. Its roots are the cultural and social anthropology, history, philosophy, sociology and psychology suggests Mohajan (2018). The interpretive paradigm was employed to study pre-service science teachers' views on the use of indigenous chemistry knowledge in chemistry metacognition. The interpretive paradigm is a constructivist paradigm that is humanistic and naturalistic which is used to interpret and understand reality in the human and social context states Shah and Al-Bargi (2013). This study was based on the subjective indigenous chemistry knowledge meanings of the pre-service science teachers' understanding and interpretation of the indigenous chemistry knowledge social and human phenomena.

2.2. Participants

The study was conducted at a secondary school teachers' college in Zimbabwe with the respondents being post ordinary level pre-service science teachers who had no exposure to tertiary level chemistry education before. The data collection and analysis were conducted in eight weeks in the pre-service science teachers' first term at college of 2020. The respondents were 29 pre-service science teachers from the science department of a secondary teacher training college in Zimbabwe. The demographic profiles of pre-service science teachers in that participated in the study shown in in Figure 1 to 3.

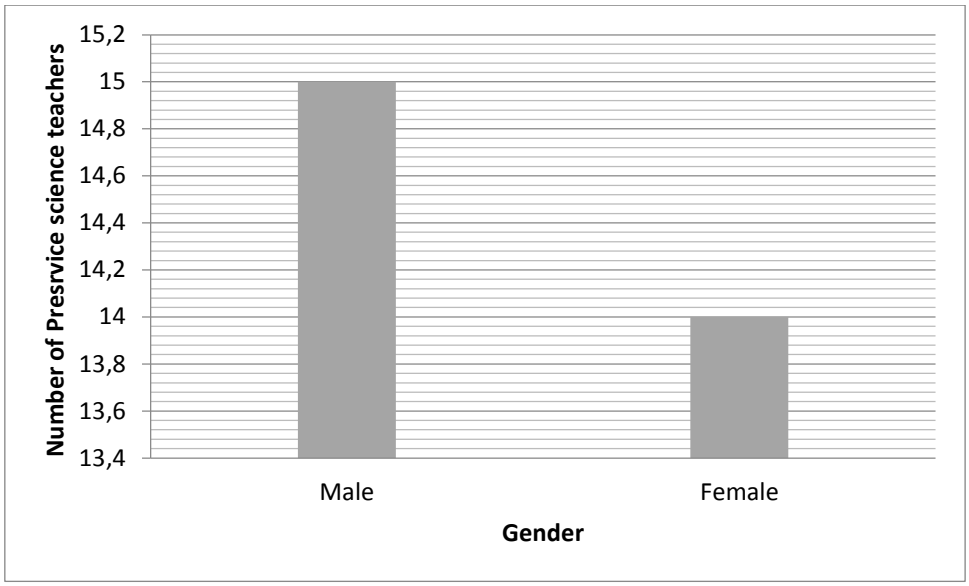

Figure 1. Gender distribution of pre-service science teachers

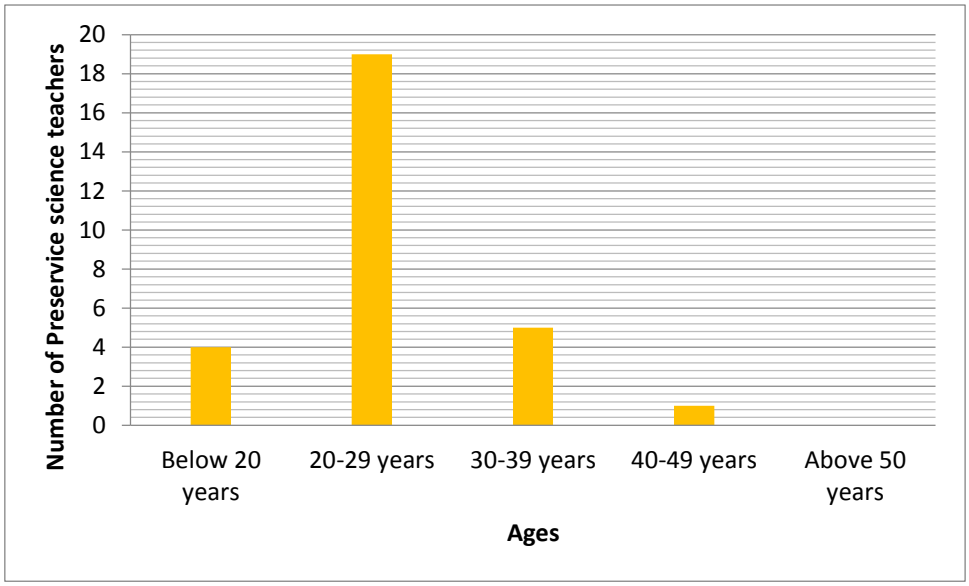

Figure 2. Age distribution of pre-service science teachers

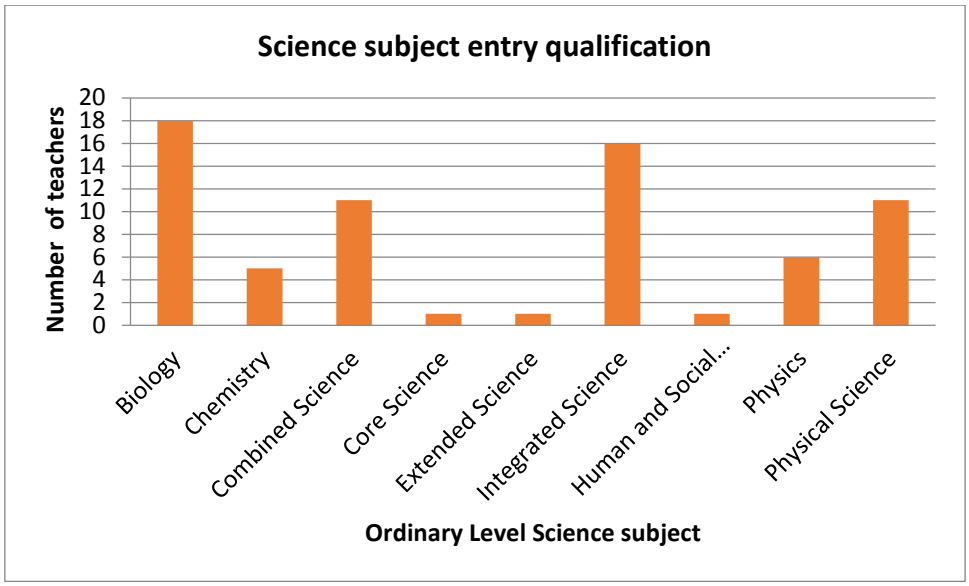

Figure 3. Science subject entry qualification of pre-service science teachers

2.3. Data Collection

The pre-service science teachers were purposively sampled who participated in the study. Focus groups, observation and document analysis were used in exploring the views of pre-service science teachers on the use of indigenous chemistry knowledge in chemistry metacognition. Focus group interviews were used for identifying the cultural indigenous chemistry knowledge held and practised by pre-service science teachers. The function of observations was to assess and find out the extent to which pre-service science teachers used cultural indigenous chemistry knowledge in the lectures. Document analysis was done using pre-service science teachers' written tests, assignments and practical write-ups at the teachers 'college after marking the pieces of work. Document analysis was used for identifying the cultural indigenous chemistry knowledge held and practised by pre-service science teachers.

2.4. Data Analysis

The data was analysed using constant comparison analysis to identify the indigenous Chemistry knowledge that is known and practised by of the pre-service science teachers. Flick (2013) describes qualitative data analysis as a process whereby material that is visual or linguistic is classified and interpreted to produce statements that are explicit and implicit in dimensions as well as structures for making meaning from the material that it represents. These were done though the components of qualitative data analysis which are data collection, data reduction, data display and conclusion drawing as well as verification suggests Miles, Huberman and Saldana (2014).

The first stage of data analysis involved organizing the indigenous chemistry knowledge experiences, perceptions, behaviours and emotions of the participants into the categories (themes) of agriculture, environmental conservation, food processing, food preservation and health care. The second stage of data analysis involved the segregating and labelling (coding) of themes into those with chemistry ideas / concepts, beneficial characteristics, common characteristics with western chemistry knowledge, important uses in chemistry lectures and those with affective impacts.

3. FINDINGS

3.1. Which Indigenous Chemistry Knowledge is Known and Practised by Pre-Service Science Teachers?

Quite a large amount of Indigenous Chemistry knowledge and skills known and practised by pre-service science teachers for survival purposes. Many uses and effectiveness of indigenous Chemistry knowledge and skills were found in agriculture, environmental conservation, food processing, food preservation and health care. Indigenous environmental conservation knowledge, skills and attitudes are an area of specialisation that is known and practised by pre-service science teachers. Most of the pre-service teachers' environmental conservation majored mainly on soil, tree, plant nutrients and animal conservation.

3.2. How can Indigenous Chemistry Knowledge be Effectively Utilised in Chemistry Metacognition?

Pre-service science teachers are aware of chemistry concepts/ideas that are in some of the indigenous chemistry knowledge they know and practice as shown in Table 1.

Table 1. Indigenous Chemistry knowledge with known chemistry ideas / concepts

Use of ashes to heal wounds. Salting meat. Maize- grind using a mortar and pestle. Animal skins -clothing leather. Pumpkin seeds – processed into cooking oil (roasting, grinding, squeezing of the pumpkin seeds). Cooking sadza. Traditional medicine(herbs). Salting fish- dehydration and pH. Drying of vegetables (irradiation and evaporation). Sour milk production. Boiling water. Mango leaves plus honey and boiling and consuming the syrup (flu and colds). Applying table salt to wounds to stop bleeding. Smoking meat- no flies to the meat after smoking. Salting and drying meat. Sour milk- fresh milk placed in closed contain. Drying meat. Ashes used to kill pests. Fire making- exposure to oxygen to promote combustion. Brewing traditional beer or drink (Mahewu). Ashes as fertilizer. Cow dung fertilizer- dosage too much kills plants. Boiling-denaturing of cells and enzymes. Application of ashes in fields (neutralisation). Cooking. Fermentation of sour porridge. Mahewu. Harvesting honey from a beehive. Salting meat. Tototo (illicit brew) brewing- fermentation and fractional distillation, raw material in tototo brewing is rotten sadza/ food and rotten fruits. Cooking sadza- endothermic and exothermic reactions. Smoking food- chemical treatment. Fire exothermic and oxidation/ reduction reactions.

These Chemistry ideas/concepts are the same chemistry ideas/concepts which are found in the western Chemistry knowledge. Indigenous Chemistry knowledge is the Chemistry prior knowledge for western Chemistry knowledge. Metacognition relies heavily on subject prior knowledge for it be learned well (Vygotsky, 1978). Pre-service science teachers gave a number of benefits associated with indigenous Chemistry knowledge and skills from their experiences in their daily lives. Table 2 gives a list of beneficial characteristics of indigenous Chemistry knowledge and skills as given by pre-service science teachers.

Table 2. Beneficial characteristics of indigenous chemistry knowledge

Quite efficient but not 100%. User friendly. Easily accessible. Rarely has side effects. Readily available. Nature derived. Help in understanding chemistry concepts. Use environmentally friendly methods. Learn as you go. Practised in everyday life. Indigenous medicines are more effective. One type of herb can be used to treat many diseases. No side effects. Environmentally friendly. Cheaper. Affordable. Passed from generation to generation (heritage). Economic. Safe. Always available. Original taste of some food staffs not lost so much. Get money through selling processed fruits. Store of wealth. Eco-friendly. Most do not have side effects. Herbs have limited side effects. Convenient.

There are some common characteristics between indigenous Chemistry knowledge and western Chemistry knowledge that were identified by pre-service science teachers as shown in Table 3.

Table 3. Common characteristics between indigenous and western chemistry knowledge

Precautions. There are stages to be followed when executing. Cure. Processes are the same, for example beer brewing- fermentation and fractional distillation process. College chemistry depends on indigenous chemistry (based on), the practical part. Save the same purpose-processes. College chemistry is a modification of indigenous chemistry knowledge. Similar process. Time periods – set time for the processes. Practical application, practice, the concepts behind, putting theory into practice. Processes, they sometimes serve the same purposes e.g. healing. There are measurements that are done. Opaque beer fermentation.
Makes life easier. Indigenous knowledge used as assumed knowledge (indigenous chemistry knowledge the known and college chemistry the unknown).
School/college-theory. Home- practical. College chemistry relates to indigenous chemistry knowledge. They depend on nature. Indigenous chemistry- application (practical) and college chemistry (theoretical). College chemistry and improvement of indigenous chemistry knowledge. College chemistry is an advancement of indigenous chemistry knowledge, indigenous chemistry knowledge is the backbone of college chemistry. Practical. Indigenous chemistry knowledge is prior knowledge to the college chemistry. Theory and practice with college chemistry being theoretical whilst indigenous chemistry is practical or hands on. Similar process. Theoretical chemistry (college) makes learners realise what is done at home is exactly the same. Similar concepts between the two, at times college brings about knowledge from other places (exotic) whilst indigenous chemistry knowledge is local, relationship mutual but indigenous people won't be knowing that they are applying chemistry. Share knowledge, serve the same purpose e.g. aloe vera – used as indigenous medicines also formal chemistry uses it to make pills.

The importance of using indigenous chemistry knowledge in formal chemistry lectures was emphasised by pre-service science teachers because of the reasons shown in Table 4.

Table 4. Importance of the use of indigenous chemistry knowledge in chemistry lectures.

School / college – theory. Home- practical. College chemistry relates to indigenous chemistry knowledge. They depend on nature. Indigenous chemistry- application (practical) and college chemistry (theoretical). College chemistry is an advancement of indigenous chemistry knowledge, indigenous chemistry knowledge is the backbone of college chemistry. Practical. Indigenous chemistry knowledge is prior knowledge to the college chemistry. Theory and practice with college chemistry being theoretical whilst indigenous chemistry is practical or hands on. Similar process. Theoretical chemistry (college) makes learners realise what is done at home is exactly the same. Similar concepts between the two, at times college brings about knowledge from other places (exotic) whilst indigenous chemistry knowledge is local, relationship mutual but indigenous people won't be knowing that they are applying chemistry. Share knowledge, serve the same purpose e.g., aloe vera – used as indigenous medicines also formal chemistry uses it to make pills.

The use of indigenous Chemistry knowledge and skills in Chemistry lectures (western Chemistry knowledge) comes with it some advantages and disadvantages as shown in Table 5.

Table 5. Advantages and disadvantages of using indigenous Chemistry knowledgein Chemistry lectures.

Advantages
Learners easily grasp concepts. No qualification that is needed. It can be a hub for home grown solutions. Captivate students' interest and motivation. Provides creativity. Promotes research and development. Making understanding better. Makes learning easy. Gives relevance. Information easily accessible. A lot of cultures. Raw material is local, available and cheap. Provides better understanding. Brings together the modernised learners and the sophisticated. Gives a clear picture of what is being taught. Makes it easy for learners to understand the concept as learners are well versed in indigenous Chemistry knowledge
Helps in following safety in a laboratory. Learners have hands-on experience. It prepares learners for after college-life. It brings reality. It promotes memory retention (empowers memory) as learners will be learning from the known to the unknown. Have an idea of what you are learning about. Common to everyone and readily available. Understand better what is being spoken/taught about them since you can relate. Learners will understand better because the concepts are being simplified. Helps to maintain the interest (motivation) of learners since they can relate.
Disadvantages
Some are out-dated. Might kill college Chemistry technical terminology among learners. Wrongly prescribe something for someone. Some of them not scientifically proven. Supports the ones in contact with the indigenous knowledge. Learners might end up dwelling much in indigenous Chemistry knowledge than on the college Chemistry concepts. Practice might be dangerous or harmful to the health of a person (Allergic to some of the indigenous Chemistry knowledge substances) There is no specificity in indigenous Chemistry. Measurements are not reliable. Some of the indigenous Chemistry knowledge method might not give enough results that can be evaluated. Reactions take a lot of time/ slow. Tends to discriminate against the ones who grew up in urban areas as compared to the ones who grew up in rural areas. Dilution of cultures of other learners' cultures (cultural shock).

3.3. What are the attitudes of pre-service science teachers towards the use of indigenous Chemistry knowledge in Chemistry metacognition?

Quite a number of attitudes were exhibited by pre-service science teachers in terms of the use of indigenous Chemistry knowledge, skills and attitudes in the Chemistry lectures. Pre-service science teachers felt that it was good, acceptable, comfortable and important to use indigenous Chemistry knowledge, skills and attitudes in the Chemistry lectures. Their reasons were that the use of indigenous Chemistry knowledge, skills and attitudes in the chemistry lectures motivates learners, improves Chemistry concepts comprehension, aids memory retention and brings reality and life experiences to the classroom. Pre-service science teachers also felt that it was the best way to learn western Chemistry knowledge, as the examples used were from their daily life experiences which are known and understood. However, pre-service science teachers also felt that in the process of assisting in the learning and teaching of western Chemistry knowledge, indigenous Chemistry knowledge, skills and attitudes are standardised and preserved in the process.

4. DISCUSSION and CONCLUSION

The results indicate that pre-service science teachers know and practice a vast amount of indigenous chemistry knowledge in agriculture, food preservation, food processing, health-care and environmental conservation, which was complemented by indigenous chemistry knowledge in other areas. The results of this study are in agreement with Mapara's (2009) findings, which indicated that indigenous knowledge which includes the areas of medicine, agriculture, craft skills, zoology and botany among others, are still held by local people even after years of colonisation. These results are

consistent with Ugboma (2014), whose findings showed that the majority of the population possess and utilise indigenous knowledge. Senanayake's (2006) findings showed that indigenous knowledge experts are ordinary people of the society. These results are also consistent with the findings of Ugwu and Diovu (2016) and Singh and Chibuye (2016) which, showed that there are many chemistry concepts in indigenous knowledge that are known and practised by learners knowingly and unknowingly in their daily life experiences.

The findings indicate that indigenous Chemistry knowledge can be effectively used in chemistry metacognition when there is an awareness by pre-service science teachers (learners) and educators of chemistry concepts / ideas in indigenous Chemistry knowledge (Chemistry prior knowledge) that actually use chemistry concepts that are known to them in their everyday lives. This is consistent with Alshammari (2015)'s study which showed that for any learner to develop metacognitive skills, prior knowledge must be present to facilitate and help in the development of the cognitive skills.

The study's findings further show that indigenous Chemistry knowledge can be effectively used in Chemistry metacognition when indigenous Chemistry knowledge's; immerse educational value, motivating effect, importance, in-depth learning, improved academic performance, advantages, benefits, and best teaching methodologies are known and made use off in chemistry tertiary institutions involved chemistry education. Semali, Grim and Maretzki (2006)'s study showed that indigenous knowledge complements and provides relevance to science-based knowledge which supports this study's findings. The findings of a study on the incorporation of indigenous Chemistry knowledge into chemistry teaching and learning by Ugwu and Diovu (2016) showed that learners improved understanding of chemistry ideas/concepts and academic achievement. The incorporation of indigenous Chemistry knowledge into chemistry knowledge improved learners' chemistry learning through, motivation, cultural identity, engagement, collaboration and higher order thinking skills in a study by Rahmawati and Ridwan (2017).

The study's results show a positive attitude towards the use of indigenous Chemistry knowledge in chemistry metacognition by pre-service science teachers. The findings contradict Shizha's (2007) findings, which showed a negative attitude by pre-service science teachers towards the incorporation of indigenous science into formal science. Other contradictory findings were those of Dziva, Mpofu and Kusure (2011), which showed that science teachers had a negative attitude towards the incorporation of indigenous knowledge in formal science classrooms. The pre-service science teachers were of the opinion that indigenous chemistry knowledge improves their comprehension, assists in memory retention and brings their everyday life experiences into the classroom.

Analysis of the data from the focus groups exhibited that pre-service science teachers are repositories of indigenous Chemistry knowledge, skills and attitudes. From these findings, the conclusion drawn is that chemistry educators such as teachers and lecturers have access to indigenous Chemistry knowledge that is held and practiced by chemistry learners in their everyday lives for survival. This indigenous Chemistry knowledge represents alternative chemistry concepts or chemistry misconceptions from the chemistry learners' social-cultural life which can either promote or disrupt the western chemistry teaching and learning process. It is recommended that the indigenous Chemistry knowledge of chemistry learners should be identified and applied constructively in the chemistry curriculum at teachers' colleges, thereby contextualising the western chemistry education.

Data analysis showed that there are some chemistry ideas/concepts in indigenous Chemistry knowledge that are known and practised as chemistry concepts/ideas by pre-service science teachers that are beneficial, useful, and reliable, give positive experiences and are the same with western chemistry ideas/concepts. The findings suggest that indigenous Chemistry knowledge can be utilised effectively in Chemistry metacognition as there is empirical evidence of the immerse value, importance and benefits of indigenous Chemistry knowledge ideas/concepts which can be used as

realia since they are used for survival purposes in the everyday life experiences of pre-service science teachers. As a result, the learners' indigenous Chemistry knowledge assists in the understanding of western Chemistry concepts as it comes from learners' everyday socio-cultural life experiences. It can be concluded that indigenous Chemistry knowledge can be used successfully in Chemistry metacognition by learners in chemistry education. What is recommended is that chemistry educators should be capacitated with the knowledge, skills and attitudes for identifying learners' indigenous Chemistry knowledge that is effectively used in Chemistry metacognition.

Analysis of the data showed that pre-service science teachers felt that it was acceptable, good and comfortable to use indigenous Chemistry knowledge in Chemistry metacognition. Their reasons were that it motivated learners, improved chemistry concepts comprehension, assisted memory retention and brought realia into the chemistry classroom. The findings show very positive attitudes towards the use of indigenous Chemistry knowledge in Chemistry metacognition by pre-service science teachers in chemistry lectures. The conclusion drawn from these findings is that pre-service science teachers favour the inclusion and use of indigenous Chemistry knowledge in chemistry lectures for purposes of Chemistry metacognition. The recommendation is that chemistry curriculum developers at teachers' colleges must harness the multicultural indigenous chemistry knowledge from pre-service science teachers for establishment of a course in indigenous chemistry knowledge at the tertiary institutions.

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5. REFERENCES

Aikenhead, G.S. & Jegede, O.J. (1999). Cross-cultural science education: a cognitive explanation of a cultural phenomenon. *Special Issue: Science Education in Developing Countries*, *36*(3), 269-287. https://doi.org/10.1.1.489.9123

Alshammari, M.K. (2015). The effect of using metacognitive strategies for achievement and the trend toward social studies for intermediate schools students in Saudi Arabia (Electronic version). *International Journal of Education, Learning and Development*, *3*(7), 47-54.

Austin, J. & Hickey, A. (2011). Incorporating indigenous knowledge into the curriculum: responses of science teacher educators. *The International Journal of Science in Society, 2*(4). https://doi.org//10.18848/1836-6236/CGP/v02i04/51284

Baker, D.& Taylor, P.C.S. (1995). The effect of culture on the learning of science in non-western countries. The results of an integrated research review. *International Journal of Science*, *17*(6), 695-704.

Flick, U. (2013). *The sage handbook of qualitative data analysis*. Los Angeles: Sage Publications.

Louca, E. (2003). The concept and instruction of metacognition. *Teacher Development*, 7, 9-28.

Mapara, J. (2009). Indigenous knowledge systems in Zimbabwe: Juxtaposing postcolonial theory. *The Journal of Pan African Studies*, *3*(1), 139-155.

Merriam, S.B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossy-Bass.

Miles, M.B., Huberman, A.M. & Saldana, J. (2014). *Qualitative data analysis* (3rd edition). Los Angeles: Sage Publications.

Mohajan, H. (2018). Qualitative research methodology in social sciences and related subjects. *Journal of Economic Development and People, 7*(1), 23-48.

Rahmawati, Y. & Ridwan, A. (2017). Empowering students' chemistry learning: the integration of ethnochemistry in culturally responsive teaching. *Chemistry: Bulgarian Journal of Science Education*, *26*(6), 813-830.

Semali, L.M., Grim, B.J., & Maretzki, A. N. (2006). Barrier to the inclusion of indigenous knowledge concepts in teaching, research and outreach. *Journal of Higher Education Outreach and Engagement*, *11*(2), 73-87.

Senanayake, S.G.J.N. (2006). Indigenous knowledge is a key to sustainable development. *The Journal of Agricultural Sciences*, *2*(1). https://doi.org/10.4038/jas.v2i1.8117 .

Shah, S.R. & Al-Bargi, A. (2013). Research paradigms: researchers' worldviews, theoretical frameworks and study design (Electronic version). *Arab World English Journal (AWEJ)*, *4*(4), 252-264.

Shizha, E. (2007). Critical analysis of problems encountered in incorporating indigenous knowledge in science teaching by primary school teachers in Zimbabwe. *The Alberta Journal of Educational Research*, *53*(3), 302-319.

Shumba, O. (2014). Implications of socio-cultural research findings for science education reformin non-western developing countries. *Zimbabwe Journal of Educational Research, 26*(2), 217-246.

Singh, I.S., & Chibuye, B.(2016). Effects of ethnochemistry practices on secondary school students' attitudes towards chemistry. *Journal of Education and Practice, 7*(17), 44-56.

Somerville, M.P. (2017). *Metacognition. Cambridge*. Cambridge Assessment International Education.

Taylor, S. (1999). Better learning through better thinking: developing student's metacognitive abilities (Electronic version). *Journal of College Reading and Learning*, 30, 34-45. https://doi.org/10.1080/10790195.1999.10850084

Ugboma, M.U. (2014). Availability and use of indigenous knowledge amongst rural women in Nigeria. *Chinese Librarianship: An International Electronic Journal*, 38. Retrievedfrom https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=3028&context=libphilprac

Ugwu, A.N. & Diovu, C.I. (2016). Integration of indigenous knowledge and practices into Chemistry teaching and students' academic achievement. *International Journal of Academic Research and Reflection*, *4*(4), 22-30.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes*.Cambridge, MA: Harvard University Press.

Research Article

Exploring Teacher Knowledge in Natural Sciences *

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Abstract

This is a qualitative interpretative case study. Its aim is to explore the teacher knowledge of senior phase Natural Sciences teachers. The following question guided the study: What is the nature of teacher knowledge of natural sciences teachers in the senior phase? Semi structured interviews and observations were used to collect data from three purposefully sampled participants. The findings reveal that senior phase teachers have limited content knowledge and inadequate subject matter knowledge and this enflamed misconception which could be transferred to their learners. It is therefore prudent to recommend a re-focus in the in-service teacher training and colleges of Education to improve teacher's subject matter knowledge and pedagogical content knowledge as they could be a barrier to effective teaching and learning and learner's performance in Natural Sciences.

Keywords: Teacher knowledge, subject matter knowledge, pedagogical content knowledge, misconceptions, natural sciences

1. INTRODUCTION

South African government is moving towards an enormous change, which is increasing the intake of learners in the STEM (Science, Technology, Engineering and Mathematics) field. However, for this enormous change to be plausible there are required number of aspects that must be considered such as adequate teaching and learning resources and most significantly teachers with adequate teacher knowledge. Teacher knowledge has been a focus area for many researchers and scholars after Shulman's (1986) work. This is evidenced by numerous studies conducted on teacher knowledge every decade such as: Grossman and Richert (1988), Ben-Peretz (2011), Mudau (2016), Nkanyani and Mudau, (2019), and Ntuli (2019).

Shulman (1986) branded teacher's knowledge in three categories namely: as content knowledge, pedagogical content knowledge and curricular knowledge. He further referred to teachers' content knowledge as "the amount and organization of knowledge per se in the mind of the teacher", which he clarified as a knowledge which is more than a mere understanding of a subject matter. Shulman (1986) further noted that teachers are anticipated to not only comprehend the content but also what is it and why is it like that and further justify their beliefs about what they understand. Shulman (1986) defined pedagogical content knowledge as "the subject matter knowledge for teaching", which comprised of how ideas were represented and made understandable to learners. He also noted that the understanding of learners is one of the vital component to pedagogical content knowledge as he argued that learners do not appear as "blank slates" as they come with preconceived ideas. The third category of teachers' knowledge was curricular knowledge, which, Shulman (1986) described as "the

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instructional materials", which he referred to as textbooks, visual materials, laboratory demonstrations…" (p. 10).

From the above Shulman's definition of teacher knowledge, it is clear that the teacher needs all three kinds of knowledge's to be able to teach natural sciences effectively and be regarded as a qualified teacher. However, that is not the case with most of the South African teachers' particularly natural science teachers as it is revealed by the study of Mudau (2016), Nkanyani and Mudau, (2019), and Ntuli (2019). The findings of these studies indicated that natural sciences teachers have weak content knowledge (CK) and inadequate subjected matter knowledge (SMK) as they only teach the content without understanding. Further to that these studies highlighted the unavailability of teaching and learning resources in some of the South African schools. These findings could be one of the reasons of why there's less intake in STEM subjects in South African schools and poor performance to those who enrolled them (Sedibe, 2014). With these challenges at hand, it is clear that South African government is yet to have an envisioned number of students in STEM field as there are still enormous challenges that need immediate attention.

1.1. Literature Review

Teacher knowledge of the Natural Sciences is one of the imperative aspects (Diamond, Maerten, Rohrer, & Lee, 2014) teachers have based on their personal experiences in teaching (Rohaan, Taconis & Jochems, 2012). It is a consequence of blending understanding and transferring experience (Kolb, 1984 in Carrier, Tugurian & Thomson, 2013). It has an absolute impact on learners` achievement of outcomes of learning (Diamond et al., 2014). It gives teachers a direction on how they should conduct themselves (Rohaan et al., 2012) and in choosing relevant teaching strategies when going to class (Halai & Khan, 2011). Strategies that can have a positive effect, if chosen well, for a successful and meaningful teaching and learning.

Shulman (1986) identified among others, three domains of knowledge when teaching: subject matter knowledge (SMK)/content knowledge (CK), Ppedagogical Ccontent Kknowledge (PCK), and curricular knowledge. In contrast, Grossman`s (1990) model of teacher knowledge as cited Rohaan et al., (2012) indicate four domains: SMK, general pedagogical knowledge, knowledge of context, and PCK. Shulman (1986, p.9) terms CK, "the amount and organization of knowledge per se in the mind of the teacher". The teacher must able to retract "substantive knowledge" s/he had attained on his/her academic journey (Starkey, 2012, p.94). This study will focus on teacher knowledge of senior phase Natural Sciences teachers.

1.1.1. Teacher knowledge in the South African basic education context

There is great concern with the level of content knowledge teachers take to class. Studies show that through assessments, content gaps have been spotted and strategies need to be created to close this gaps and consequently enhancing proceedings in class (DBE, 2015). Moreover, Ventak and Spaull (2015) indicate that report by SACMEQ III (2007) show a serious concern in the teacher content knowledge level. The study indicates that Grade 6 Mathematics teachers failed to answer questions which were meant for Grade 6 learners, with some of the learners getting better marks than teachers (Ventak & Spaull, 2015). It evident from this point of view that there are teachers who dessimate to learners in class, knowledge that they themselves do not have. Further, it raises eyebrows that elementary school teachers indicate considerable aperture in their Science Content Knowledge (SCK), consequently barring adequate teaching (Diamond et al., 2014). Leta, Ayele and Kind, (2021) support that notion by indicating that Physics teachers in their study failed to demonstrate CK in their teaching. Consequently, these misgivings have a negative impact on teaching and learning since teachers who have adequate understanding of CK will develop effective PCK (Rollnick & Mavhunga, 2016).

The teachers' understanding knowledge deals with "the knowledge of learners` prior knowledge, linguistic abilities, and learners` interests as well as their misconceptions" (Mudau

2016). If provided in sufficient quantity as required, it will be crucial in "interpreting reform ideas, managing the challenges of change, using new curriculum materials, enacting new practices, and teaching new content" (Ball et al 2001 in Diamond et al,. 2014, p.636). However, study by Usak, Ozden, and Ingo (2011), report that teachers show insufficient amount of SMK. Moreover, Bartos et al., (2014) indicate a failure of teachers transferring their SMK to the classroom. This was further amplified by Nkanyani and Mudau (2019) who argue that teachers bring to class misconceptions while at the same time teaching subject matter, which is unsuitable for the grade. Further, the misconceptions can arise in class, if a teacher gives learners a lot of content at once during a lesson (Rosenshine, 2012). Moreover, despite some teacher carrying overwhelming amount of misconceptions, they also had no procedural knowledge in their physics teaching (Leta et al., 2021). The teacher's knowledge of content therefore, has to be of the highest quality in order to identify with certainty, the misconception associated with his/her topic in class. This current study has the potential of exploring teacher knowledge from two strands of natural sciences.

1.1.2. Conceptual framework

Since this study focused on exploring teacher knowledge in Natural Sciences which is one of the aspects in the Classroom Practice Diagnostic Framework (CPDF). It was imperative to use this framework as it best suited this study. The framework was developed after borrowing some aspects of the teacher knowledge from the (CPDF) developed by Mudau (2016). The Teacher knowledge component of the CPDF is what the authors elected to employ as a theoretical lens for this study. The teacher knowledge component is composed of content knowledge, student understand knowledge among others, which is the focus of this study. The teacher knowledge framework can be seen at Figure 1.

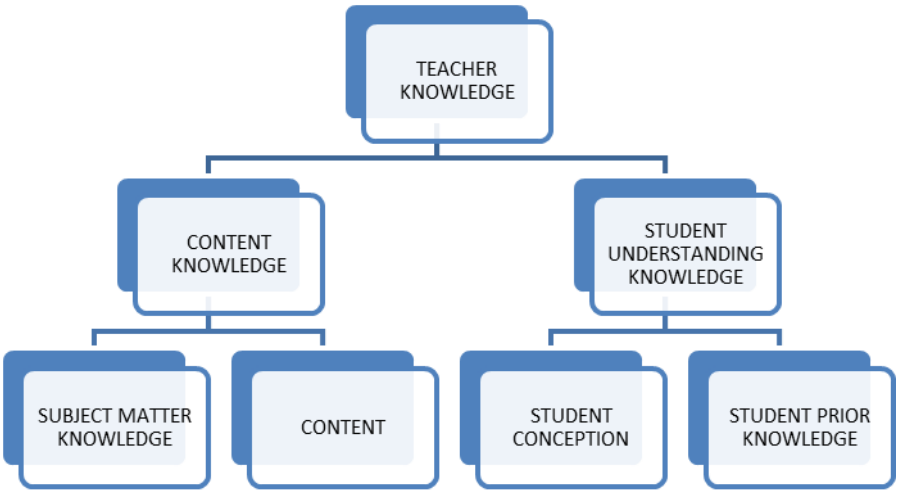

Figure 1. Teacher knowledge framework

1.2. Purpose of Study

The main purpose of this study was to explore teacher knowledge of natural sciences teachers in the senior phase focusing on two strands Matter and Material as well as Planet Earth and Beyond.

2. METHOD

2.1. Research Design

A qualitative research design was used in this study. Qualitative research design is an exploratory research used in describing, understanding and interpreting the phenomenon under exploration (Meriam, 2009). This design was used to develop in-depth understanding on how teachers

use their teacher knowledge to shapes their natural sciences classroom practices. The study adopted interpretative case study approach in an attempt to comprehend teachers' knowledge and their implementation in senior phase natural science. Case study approach allowed researchers to look at the depth of the problem in order to attain concrete, contextual, in-depth knowledge about phenomenon under exploration (McCombes, 2019).

2.2. Sample

The study sample involved two teachers in Limpopo province and one teacher in the Mpumalanga province. For the purpose of this study, participants were sampled purposefully with a belief that participants have different background, qualifications and teaching experience. Patton (2002) defined purposive sample as a technique widely used in qualitative research to identify and select-rich cases for the most effective use of limited resources which must be consistent with the study aim. This involves identifications and selection of participants that are knowledgeable about and experience with phenomena of interest (Cresswell & Plano clark, 2011). Consequently, by purposive sample researchers included three senior phase natural sciences teachers from secondary schools situated in Limpopo and Mpumalanga province to participate in the study.

2.3. Participants

Three teachers participated in the study were three males. Hence, the names appeared in the study are pseudonyms and this was done to protect participants' identity. Moreover, the participants have different teaching qualification and experience. Table 1 below, summarize participants' demographic details:

Table 1. Demographic details of participants

Cases (short abbreviation)	Participant pseudonyms	Gender	Qualification/s	Overall teaching experience in years	Teaching experience in natural science in years	Post level	Type of school
Case 1/natural sciences/participant 1 (c1/ns/p1)	Mr john	Male	Diploma	4	4	1	Combined school
Case 2/natural sciences/participant 2 (c2/ns/p2)	Mr marula	Male	Ptd, Ace	18	6	2	Public school
Case 3/natural sciences/participant 3 (c3/ns/p3)	Mr kay	Male	BA, PGCE(sp &FET)	6	6	1	Public school

2.4. Data Collection Methods and Instruments

2.4.1. Observation

Creswell (2012) reported observation as a process of collecting first hand data in the research site by means of observing participants. An observational tool collected data during lesson observation and lessons were video-recorded to ensure accuracy of the data collected. Researchers obtained Participants' consent prior to lesson observation in order to ensure reliability and to avoid mistake of data collected during the process of analyzing data. The researchers were non-participants observers. Non-participants observer involves observing participants in the research site without actively participating in the activities (Singh, 2014). The researchers observed participants in their classroom and learn about the activities conducted without interfering in any of the activities. Researchers used

video recorder to capture data of the entire lesson process and researchers ensured that the data were transcribed and analysed accordingly.

2.4.2. Interview

Semi-structured interview tool was used as data collection technique for this study. Semi-structured interview is a technique of qualitative data in which the questions to be asked interviewees are constructed by interviewers before the interview process commences. Dejonckheere and Vaughn (2019) described semi-structured interview as flexible structure of interview which allows researchers the opportunities to probe and expand on interviewees responses if necessary. Audio recorder captured the data of the entire interview process and researchers ensured that the participants asked same open questions followed by further probing and clarification (Nieuwenhuis, 2016).

In this study, researchers conducted face to face interview with the participants where semi structured interview tool and audio recorder used for data collection. Additionally, researchers' first attained consent from participants for the purpose of ensuring reliability and avoidance of mistakes on information gathered during the entire study process. Researchers transcribed and analyzed audio-recorded interviews separately.

2.4.3. Validity

Leung (2015) indicated that in qualitative research design validity can depend on the accuracy of techniques used for data collection, procedures and information obtained from the participants. Interviews and observations used in the study to increase the validity of the study findings and reliability of results with the data (McMillan & Schumacher, 2010; Merriam, 2009). To ensure validity in this study, researchers presented interview and observational tools to seven natural sciences teachers who were not part of the study to ensure that they serve the purpose they were designed for. By so doing researchers invited corrections, comments, and additional information from the non-participants natural sciences teachers. Pilot study conducted with one teacher who was not part of the main study where both semi-structured interview and observational tool were tested to ensure they were valid. During pilot study process data analysis scheme (DAS) was developed and implemented. Moreover, researchers enhance validity of this paper by focusing only on data collected from all participants of this study.

2.5. Data Analysis

Data of the study collected from three cases were analysed and interpreted separately. Audio-recorded semi-structure interviews and video-recorded lesson observation were transcribed verbatim by researchers to a word document. Thereafter, researchers' replayed video and audio recorded in order to check if the words transcribed corresponded with what was on the recording devices. Moreover, researchers did not correct participants' grammatical errors in order to ensure that data collected from participants was presented accordingly and does not lose its original meaning. Henceforth, researchers presented each participant his or her transcribed data for corrections, comments and additions before being considered as a final product.

The data collected was presented in the form of case studies i.e. case 1, case 2 and case 3. Data Analysis Scheme (DAS) which was developed, implemented and confirmed during pilot study was used in analysing the data of this paper. McMillan and Schumacher (2010) report that inductive analysis is a process in which qualitative researchers synthesise and extract meaning from the data by deriving categories and patterns from specific data. The themes proposed for this paper was adopted from reviewed literature, conceptual framework, research question and aim. We focused on teacher knowledge herein content knowledge and student understanding were themes. With organization amount of subject matter knowledge, linguistic abilities, misconceptions and prior knowledge were the

categories. Data interpreted and analysed focused on the themes proposed for the paper and each theme included each categories and characteristics. Moreover, for the purpose of this paper, data relevant to study themes were considered and assisted researchers in answering research questions and achieving the aim of this paper.

3. FINDINGS

The results of each cases were presented separately as single case as our intention were not to conduct a comparative study but to have an in-depth understanding of each cases within their own context. The following keywords and symbols were used to present cases of each participant:

Case 1/ Participant 1/Natural Sciences= MR JOHN

Case 2/Participant 2/Natural Sciences= MR MARULA

Case 3/Participant 3/Natural Sciences= MR KAY

3.1. Teacher Knowledge

Case 1: Mr John

It was imperative for the purpose of this paper to tap into what the teacher understands about matter and material as one of the strands of Natural Science subject. Mr John displayed a limited content knowledge (CK) and poor subject matter knowledge (SMK) during the interviews as the question was posed on what was the periodic table is all about. He had indicated that it was the topic he was going to teach. John said:

"Periodic table is nothing a way in which elements are ordered and grouped according to their behaviour." Mr John

Drawing from the above extract it shows that Mr John had an idea of what the periodic table is, however his knowledge was partial and limited as he only indicated that the periodic table is about elements and their behaviour, however there is more to it than that. There are many concepts embedded within the periodic table as shown in the NS CAPS document such as the three main categories in which elements are arranged and their properties.

Mr John was observed starting his lesson by showing an organised content knowledge (CK) as he explained the terms of an element and matter to learners as per expectations, according NS CAPS document. Mr John further explained to learners who devised the periodic table. This is evidenced by the extract below from the observation.

"There was this Russian by the name Dmitri Mendeleev, when you read this Dmitri Mendeleev he was a Russian, in 1820 that's when he discovered or that's when he come up with this periodic table in 1820 many many years ago. So he came up with this periodic table and who is this person Dmitri Mendeleev who was a Russian. But after him, there are so many scientists who wanted to come with new things new ideas on top of what this Russian Mendeleev has already discovered." Mr John

He further explained to learners that the periodic table is divided into three main categories and said:

"And so according to this periodic tables, we have metals, we have non-metals and we have semi-metals" Mr John

This indicated that even though John did not mention these categories as concepts that are part of the periodic table during the interview, he did know about them. He further explained where these three categories are situated in the periodic table and said:

"Metals are situated on a periodic table on your left-hand side, the non-metals are on your right-hand side, that zigzag part, and those are the semi-metals." Mr John

As the lesson proceed John displayed a limited content knowledge (CK) and poor subject matter knowledge (SMK) as he was observed telling learners about the groups and periods found in the periodic table and what they are used for. He said:

"There are groups and also we have the periods. Periods and groups are there also to show us where is metal situated and where non-metal is situated and where are the semi-metals situated"

From the extract above, it was confirmed that some of the Natural Science teachers show a limited amount of Content Knowledge (CK) and Subject Matter Knowledge (SMK). Mr John had an idea that there are groups, periods in the periodic table but due to his limited content knowledge (CK) he failed to explain which ones are groups, and which ones are periods and how to identify the two. Furthermore, this limitation hindered him from explaining the number of groups thereof.

3.2. Teacher Knowledge

Case 2: Mr Marula

It was imperative for the purpose of this paper to tap into what the teacher understands about planet earth and beyond as one of the strands of Natural Science subject. The teacher had irrelevant subject matter knowledge and failed to incorporate the Natural Science CAPS document in teaching and learning process. His irrelevant subject matter knowledge is evident in the statement below:

"When these spheres (pointing at the lithosphere, atmosphere and hydrosphere) interact with one another, they are going to make the biosphere" Mr Marula

It was apparent that the teacher chose to focus only on the latter which is the interaction between the three spheres and the biosphere and nothing was said about the interaction between the spheres themselves. Therefore, it is evident that the CAPS document was not incorporated.

3.3. Student Understanding

During observations, when he interacted with his learners we observed that his lessons was characterized by lot of misconceptions. This was evident during the question and answer session that he had with his learners below:

"And again we have got four spheres of earth, what are those?" Mr Marula

"Hemisphere!" Learner 1

Even though the teacher managed to do away with the above misconception, he ended up creating lot of misconceptions. At one stage referred to the lithosphere as the solid part of earth. When asked what he meant by his statement during post-observation interviews, he indicated that:

"Even though living organisms are solids, they are part of the lithosphere." *Mr Marula*

That in itself creates another misconception that all living organisms are found in the lithosphere. Moreover, his failure to explain clearly the relationship between the hydrosphere and lithosphere could have had the learners thinking that the two are the same.

The teacher visited irrelevant prior knowledge and it was insufficient. Furthermore, he went on probing questions on learners with content which was irrelevant to the topic that he was teaching. This is evident in the statement below:

"So now I want you to…I want us to go back. We know that in Grade 7 we learnt about the earth which is one of the coordinates of the world. Are we together. So what are the… what are the structure… what is the structure or what are the layers of the earth? What are the layers of the earth?" Mr Marula

Revisiting the correct and relevant prior knowledge could have helped learners to connect the dots and enjoy the teaching and learning process but that was not the case. In relation to context knowledge, the class was dominated by English language even though he in some instances used Sepedi to explain some concepts and relationships. This could have been a downside to his teaching since the language of teaching and learning is English. Furthermore, using Sepedi knowing that some of the English words are not available in their vocabulary, could have led to an incorrect translation in the learners` minds. He asserted that:

"*(In Sepedi) biosphere is where you see animals and people live together in the world just like as we are." Mr Marula*

It is clear from the teacher's utterances that his explanation in Sepedi could have best been explained in English. His explanation could have created misconceptions in the learners` minds that people (human beings) are not animals. In conclusion, it is evident that the teacher had irrelevant content knowledge, irrelevant utilisation of prior knowledge, misconceptions and poor context knowledge.

3.4. Teacher knowledge

Case 3/Participant 3/Natural Sciences= MR Kay Participants

For the purpose of this paper we had to focus on the classroom practice of the teacher in relation to matter and material as one of the strands for Natural Sciences. During the lesson presentation when the teacher taught about the topic of matter and material, we observed that the teacher has adequate content knowledge and subject matter knowledge. This was evident when he provided learners with adequate explanation of the topic and presenting the ideas in a sequence manner. He asserted that:

"Our lesson today that is properties of matter. The main purpose for this, that is to know all things that are responsible for making any different of materials that we have. So in our class we have got different materials, some of the materials they are hard whereas some of the materials are soft, some of them (materials) they are somewhere between hard and soft right. The first thing that I want you to do, that is to identify all those materials that we have here in the class, can you identify them?" Mr Kay

Furthermore, he used content knowledge and subject matter knowledge that was adequate in the explanation of the concepts to the learners and he presented the sequence of ideas during the lesson as follows:

"*Matter is anything that occupies space and has mass, anything that occupies space and has weight. So in our class we have got different materials, some of the materials they are hard whereas some of the materials are soft, some of them they are somewhere between hard and soft right. I want you to identify all those materials that we have here in the class." Mr Kay*

The teacher was observed referring to the Natural Science textbook when teaching. He did not take either a lesson plan or the Natural Science CAPS document along to assist to teach the particular concept. However, he used his subject matter knowledge to explain the different concepts. Therefore, it is evident that the teacher has adequate content knowledge and subject matter knowledge.

During lesson observations when he taught about materials, he requested learners to identify materials used to build the classroom. He engaged learners into question and answer session and this led to the development of misconceptions amongst them. This was evident in the statement below:

"*Yes instead of using what….sand to build what….houses we can use what ……metal? Just like here (the teacher touch the wall of the classroom) these are not sand, what materials are these once?" Mr Kay*

"*Aluminium* (others said) *wood" Learners*

"Is it a plastic? Is it a wood?" Mr Kay

"Copper, (others said) *plastics" Learners*

"It is a wood, check where there was a scratch as it is painted" Mr Kay

Some of these misconceptions were not attended to by the teacher. As result, this resulted into learners thinking that the ideas that they are providing were appropriate. We further observed the teacher revisiting prior knowledge when he was teaching. He reminded learners what they have learnt previously about the topic by asking them questions. He used prior knowledge to connect with new information on a particular concept and this assisted learners in understanding the ideas of the lesson as well as taking part in the lesson. This was evident in the statement below:

"*The first thing that we need to do, we must start with the word itself matter. What do you understand about this word that we call it matter? Do you still remember the first thing when we were*

in the beginning of our Natural science we have dealt with different spheres; do you still remember the spheres?, Lithosphere, biosphere, hydrosphere, and mesosphere. Then all those spheres we dealt with different matter. So there are matters that are found in the water, there are matters that are found on the ground, on the space in different places.so what is matter?" Mr Kay

Furthermore he also used his prior knowledge to enable learners to list the materials that were available in the class in order for learners to know and see the materials available around them. His emphasis here was for his learners to know that materials differ as some of them are soft, some are hard and some are in between. The teacher also used prior knowledge for learners to recognise that different materials can be used to make the same object. This was evident in a question and answer session below:

"W*hat is it that makes a ruler? The material that makes a ruler, think you also have a ruler in your bags, check.*" *Mr Kay*

"P*lastic, wood, iron." Learners*

"It means we have the other one that is made out of wood, the other one out of iron, the other one out of plastics." Mr Kay

Based on our findings, the teacher displayed adequate content knowledge even though there were misconceptions observed amongst his learners. Furthermore, he revisited the prior knowledge continuously to ensure that learners are able to understand the content being taught.

4. DISCUSSION and CONCLUSION

Natural Sciences curriculum consists of four knowledge strands which are life and living, matter and material, energy and change as well as planet earth and beyond (Department of Basic Education [DBE], 2011). This study was based on two strands, which is matter and material as well as planet earth and beyond. *Mr John* and *Mr Kay* lessons focused on matter and material while *Mr Marula* focused on planet earth and beyond. These topics were a part of the four knowledge strands as stipulated in grade 7 Natural Sciences CAPS document (DBE, 2011).

A study by Usak et al (2011) revealed that some of the Natural Science teachers displayed inadequate content knowledge and subject matter knowledge for this subject. These findings were evident when *Mr John* and *Mr Marula* displayed a limited amount of content knowledge and subject matter knowledge in their teaching and learning process. This is clear that they did not have an understanding of the themes and topics that needed to be imparted to the learners (Rohaan et al., 2012). This was observed with Mr John as he failed to explain to learners what are periods and what are groups on the periodic table and how to differentiate the two.

However, that was not the case with *Mr Kay* as he displayed adequate content knowledge and subject matter knowledge of Natural Science. *Mr Kay* emphasised on the links learners need to make with related topics to help them achieve a thorough understanding of the nature of and the connectedness in Natural Sciences (DBE, 2011). *Mr Kay* achieved this by looking for explanations and connecting ideas in a systematic way (DBE, 2011). That was not the case with *Ms Kate* and *Mr Marula*. *Ms Kate* did not teach the topics in a sequential order *(Acids, Bases and Neutrals; Arrangement of elements on the Periodic Table; and Some properties of Metals, Non-Metals and Semi-Metals)*.

While *Mr Marula* chose to focus on the latter which is the interaction between the three spheres and the biosphere and nothing was said about the interaction between the spheres themselves. As a result, a CAPS document was not incorporated as it clearly states that the content that needs to be taught, is how the spheres interact with another and how they interact with the biosphere (DBE, 2011). Therefore, it is evident that content knowledge can influence what teachers teach as well as how they teach it (Yilmaz-Tuzun, 2008).

The lessons presented by *Mr Marula and Mr Kay* were embedded with enormous misconceptions between the teacher and the learner. Furthermore, too much content was taught which resulted to misconceptions (Roseshine, 2012). These misconceptions led *Mr Kay* learners to believe that their answers were appropriate as the misconceptions that they had were not attended too. Such misconceptions could even block learners' effective learning of science (Burgoon et.al 2010). Furthermore, learners developed more misconceptions when *Mr Marula* decided to teach some of the content in IsiNdebele and Sepedi which led to incorrect translation.

P3/C3/NS revisited the correct and relevant prior knowledge which helped the learners to connect the dots and enjoy effective teaching and learning. However, that was not the case *Mr Marula* as their prior knowledge reviewed was not in line with the content taught. Hence, it is important to check learner's prior knowledge as it allows them to match the previous knowledge with the new emerging learning (Mesa et al, 2014).

The findings of this paper indicated that meaningful teaching and learning of senior phase Natural Sciences at schools it is weakened by a variety of challenges. Some of the challenges such as limited subject matter knowledge and inadequate pedagogical content knowledge are so vital that they hindered the teaching and learning process. This paper provide evidence that effective teaching and learning in the senior phase natural sciences is negatively affected by the existence of the above-mentioned challenges which resulted in misconception and poor context knowledge, which should be addressed. Therefore, based on the findings of this paper it is recommended that the Department of Education as an arm of government should conduct sufficient workshops on subject content in order to develop and improve teachers' knowledge on how to approach Natural Science content. Moreover, HOD's and subject advisors should monitor teachers' classroom practices in order to assist them where necessary as well as hold meetings with their teachers to share their ideas on the subject under exploration. The in-service teacher training and colleges of Education should adapt their curriculum and focus more on teacher`s SMK and PCK as they proved to be barriers of effective teaching and consequently learner`s performance in the NS.

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5. REFERENCES

Ben-Peretz, M. (2011). Teacher knowledge: What is it? how do we uncover it? what are its implications for schooling? *Teaching and Teacher Education*, 27, 3-9.

Carrier, S. J., Tugurian, L., P. & Thomson, M., M. (2013). Elementary science indoors and out: Teachers, time, and testing. *Research in Science Education*, 43, 2059-2083.

Cresswell, J.W. & Plano clark, V.L. (2011). *Designing and conducting mixed methods research*. (2nd Edition). Sage Publications, Los Angeles.

Bartos, S. A., Lederman, N. G., & Lederman, J. S. (2014). Teachers` reflection on their subject matter knowledge structures and their influence on classroom practice. *School Science & Mathematics, 114*(3), 125-138.

DeJonckheere, M., & Vaughn, L.M. (2019). Semi-structured interviewing in primary care research: a balance of relationship and rigour. *Family Medicine and Community Health*. https://doi.org/10.1136/fmch-2018-000057

Department of Basic Education (DBE). (2011). *Curriculum and assessment policy statement grade 7-9. Natural Sciences.* Pretoria: Government Printers.

Department of Basic Education (DBE). (2015). *National senior certificate school subject report.* Pretoria.

Department of Education. (2011). *National curriculum statement grades r-12 (schools), Natural sciences.* Pretoria. National Department of Education.

Diamond, B,S, Maerten, J, Rohrer, R, E & Lee, O. (2014). Effectiveness of a curricular and professional development intervention at improving elementary teachers` science content knowledge and student achievement outcomes: Year 1 results. *Journal of Research in Science Teaching, 51*(5), 635-658.

Grossman, P. L. & Richert, A. E. (1988). Unacknowledged knowledge growth: A re-examination of the effects of teacher education. *Teaching and Teacher Education*, *4*(1), 53-62.

Halai, N., & Khan, M., A. (2011). Developing pedagogical content knowledge of science teachers through action research: A case study from Pakistan. *Asia- Pacific Forum on Science Learning and Teaching, 12*(1), 1-24.

Leta, D.T., Ayele, M.A., & Kind, V. (2021). Dialogic teaching approach vis-à-vis middle school physics teacher's content knowledge. *EURASIA Journal of Mathematics, Science and Technology Education, 17*(1), https://doi.org/10.29333/ejmste/9613

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care*. *4* (3), 24-27.

McCombes, S. (2019). *Research design: Types, methods, and examples.* Scribbr.

McMillan, J.H. & Schumacher, S. (2010). *Research in education: Evidence-based inquiry (7th Ed).* USA: Pearson Education.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation. Revised and expanded from qualitative research and case study applications in education.* San Franscisco: Jossey-Bass.

Mudau, A.V. (2016). The classroom practice diagnostic framework: A framework to diagnose teaching difficulties of science. *Eurasia Journal of Mathematics, Science and Technology Education, 12*(11), 2797-2815.

Nieuwenhuis, J. (2016). *Qualitative research designs and data gathering technique.* In Maree, K. First steps in research. Pretoria: Van Schaik publishers.

Nkanyani, T.E. & Mudau, A.V. (2019). Natural sciences teachers` experiences on teaching planet earth and beyond knowledge strand. *Journal of Turkish Science Education, 16* (4), 478-488.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. US: Sage Publications.

Rohaan, E. J., Taconis, R & Jochems, W.M.G. (2012). Analysing teacher knowledge for technology education in primary schools. *International Journal of Technology and Design Education,* 22, 71-280.

Rollnick, M., & Mavhunga, E. (2016). Pedagogical content knowledge in the book: Taber, K.S., & Alkpan, B. (EDS). *Science education-An international course companion.* Rotterdam: Sense Publishers.

Rosenshine, B. (2012). Principle of instruction: Research-based strategies that all teachers should know. *American Educator, Spring.*

Sedibe, M. (2014). Natural science teachers' perceptions of their teaching competence in senior phase schools in Soweto area. Gauteng Province. *Journal of Anthropology, 18*(3), 115-122.

Shulman, L.S. (1986). Those who understand: knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Singh, R. J. (2014). Is mother-tongue education possible in a language-diverse province? A case of limpopo province. *Mediterranean Journal of Social Sciences, 5*(25), 141-147.

Usak, M., Ozden, I., & Ingo, E. (2011). A case study of beginning science teachers' subject matter (SMK) and pedagogical content knowledge (PCK) of teaching chemical reaction in Turkey. *European Journal of Teacher Education, 34*(4), 407-429.

Ventak, H & Spaull, N. (2015). What do we know about primary teachers' mathematical content knowledge in South Africa? An analysis of SACMEQ 2007. *International Journal of Educational Development*, 41,121-130.

Yilmaz-Tuzun, O. (2008). Pre-service teachers, beliefs about science. *Journal of Science Teacher Education*, 19, 183-204.

Research Article

Reflections on the Integration of Environmental Education by a Primary School Teacher*

Lettah SIKHOSANA[1]

Abstract

The integration of environmental education is embedded with challenges such as inadequate knowledge of what environmental education entails. This situation was not different to what was encountered during the researchers' training to be a teacher from the schools where they acquired their teaching practice. It was observed that there was minimal or no integration of environmental education in the teaching and learning process. Therefore, this paper reflected on how a primary school teacher integrated environmental education in teaching and learning. The findings from this paper may assist teachers in developing a positive approach to the process of ongoing attempts and the will to integrate environmental education. It may expose the kinds of knowledge other teachers have of what environmental education entails and its integration in school subjects as well as the instructional strategies that they use. The focus on the challenges and the opportunities may excite teachers in that those who have similar circumstances would use the findings from this paper as a launch pad to work on their strengths or weakness in the endeavor to integrate environmental education.

Keywords: Environmental education, challenges, teacher knowledge, integration

1. INTRODUCTION

Environmental education must be both pervasive and integrated. If a child acquires a particular broad environmental understanding and knowledge, they will develop a social conscience attitude that will affect actions towards the environment as a whole. Which is the reason why Corpuz San Andres, and Lagasca (2022) suggested that an integrated, interdisciplinary instructional program should be developed in environmental education which is designed to promote an environmental awareness and sociological attitude. As it reflects on how continuing teacher professional development programmes may be designed and implemented to support teachers to work creatively with a content and assessment-referenced national school curriculum (Songqwaru & Shava, 2017). Even though the South African Curriculum and Assessment Policy Statement (CAPS) advocates for the integration of environmental education in all grades and subjects (Hebe, 2019). There is still a lack of human capacity and resources by a majority of schools across the country, which raised assumptions that South Africa has decent policies to fulfil the integration of environmental education while the implementation level of these policies still lags behind (Tikly, 2019).

Sikhosana Mudau, and Msezane (2020) conducted a research which focused on the integration of environmental education in teaching and learning process. While Shabalala and Msezane (2020) explored how teachers and learners perceived the integration of environmental education into the curriculum. Which led Munasi and Madikizela-Madiya (2020) to look into the implications for the integration of environmental education specifically in Life Science subject. However, there is still a lack of research conducted in relations to the progress made when it comes to the implementation of

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environmental education (Makokotlela, 2021). Hence, necessary support is needed amongst teachers in order for them to be able to steer agreed upon values that can contribute towards the effectiveness of environmental education integration (Setlhodi & Lebeloane, 2014). Furthermore, it is important to acknowledge participant attributes and knowledge when conducting this research as public perceptions of environmental education are embedded with a lot of misconceptions due to challenges that the teacher encountered. Hence, it is clear that environmental education is the most important aspect in the field of education as it can contribute towards addressing misconceptions various teachers have.

According to Saylan and Blumstein (2011) environmental education has failed because:

a. it is not keeping pace with environmental degradation.
b. schools have failed to practice what they teach as they neglect education in and for the environment.
c. it neglects the effectiveness of the environment and is more concerned with environmental problems rather than finding solutions to overcome and resolve such problems.

A learning environment is made up of the diverse physical locations, cultures and contexts in which learners learn. In this study, the researcher conducted interviews and lesson observations in different learning environments. This had a direct and indirect influence on the paper based on how environmental education was integrated. Thus, it is the responsibility of a teacher to ensure that what they teach is relevant to the present and future lives of learners to ensure sustainable development.

Environmental learning is education about the environment, in the environment and for the environment with the main aim of integrating environmental education. The Institute for environmental learning (2011) promotes:

- Making informed and responsible choices
- Integrating science and social sciences with a multi-disciplinary approach
- Identifying individual's cultural values
- Critiquing societal and industrial practices that contribute to environmental problems
- Learning about the Earth's ecosystems

According to Zafar (2021) education about the environment, education in the environment and education for the environment are important approaches to environmental education as:

- education about the environment: is mainly concerned with providing enough information about the environment and the environmental problems. Learning about the environment supports individuals to develop an understanding of the environment, its challenges and the solutions needed in decision-making.
- education in the environment: is focused on any form of teaching and learning that takes place outside of the classroom environment which can be taught in a practical manner through direct experience as it has strong links with outdoor education.
- environmental learning as an education for the environment: it develops attitudes and values which trains individuals to make choices that maintain and improve the quality of the environment as it seeks to change the behavior of individuals towards the environment. Education for the environment needs to teach and encourage people to take part in environmental activities and to believe that their efforts can have an impact on the environment.

As a result, environmental learning cannot take place in a classroom environment only, but it can take place anywhere, from formal learning environments to informal learning environments which include parks, environmental programs, nature reserves and much more.

1.1. Purpose of Research

The purpose of this research was to reflect on the integration of environmental education by a primary school teacher. Furthermore, to understanding the nature of teacher knowledge in relation to

environmental education. Moreover, to present challenges that the teacher encountered towards the integration of environmental education.

2. METHOD

2.1. Research Model

This study employed a qualitative interpretative case study. The researcher used a qualitative research method to access thoughts, opinions and beliefs of the participants in order to enhance a deeper understanding and reflect on how the teacher integrated environmental education in teaching and learning (Sutton & Austin, 2015). In order to achieve this, an interpretative research paradigm was neccessary to enable the researcher to interpret and understand teacher's knowledge in relation to environmental education as well as the challenges that the teacher experienced when integrating environmental education (Sikhosana, 2022).

2.2. Participants

A number of three participants were involved in the main research but for the purposes of this paper only one participant which is a primary school teacher was focused on. This primary school teacher taught the following subjects; Natural Science and Technology as well as Social Sciences in grade 6 and has a teaching experience of 5 years. The researcher used purposeful sampling to select the participant based on the purpose of this paper with the belief that the teacher will provide rich and unique data (Suen, Huang & Lee, 2014).

2.3. Data Collection

Data was collected through interviews and observations. The researcher conducted pre-observation interviews as well as post-observation interviews. This was done with a motive of ensuring what was said by the teacher corresponds with what the researcher has observed. For the purpose of triangualtion, lesson observations were conducted. An observation tool and audio recorder were used to collect data during lessons observations to ensure accuracy of data collected for data analysis.

2.4. Data Analysis

The collected data was presented through themes and catergories category and themes. A typology approach was used to analyse data based on the purpose of this research (Hatch, 2002). This was a single case study and the pseudonym of the primary school teacher was Mr Maphosa. The transcribing process was done using the analytical framework. The researcher transcribed all audio interviews and lesson observations word for word. The grammatical errors were not corrected to ensure that all data collected does not lose its original meaning.

3. FINDINGS

It was imperative for this research to tap into what the teacher understands about the key concepts that are interrelated with the integration of environmental education. The teachers' understanding of these concepts plays an important role in shaping the purpose of this research. As a result, the teacher was requested to give details based on what he understands about the word "environment". Mr Maphosa's response was broad as he indicated that environment can be defined in various ways depending on the approach of certain topics that he engages himself with. He revealed that environment is based on the surroundings, where there is life and even where there is no life. Mr Maphosa said that:

> *"The environment is based on the surroundings where we are staying, it depends on where you are. Now, when we talk of surroundings and the environment, we are referring to a situation whereby there is life and even where there is no life. It will depend on the approach of the topic that we are dealing with yes."*

Mr Maphosa's response prompt the researcher to ask him what he understood about the concept "environmental education". The teacher believed environmental education refers to being educated by your surroundings. He mentioned that:

> *"Being educated by your surroundings, for example being taught on how to take care of your environment. Having a skill to see problems that affects your surroundings and find ways on how to solve them"*

The evidence underpinning Mr Maphosa's statement was comprehensive because during lesson observations it was observed that he presented a lesson on recycling, whereby he taught about issues that affect the environment, which in this context was pollution and landfills that are not managed properly. This was evident in the statement below:

> *"Pollution right, is going to be exposed. So, remember we do not want to pollute the surrounding. It is very much important to make it a point that our surrounding is conducive, therefore we must prevent that, we must prevent pollution. Whenever we dump something there, and we leave it, whenever there is wind the wind we blow the rubbish and our surrounding is polluted."*

Furthermore, Mr Maphosa was able to relate the lesson of recycling to real life situations that affect the environment in a way that encourages learners to improve and resolve environmental challenges. He did so by giving them an illustration of what is currently happening in the community that they are situated in so that they can develop a deeper understanding of environmental issues. He mentioned that:

> *"There are old women and men that use to move along the road, collecting tins and bottles. They are taking those tins and bottles for recycling. You understand what I am saying?"*

Mr Maphosa's assertions led the researcher to find out what he understood about the concept of "integration". He defined integration as taking different subjects and looking for what is common in them, he even engaged various examples to ensure that one can easily understand what he meant. He mentioned that:

> *"To integrate is to take different subjects; for example, you look for what is common in it, and whenever you are teaching that subject, you refer to the other learning areas."*

However, as much as his above-mentioned statement was broad at first glance, he elaborated further to support his description so that it could have a clearer meaning. He asserted that:

> *"For example, I can integrate science with mathematics, if I take learners outside and say let them be in groups, then I tell them to make groups of five members, it is also part of mathematics. I am integrating, I am not be teaching in digits; but I will be talking about numbers. In addition, I will be talking about numbers when I say let us go to a dumping zone to sort materials, we will also count them, by doing so, we will be integrating."*

Based on the statement above, it was evident that Mr Maphosa was not able to explain the concept of integration effectively as he mainly depended on illustrations. Nevertheless, he was able to present various examples that demonstrated how the integration process takes place in the teaching and learning process. Therefore, based on the data that was collected from the interviews and lesson observations it was evident that Mr Maphosa had a correct conceptualisation about what environment, environmental education and integration entail. Starting a lesson topic with prior-knowledge serves as a benefit for teachers as it enhances effectiveness in the teaching and learning process. In addition to that, it contributes towards making a lesson as engaging as possible. It allows teachers to tap into

existing knowledge that learners already have. The teacher was observed implementing prior-knowledge when he taught about recycling. He applied prior-knowledge by asking questions about what recycling is and why is it important to separate rubbish if you wish to recycle.

During lesson observations it was noticed that the application of prior-knowledge was not evident in some of the lessons that the teacher presented, especially when he taught about careers in chemistry, mining and waste management. As a result, the teacher was unable to tap into the knowledge that the learners had already developed. His main concern was just curriculum coverage and the completion of the separation of ink by chromatography practical assessment on time.

In the course of the interviews, Mr Maphosa was questioned about the misconceptions that are connected with the integration of environmental education. In the beginning, his response about the misconceptions was broad, which made it challenging for the researcher to comprehend what he meant. He stated that:

> *"Sometimes we take things easy to say integration of environmental education issues in education they are not right, because sometimes we take the learner to dumping zones it is not nice (safe). However, remember for learner to know that, we have to take them there because now they must experience and see what is said of when we talk about environmental impact; they must see it and they should be able to have an input on what they observed."*

Based on the above statement, the teacher believed that misconceptions of environmental education are caused by the conflict of interest between what is right and wrong about the integration of environmental education. He indicated that different learning environments are not catered for as teachers normally prioritise the safety of learners which leads them to be reluctant towards the integration of environmental education. As a result, they develop misconceptions that environmental education cannot be integrated in various ways because they are not aware of safety measures that they can implement; to avoid any dangers that can occur in different learning environments that are perceived to be not conducive to learning.

Nevertheless, Mr Maphosa had a misconception of the integration of environmental education. He was of the opinion that the integration of environmental education can only be integrated in some school subjects and through practical assessment. This was evident from the statement below:

> *"Some schools subjects have contents on how to take care of your environment for example pollution. While they are being taught about that a practical assessment can be done so that they can aware or shown practically how are we polluting our environment and given clues on how that can be solved."*

Based on the above statement, Mr. Maphosa developed a misconception because environmental education is integrated across all subjects in the Curriculum Assessment Policy Statement in South Africa and there are strategies that can be used other than practical assessment to integrate environmental education. Thus, it was evident that the teacher had a limited amount of knowledge when it comes to the integration of environmental education. During post-observation interviews, Mr Maphosa mentioned a statement that was contrary to what he did, especially when he was asked about the part of the lesson presentation that he enjoyed the most. He stated that:

> *"The separation of mixtures of colour especially when I investigated the black I found that black is a secondary colour, and I found out that black is made from different colours, that was so much interesting."*

Taking this statement into account, it developed into a contradiction based on what the teacher said and did about the integration of environmental education in teaching and learning. In fact, it became a misconception because during lesson observations there was no experiment or practical that

took place whereby the teacher was seen investigating the mixtures of colours, even his findings are not accurate because there was no evidence that supported what he asserted.

Mr Maphosa was asked about the challenges that he experienced when he had to integrate environmental education. He mentioned that a lack of learning materials and school environment contributes to the challenges when he had to integrate environmental education. He stated that:

> *"Challenges are always there, because when you integrate environmental education, sometimes you might not have enough material to use in class, especially those that can help learners to easily understand, sometimes you want to integrate education with the environment, but the school situation does not allow us."*

It was important for this research to find out about the opportunities of integrating environmental education in teaching and learning. The teacher asserted that he does integrate environment education in the teaching and learning process. His positive response prompted the researcher to find out how he integrated environmental education. His statement emphasised more on using different learning environments in order to enhance better understanding of the lesson content presented. He asserted that:

> *"Whatever we are experiencing outside, we must take it into a classroom situation. Whatever we are talking to learners, some learners might understand visual things. So now, whenever we take something on the environment outside into a classroom situation then learners understand it better."*

His response led me to find out more about the importance of integrating environmental education as it contributes towards an opportunity that will enable the teacher to be able to integrate environmental education effectively. The teacher indicated that it is important to integrate environmental education in teaching and learning process. He asserted that:

> *"I think it is important because when you talk of environmental education (remember the environment is a situation whereby we live), therefore, whenever we talk about the environmental education we are looking at the different things that we come across. For example, if we talk of conducive hygiene, therefore it means we must talk about the environmental issues."*

Based on data collected from interviews and lesson observations, it was evident that the teacher was aware of the importance of integrating environmental education as well as challenges and opportunities that are associated with it. As a result, the teacher was able to recognise the importance of integrating environmental education.

4. DISCUSSION

According to the Department of Environmental Affairs and Tourism (2014), the concept of environment is widely used and has a broad range of definitions, interpretations and meanings. This was similar to what Mr Maphosa has alluded that the environment refers to surroundings, which is also a situation whereby there is life and even where there is no life. This statement relates with the Department of Environmental Affairs and Tourism (2014), which defined the concept of environment as surroundings in which humans and other organisms exist. Furthermore, Zafar (2018) defined environmental education as a holistic procedure that is aimed at creating responsible individuals who can identify environmental problems, engage themselves in problem-solving and act towards protecting the environment. This was similar to Mr Maphosa as he defined environmental education as a process that enables one to be educated about their surroundings, being taught on how to take care of the environment and having skills to see the problems that affect their surroundings to come up with solutions to resolve them.

The teacher showed insufficient knowledge about the concept of "integration" as he mentioned that it refers to taking different subjects and looking for what is common between them. His statement was broad, as much as he did not manage to illustrate the concept itself. Prior-knowledge has long been measured as the most important factor that has an impact in teaching and learning according to Hailikari, Nevgi, and Lindblom-Ylanne (2007). These important considerations were partially evident in the lessons that were presented by the teacher. Prior-knowledge was administered when he taught about recycling but that did not materialise as it was difficult for learners to connect the new content to what they already knew.

The insufficiency of a teacher in content knowledge is regarded as a main cause of misconceptions. Based on the research findings, it was evident that the teacher had a wrong conceptualisation of the integration of environmental education in teaching and learning. He was of the opinion that only some school subjects have content on how to take care of the environment, which was a misconception. The integration of environmental education is referred to as a cross-curricular phase organiser which needs all teachers in all learning areas to consider an environmental focus (DBE, 2011). Hence, environmental education content is integrated in all subjects and levels of the schooling system which is Grade R to Grade 12 (DBE, 2011).

During lesson observations and the interviews that were conducted it was evident that the teacher encountered a lot of challenges when he had to integrate environmental education. Mr Maphosa mentioned that a lack of learning materials is one of the challenges that he experienced when he had to integrate environmental education. This relates to the research that was conducted by Safta-Zecheria, Ștefănigă, Negru, and Virag (2020) who found that teachers were challenged by access to resources, which in this regard is learning support materials, which made it difficult to integrate environmental education. Mr Maphosa also encountered challenges with the issue of not having seniors. This relates with Rahman Halim, Ahmad, and Soh (2018) who indicated that a lack of support from the school administrators and relevant stakeholders are one of the contributing factors that leads to challenges that impedes the integration of effective environmental education. Which is why necessary support is needed from school management teams in order for them to be able to steer agreed upon values that can contribute towards the effectiveness of environmental education integration (Setlhodi & Lebeloane, 2014).

In addition, an inadequate school environment and lack of apparatus served as constraints that hindered the teacher in integrating environmental education in teaching and learning. School classrooms, buildings, laboratories and equipment are considered to be the most important elements of learning environments in schools, as they are able to enhance better instruction and improve learning outcomes (Teixeira et al, 2017). Thus being said, it is important to acknowledge that the school environment is capable of affecting learning through three inter-related factors such as stimulation, naturalness and the flexibility of learning environment. Thus being said, it was quite clear that the lack of access to teaching and learning materials has been an on-going challenge that seems to be the most contributing factor that impedes the integration of environmental education. These constraints have a negative impact on environmental education as it cannot be integrated effectively (Rahman et al, 2018).

5. CONCLUSION

The findings from this study have shown that the teacher has adequate knowledge about the concept of environment. However, his understanding led him to develop misconceptions about integration, environmental education and the integration of environmental education. Therefore, it is recommended that during training workshops these aspects must be clarified and clearly defined so that teachers can acquire adequate knowledge and skills towards the integration of environmental education as stipulated in the CAPS document. The teacher encountered challenges such as a lack of learning materials when he had to integrate environmental education. Therefore, it is recommended

that the Department of Basic Education should provide teachers and schools with adequate teaching and learning materials needed so that they can be provided with opportunities to integrate environmental education effectively.

The teacher did not integrate environmental education adequately and across the curriculum. Therefore, it is recommended that the school, together with teachers, should introduce continuous environmental education programmes or competitions that cater to the curriculum, as this might assist teachers and learners to be aware of the importance of sustaining the environment and acquiring knowledge and skills on sustainable development practices. It is also recommended that future studies on the integration of environmental education be carried out across all phases such as Foundation phase, Intermediate phase, Senior phase as well as Further Education and Training Phases (FET) whereby it will include several schools, circuits, districts and expanded provincially.

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6. REFERENCES

Corpuz, A. M., San Andres, T. C., & Lagasca, J. M. (2022). Integration of environmental education (EE) in teacher education programs: Toward sustainable curriculum greening. *Problems of Education in the 21st Century*, *80*(1), 119-143. https://doi.org/10.33225/pec/22.80.119

Department of Basic Education. (2011). *Curriculum and assessment policy statement*. Pretoria.

Department of Environmental Affairs and Tourism. (2014). *Environmental management plans*, integrated environmental management. Information series 12. Pretoria

Hailikari, T., Nevgi, A., & Lindblom-Ylanne, S. (2007). Exploring alternatives ways of assessing prior knowledge, its components and their relation to student achievement: A mathematics-based case study. *Stud Edu Eval, 33,* 320-37.

Hatch, J. A. (2002). *Doing qualitative research in educational settings.* Albany: State University of New York Press.

Hebe, H. (2019). Locating the position of environmental education in the South African school curriculum: The case of grade R. *Eurasia Journal of Mathematics, Science and Technology Education*. https://doi.org/15.10.29333/ejmste/108486

Makokotlelala, M. V. (2021). Exploring teachers' views regarding environmental education implementation in the intermediate phase: A South African perspective. *The International Journal of Pedagogy and Curriculum, 28*, 57-70. https://doi.org/10.18848/2327-7963/CGP/v28i01/57-70

Munasi, K. R., & Madikizela-Madiya, N. (2020). Agency curtailed: Implications for the integration of environmental education in life sciences. *International Journal of Educational Development in Africa. 5*, 15. https://doi.org/10.25159/2312-3540/9685

Rahman, N. A., Halim, L., Ahmad, A., & Soh, T. M. T (2018). Challenges of environmental education: Inculcating behavioural changes among indigenous students. *Creative Education, 9*, 43-55. https://doi.org/10.4236/ce.2018.91004

Safta-Zecheria, L., Ștefănigă, S. A., Negru, I. A., & Virag, F. H. (2020). Challenges experienced by teachers regarding access to digital instruments, resources, and competences in adapting the educational process to physical distancing measures at the onset of the Covid-19 pandemic in Romania. *Journal of Educational Sciences, 2*(42). https://doi.org/10.35923/JES.2020.2.05

Saylan, C., & Blumstein, D. (2011). *The failure of environmental education (and how we can fix it).* Berkeley; Los Angeles; London: University of California Press. http://www.jstor.org/stable/10.1525/j.ctt1pnv79

Setlhodi, I., & Lebeloane, O. (2014). The role of school management teams in underperforming schools: A matter of values. *Mediterranean Journal of Social Sciences, 5*. https://doi.org/10.5901/mjss.2014.v5n3p475

Shabalala, N. P., & Msezane, S. B. (2020). Perceptions of environmental education integration in South African schools. *Eco. Env. & Cons, 26*(4), 1629-1635. http://www.envirobiotechjournals.com/EEC/v26i420/EEC-28.pdf

Sikhosana, L. (2022). *The development and implementation of the sustainable intervention strategy for solid waste management in primary schools: A case of Nkangala District, Mpumalanga province*. [PhD thesis, University of South Africa, Pretoria]. https://hdl.handle.net/10500/29114

Sikhosana, L., Mudau, A. V., & Msezane, S. B. (2020). Insights into the integration of environmental education in the senior phase. *Journal for the Education of Gifted Young Scientists, 8*(4), 1411-1425. https://doi.org/10.17478/jegys.750519

Songqwaru, Z., & Shava, S. (2017). Strengthening teachers' knowledge and practices through a biodiversity education professional development programme. In: Lotz-Sisitka, H., Shumba, O., Lupele, J., Wilmot, D. (eds) *Schooling for sustainable development in Africa. Schooling for sustainable development*. Springer, Cham. https://doi.org/10.1007/978-3-319-45989-9_15

Suen, L. J., Huang, H. M., & Lee, H. H. (2014). A comparison of convenience sampling and purposeful sampling. *The Journal of Nursing, 61*(3), 105-111. https://doi.org/10.6224/jn.61.3.105

Sutton, J., & Austin, Z. (2015). *Qualitative research: data collection, analysis and management.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4485510/

Teixeira, J., Amoroso, J., & Gresham, J. (2017). *Why education infrastructure matters for learning.* https://blogs.worldbank.org/education/why-education-infrastructure-matters-learning

The Institute for Environmental Learning. (2011, March). *Faculty of education- Simon Fraser university*. https://www.sfu.ca/education/newsevents/foenews/2011/march/mar30.html

Tikly, L. (2019). Education for sustainable development in Africa: a critique of regional agendas. *Asia Pacific Educ. Rev, 20*, 223–237. https://doi.org/10.1007/s12564-019-09600-5

Zafar, S. (2018). *Insights into environmental education*. https://salmanzafar.me/environmental-education

Zafar, S. (2021, March). The importance of environmental education for children. https://www.ecomena.org/the-importance-of-environmental-education-for-children/

Research Article

Evaluation of Educators' Experiences and Practices of Inclusive Education in Primary Schools: A South African Perspective *

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Abstract

This research evaluates educators' experiences and practices of Inclusive Education in primary schools in South Africa. The educators who serve as role models, nevertheless, do not seem to truly grasp the idea of Inclusive Education. The study used a qualitative research approach based on the interpretative research paradigm to investigate educators' understanding, experiences, and practices of Inclusive Education. The fourteen participants, who included two school principals, two deputy principals, five teachers, and five members of the school-based support team, were chosen through a purposeful sampling process. Five primary schools in the Warmbaths region in Limpopo Province were used to select the participants. With each participant, semi-structured one-on-one interviews were conducted. Thematic analysis was done to examine and analyse the data. The findings showed the varying perspectives on Inclusive Education, including views based on children's rights, abilities and disabilities, and quality, equity, and fairness for all children. This is further shown by the lack of improvement in stakeholders' ability to recognise learners who experienced barriers to learning. Educators lack adequate knowledge to implement Inclusive Education successfully. In addition, it was discovered that teaching an inclusive class was quite demanding on educators regarding planning, organising, and curriculum delivery. This study suggests that educators should use a combination of traditional teaching methods and digitally mediated learning to effectively meet the needs of all students, regardless of their learning abilities. Furthermore, educators should be provided with continuous professional development to empower them to meet the educational expectations of all learners.

Keywords: Digitally mediated learning, inclusive education, learning barriers, special needs education, traditional teaching methods

1. INTRODUCTION

The concept of Inclusive Education has received tremendous research attention over the last decade, both national and international (Buli-Holmberg, Nilsen, & Skogen 2019; Mukhopadhyay, 2013; UNESCO, 1990; UNESCO, 1994). The global goal of education for all was a brain child of United Nations (Educational, Scientific and Cultural Organization (UNESCO), with the intention of meeting the learning needs of all children, youth, and adults. The objective of Inclusive Education for all students with special education need (SEN) was highlighted in 1990 already (UNESCO, 1994). Therefore, South Africa is no exception in the idea of Inclusive Education for all, irrespective of ability or disability (Department of Education, 2001). However, the effectiveness of Inclusive Education in the understanding of the concept and what it entails by all stakeholders is not standard (Sigstad, Buli-Holmberg & Morken, 2021). Different people, in their different settings, explain the concept differently (Artiles, Kozleski, Dorn, & Christensen, 2006).

The South Africa of national unity, which came into power in 1994, brought several changes to the education system. Education White Paper of 1995 on education and training committed the

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government of national unity to a unified education and training system, which is committed to equal access, non-discrimination, and redress (Department of Education, 1995). Furthermore, it also made provision for a National Commission on Special Needs in Education and Training (NCSNET) to make policy recommendations to government on the inclusion of learners with special needs in main stream education and training within a single equitable system. The NCSNET and the National Committee on Education Support Services (NCESS) were appointed by the Ministry of Education to investigate and make recommendations on special needs and support services in South Africa.

The two committees, NCSNET and NCESS, presented reports to the then Minister in November 1997, and the Department of Education published the final report. The findings of the joint report of the NCSNET and NCESS were put forward to recommend that the education for all policy is to foster the development of inclusive and supportive centres of learning to enable all learners to participate actively in the education process, and that it would offer all learners with opportunities to develop their potential to become equally active members of society (Department of Education, 2001). The Department of Education further issued a framework policy document called White Paper 6 that contained the special needs education to build an Inclusive Education and training system in 2001. The paper outlined government's strategy to transform the education system to make it more efficient, more equitable, and more just, recognising the right of all learners to attend their local neighbourhood school and to receive the necessary support. The implementation of this policy is in its 20th year of the roll-out plan. The challenge is that there has been little progress to date. In conclusion, given the magnitude of this problem, a study of this nature would assist in finding a possible solution to the phenomenon.

Regardless of the challenges, the UNESCO (2007), reminds every stakeholder of the fundamental right of education for all, principles that values students' wellbeing, dignity, autonomy, and contribution to society, and a continuing process to eliminate barriers to education and promote reform in the culture and practice in schools to include all students. Focus should be on education to ensure quality, and equitable and effective learning outcomes for all as an integral part of the right to education (UNESCO, 2017). Mitchell, (2015) state that all learners or students, regardless of any challenges they may have, should be placed in age-appropriate general education classes that are in their own neighbourhood schools to receive high quality instruction, intervention, and support that enables them to be successful in the core curriculum. Therefore, all students could be full participants in the classroom and in the local school community. This view was supported by Florian, and Black-Hawkins, (2011) and Hehir, Silvana and Pascucci (2016), in partnership with ABT Association who point out that the importance of Inclusive Education is defined in its positive outcomes for all children, both with and without disabilities or other disadvantages.

The initiative of education for all became a solving tool for those individuals with disabilities, whose human rights were violated and their access to education restricted because of their physical ability (Mukhopadhyay, 2013). According to Kirk, Gallagher, Anastasiow and Coleman (2006), Inclusive Education rescues those who are disabled from abuse. Education that encompasses the most prevalent component of inclusion, where students receive excellent instruction and support in regular classrooms that enable them to thrive in the core curriculum, is the goal (Alquraini & Gut 2012). The education system provides instruction to a variety of learners in the same classroom (Isaksson & Lindqvist, 2015). Therefore, learners with special needs should be placed in a regular classroom setting. Other studies; however, have put more emphasis on inclusionary principles like belongingness, participation on an equal footing, shared responsibility, and getting support academically and socially (Sigstad, 2017).

The South African framework, through White paper 6, states that educators are the primary resource for achieving the goal of Inclusive Education and a training system (Department of Education, 2001). Based on the above, it is the responsibility of primary school teachers to ensure that

Inclusive Education is implemented effectively in schools, teachers need an understanding of best practice in teaching and of adapted instruction for students with disabilities. However, a positive attitude toward inclusion is also important for creating an inclusive classroom that is effective.

White Paper 6 states that there will be a need for a flexible curriculum and assessment policy that is accessible for all learners, irrespective of the nature of their learning needs. Because curricula create the most significant barrier to learning and exclusion, the issue of curriculum differentiation is critically important and its success dependents on implantation policy and teachers' characteristics (World Health Organisation, 2011). Forlin and Chambers, (2011), and Sharma, Simi and Forlin (2015), all suggest that more sustainable Inclusive Education implementation would put more emphasis on inclusive pedagogy in pre-service teacher training for all teachers, as well as sustained and continuous in-service development. This also positively affects the teachers' attitude towards inclusion by emphasising that it is within their professional role to include all children in their classroom, and it is not just the domain for specialists and a special curriculum.

Ineke, Markova, Krischler, Krolak and Schwedt (2017) state that teachers are expected to accommodate an increasingly mixed student population. However, teachers feel ill prepared and, hence, may be apprehensive toward the inclusion of students with SEN in a regular classroom setting. Mukhopadhyay (2013) explains that there is evidence to suggest that many teachers do not feel equipped to teach children with disabilities and complain that they need more time to instruct these students. Teachers are expected to accomplish the task of meeting all learners' educational needs by making the curriculum flexible and accessible. Therefore, the successful implementation of Inclusive Education practices is largely dependent on the teachers.

Armstrong (2017) states that teachers with more experience in dealing with children with social, emotional, and behavioural disorders, hold a more negative attitude. In addition, they argue that the organisation of training programmes should be well thought out. Borg (2011) states that the European Agency for Development in Special Need Education explicitly specifies that teachers need to have the appropriate skills, knowledge, and understanding, but also show certain values and attitudes to work effectively in inclusive settings.

Odom, Buysse and Soukakou (2011) emphasise that in the USA and Europe, it is generally stated that effective inclusive practices require teachers that can deliver specialised instructional practices geared toward the individualised needs of all students. Education White Paper 6 of Department of Education (2001) states that educators' skills and knowledge will be improved to develop new skills. In other words, teachers will be trained with new methods of teaching through training programmes and staff development at the school level. Educators need skills and knowledge to teach learners who experience difficulties in the classroom. Forlin, and Loreman, (2014) points out that inclusion is realised mainly at classroom level. Therefore, there is a need for adequate support from knowledgeable School Based Support Teams (SBST) at primary school level.

Forlin, and Loreman, (2014) asserts that the implementation of Inclusive Education requires teachers to reconsider their teaching practice, but many teachers do not feel competent in doing this, so professional development should support teachers by providing guidance on good practices Kurnaiwatt et al (2014) state that these training programmes have positive effects on mainstream primary teachers. Training programmes that are focused on specific students' needs or disabilities were found to be more effective than general training programmes. In addition, Kurnaiwatt et al. (2014), Roberts and Simpson (2016); emphasise that tools and strategies related to specific teachers' concerns and their teaching context (e.g., curriculum), are helpful and effective in encouraging change in teaching practices. On the other hand, Juvonen, Lessard, Rastogi, Schacter, and Smith, (2019), pointed out that for all stakeholders of education to be able to facilitate inclusive education successful within schools, educators and school administrators need to be aware of group dynamics, rather create conditions that are safe and accepting for all learners.

Qi and Ha (2014) point out that educators (in physical education) must provide successful approaches for including SEN students within their curricula, as good practice for pre-service teachers. The studies by Englebrecht, Swart and Eloff, (2001); and Englebrecht (2006) reveal that teacher training programmes do not appear to be adequately addressing this need, resulting in stress for teachers and lack of progress for learners with disabilities. Stofile (2008) state that training programmes that educate teachers on how to accommodate and teach learners with disabilities are generally a week or two weeks long, and teachers report that although these brief training programmes are helpful, it is not sufficient. Fullan (2007), and Kuroda, Kartika and Kitamura (2017), report that there is mounting evidence that these kinds of short term, 'parachute' training do little in terms of impact and systematic change. These training programmes are provided as continued professional development and it is once-off workshops that focus on developing some skills, whereas teachers need more time for training.

Avramidis and Norwich (2002) point out that teachers' competence is related to their studies in teaching students with special educational needs. According to Ineke et al. (2017), competencies are the skills and knowledge that enable a teacher to be successful. Therefore, the importance of teachers' competence for inclusive practice is evident in its effect on student learning. Dalton, Mckenzie and Kahonde (2012) point out that in general, teachers' pedagogical content knowledge positively affects student outcomes. In addition, Kunter, Frenzel, Nagy, Baumert, and Pekrun, (2011); explain that teacher competence not only includes cognitive aspects, but also skills and knowledge.

2. METHOD

2.1. Research Design

A qualitative design was used in this study to ascertain the opinions of participants and the meaning they attach to successful implementation of Inclusive Education. A phenomenological approach was used, as it describes the meaning of lived experiences of participants in the study. With phenomenology, the researcher puts aside all prejudgement and collects data on how individuals make sense out of a particular experience or situation. The authors attempted to understand how people experience a phenomenon from each person's own perception.

2.2. Research Population and Sample

Purposive sampling was used in the study to gather detailed information about the phenomenon under investigation from participants. The fourteen participants, who included two school principals, two deputy principals, five teachers, and five members of the SBST, were chosen through a purposeful sampling method. Five primary schools in the Warmbaths region in Limpopo Province were used to select the participants.

2.3. Data Collection and Analysis

With each participant, semi-structured one-on-one interviews were conducted. Semi-structured interviews were used to gather in-depth data from participants. Semi-structured interviews allowed the authors to have set questions with the option to probe for clarity when needed.

Data analysis was done through a systematic process of coding, categorising, and interpreting data to provide explanations of a single phenomenon of interest. Thematic analysis was employed by reading through data from the in-depth interviews and identifying patterns across the data to detect relevant themes.

3. FINDINGS and DISCUSSION

The findings showed the varying perspectives on Inclusive Education, including views based on children's rights, abilities and disabilities, and quality, equity, and fairness for all children.

From the thematic analysis, the following three sub-themes emerged and are discussed below:

Sub-theme 1: Views on Inclusive Education

Participants were asked to give their views on their understanding of Inclusive Education, and to give a simple explanation of what is meant by them. Participants' response showed that they view Inclusive Education in different ways namely the rights of all children, children's ability and disability, quality, equality, and fairness of all children.

Research has indicated that educators often have very different definitions of inclusion and Inclusive Education, and the definition that they believe in is seen to affect the way educators implement inclusive practices in the classroom (Hay, 2009). One of the participants asserted that Inclusive Education is for all schools to accommodate all learners with or without barriers in the same classroom. That is what the participant had to say: *E1 "A" "It means all children in the same classroom; all children must be in the same school".*

In support of the previous participant, the other participants indicated that all learners should be accommodated in the main stream, and it is the responsibility of all school stakeholders to embrace and meet the diverse needs of every learner. E2 "B" had this to say: *"It is a way of embracing every learner in a school despite of his/her abilities or disabilities".* In support, *SBST 3 "C"* added, *"It means all children must be included irrespective of age, colour, race, gender, academic achievement*".

Interpretation

Participants' responses indicate that they understand Inclusive Education differently and in different contexts, but in practice they perceive inclusivity as accommodating learners in the same classroom irrespective of the learner's abilities or disabilities, gender, race, colour, or even learners' academic achievements. Through participants' responses they highlighted that there should not be any discrimination in learners' education. The other challenge could be on implementation of the system within schools and taking ownership (Nilholm & Goranssonk, 2017).

Sub-theme 2: Identification of learners with learning barriers

Barriers to learning is any difficulty within the education system, the learning site, and/or within the learner him/herself that prevents the access to learning and development of learners (Department of Education, 2010). Most learners in public primary schools are experiencing one or more barrier to learning, such as intrinsic, pedagogical, socio-economic, and systemic barriers, for example curriculum, language, and educator-pupil ratio (Lebona, 2013). Furthermore, it is the responsibility of an educator to manage the process of identifying and minimising any barriers to learning (Department of Education, 2014).

Participants raised the lack of support in identifying learners with barriers to learning as a serious concern to implement Inclusive Education effectively. Participants articulated their frustrations of dealing with learners experiencing barriers to learning. This is the response from *SBST 1 "A"* regarding the identification of learners with learning barriers, *"We deal with children who behave in a sensitive way, we listen to their needs. SBST 5 "E"* concurs with *SBST 1 "A"* by saying, *"some of us do not have any knowledge of really identifying learners with learning barriers except through judging them through their behaviour, for me I was not made ware as to how to identify them in my class".*

Participants showed a lack of knowledge in identifying learning barriers. *E4 "D"* stated, *"It is very hard to tell because the school management and the department expect us to implement Inclusive Education and sometimes it is very difficult for us to identify learners experiencing barriers to learning".* One of the participants in the intermediate phase indicated that there was no cooperation from foundation phase educators in connection with the names of learners who are experiencing barriers to learning. This showed that educators need training in the areas of identification of barriers to learning. *E5 "E" "First of all, most of the learners who come to us from foundation phase already have these learning barriers. The problem is that we are not aware of them because there is nothing to*

*inform us about their learning abilities, their learner profiles do not indicate any learning need" (*Participant shook his head).

One of the participants responded positively towards learners' different needs. *E2 "B"* articulated that*, "We are aware of different needs and don't feel excluded from the rest. We create environment that works for all. Every teacher in our school tries to create a purposeful environment".*

Interpretation

Participants' responses showed that there is little progress in their schools in terms of identifying learners with barriers due to their lack of knowledge and skills. According to Education White Paper 6 on special needs education Department of Education (2001), every educator should have skills or expertise to identify barriers to learning. However, according to the participants those are the skills that educators are still lacking in.

Sub-theme 3: Workload

Many educators feel that teaching children with barriers to learning is beyond their area of expertise, and they should not be expected to teach those learners without assistance (Engelbrecht, 2006). Some of the participants viewed the implementation of Inclusive Education as adding extra work and causing stress. Lambe and Bones (2007) point out that if educators are unable to adapt their teaching methods, it could result in adding more stress for them.

One of the participants pointed out that workload appeared to be the major concern, as inclusive education in the classroom needed more time for preparations. This is what *E1 "A"* had to say, *"Definitely a lot more preparation and planning is needed because of overcrowded classes with learners of different and unique behaviours."* Another participant complained that an inclusive education classroom is very diverse because learners learn differently at a different pace, and educators had a problem in adapting to different teaching methods. *E3 "C"* posit that, *"Inclusive class really is more demanding and frustrating to us, it demands a lot from us as educators".*

Educators' frustrations for not coping were captured in the following quotes, *SBST 3* "C" *"We struggle to reach our goals, when you attend to a child with special needs the rest tend to be noisy and naughty"* and *E4 "D" "Fast learners tend to get bored".*

Interpretation

Participants' responses indicate that there is a lot of pressure and a higher workload in an inclusive classroom, especially when it comes to planning, preparation, and discipline.

4. CONCLUSION

This study examined Inclusive Education strategies and educator experiences in South African elementary schools. Cultures, educational policies, and practices vary regularly among nations. Considering this, South Africa developed and put into practice a policy on Inclusive Education through the Education White Paper 6 on special needs education. The Policy on Screening, Identification, Assessment, and Support, which provides a framework for the implementation of Inclusive Education in all public schools, was developed to give direction and guidelines in the implementation of Inclusive Education. However, the educators do not seem to have a solid understanding of Inclusive Education. There are vulnerable learners whose quality learning and progress in their studies is the basis of education for all learners without any discrimination.

All concerned parties are advised to work together, support each other, and use all available resources to meet the educational goals of students, regardless of the obstacles to learning that students may face, and the difficult problems that educators may face. Juvonen, et al, (2019), reiterated that, to use proactive tactics to bring together children from different backgrounds and characteristics, educators must become knowledgeable about social dynamics and group processes. Therefore, collaboration of all stakeholders of basic education and educators require continuing assistance to avoid and manage instances of peer victimization, rejection, and isolation of leaners in any form.

Makoelle, (2014) and UNESCO (2021) in support of the above recommendations, call for collaboration effort among all policy marker, middle management and the teachers as the implementation cannot be a one man show. Ydo (2020), indicated that the right to Inclusive Education requires a shift in culture, policy, and practice in all educational environments to accommodate the many needs and identities of individual learners.

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5. REFERENCES

Alquraini, T., & Dianne Gut, D. (2012). Critical components of successful inclusion of students with severe disabilities: literature review. *International Journal of Special Education, 27*(1), 42-59.

Armstrong, D. (2017). Wicked problems in special and inclusive education. *Journal of Research in Special Educational Needs, 17*(4), 229-236.

Armstrong, D. (1998). Changing faces, changing places: Policy routes to inclusion. In P. Clough (Ed.), *Managing inclusive education: From policy to experience*, 31-47. London: Paul Chapman.

Artiles, A. J., Kozleski, E. B., Dorn, S., & Christensen, C. (2006). Learning in inclusive education research: e-mediating theory and methods with a transformative agenda. *Review of Research in Education, 30* (1), 65-108. https://doi.org/10.3102/0091732X030001065

Avramidis, E., & Norwich, B. (2002). Teachers 'attitudes towards integration / inclusion: a review of the literature. *European Journal of Special Needs Education, 17* (2).

Borg, S. (2011). The impact of in-service teacher education on language teachers' beliefs. *School of Education*, University of Leeds. UK. https://doi.org/10.1016/j.system.2011.07.009

Buli-Holmberg, J., Nilsen, S., & Skogen, K. (2019). Inclusion for pupils with special educational needs in individualistic and collaborative school cultures. *International Journal of Special Education, 34* (1), 68–82.

Dalton, E.M., McKenzie, J.A., Kahonde, C., (2012). The implementation of inclusive education in South Africa: Reflections arising from a workshop for teachers and therapists to introduce universal design for learning. *African Journal of Disability 1*(1). https://doi.org/10.4102/ajod.viii.13

Department of Education, (1995). *White paper on education and training*, Government Gazette, no 16312, 15 March 1995.

Department of Education, (2001). *Education white paper 6 special needs education: Building an inclusive education and training system*. Department of Education: South Africa.

Department of Education, (2010). *Guidelines for inclusive teaching and learning*. Pretoria: Government printers.

Department of Basic Education, (2014). *Policy on screening, identification, assessment, and support*. Pretoria: Government Printers.

Engelbrecht, P. (2006). The implementation of inclusive education in South Africa after ten years of democracy, *European Journal of Psychology of Education-EJPE, 21*(3), 253-264.

Engelbrecht, P., Swart, E., & Eloff, I. (2001). Stress and coping skills of teachers with a learner down's syndrome in inclusive classrooms. *South African Journal of Education, 21*(4), 256-260.

Florian, L., & Black-Hawkins, K. (2011). Exploring inclusive pedagogy. *British Educational Research Journal, 37* (5), 813-828. https://doi.org/10.1080/01411926.2010.501096

Fullan, M. (2007). *The new meaning of educational change*, (4th Edition). New York: Teachers College Press.

Forlin, C., & Chambers, D. (2011). Teachers' preparation for inclusive education: Increasing knowledge but raising concerns. *Asia-Pacific Journal of teacher education*, *2*(7), 124-126.

Forlin, C., & Loreman, T. (2014). Conceptualising and measuring inclusive education. *International Perspectives on Inclusive Education*, 3-17. https://doi.org/10.1108/S1 479-363620140000003015

Hays, R. (2009). *Inclusive education: educator's perceptions of teaching learners with emotional, cognitive and physical barriers to learning*. Unpublished – master's thesis, University of the Witwatersrand, South Africa.

Hehir, T., Silvana, & Pascucci, C. (2016). *A summary of the evidence on inclusive education*. Cambridge.

Ineke, M.P.C., Markova, M., Krischler, M., & Krolak-Schwerdt, S. (2018). Promoting inclusive education: The role of teacher's competence and attitudes. *Insights into Learning Disabilities, 15*(1), 49-63.

Isaksson, J. & R. Lindqvist, R. (2015). What is the meaning of special education? Problem representations in Swedish policy documents: late 1970s–2014. *European Journal of Special Needs Education, 30* (1), 122-137.

Juvonen, J., Lessard, L.M., Rastogi, R., Schacter, H.L., & Smith, D.S. (2019). Promoting social inclusion in educational settings: Challenges and opportunities. *Educational Psychologist*, 54, 250-270. https://doi.org/10.1080/00461520.2019.1655645

Kirk, S.A., Gllagher, J.J., Anastasiow, N.J., & Coleman, M.R. (2006). *Educating exceptional children* (10th ed.). Boston: Houghton Mifflin.

Kunter, M., Frenzel, A., Nagy, G., Baumert, J., & Pekrun, R. (2011). Teacher enthusiasm: Dimensionality and context specificity. *Contemporary Educational Psychology*, *36*(4), 289-301.

Kuroda, K., Kartika, D., & Kitamura, Y. (2017). Implications for teacher training and support for inclusive education in Cambodia: An empirical case study in a developing country. JICA Research Institute.

Lambe, J., & Bones, R. (2007). The effect of School- based practice on student teachers' attitudes towards inclusive education in Northern Ireland, *Journal of Education for Teaching*, *33*(1), 99-113. https://doi.org/10.1080/02607470601098369

Lebona, T.G. (2013). *The implementation of inclusive education in primary schools in the Lejweleputswa education district*. Magister Educationist in the faculty of Humanities at the Central University of Technology, Free State, South Africa.

Makoelle, T.M. (2014). Exploring effective teaching practices for inclusion: A case of a South African secondary school. *International Journal of Education Science*, *7*(1), 183-192.

Mitchell, D. (2015). "Inclusive education is a multi-faceted concept." *C.E.P.S Journal, 5* (1), https://doi.org/10.26529/cepsj.151

Mukhopadhyay, S. (2013). Voices of experience: Botswana primary school teachers on inclusive education. *European Journal of Educational Studies, 5*(1), 77-85.

Nilholm, C., & Göransson K. (2017). What is meant by inclusion? An analysis of European and North American journal articles with high impact, *European Journal of special needs education, 32*(3), 437-451. https://doi.org/10.1080/08656257.2017.1295638

Odom, S.L., Buysse, V., & Soukakou, E. (2011). Inclusion for young children with disabilities: A quarter century of research perspectives. *Journal of Early Intervention, 33*(4), 344-356.

Roberts, J., & Simpson, K. (2016). A review of research into stakeholder perspectives on inclusion of students with autism in mainstream schools. *International Journal of Inclusive Education, 20*(10), 1084-1096.

Sharma, U., Simi, J., & Forlin, C. (2015). Preparedness of pre-service teachers for inclusive education in the Solomon islands. *Australian Journal of Teacher Education, 40*(5), 103-116. https://doi.org/10.14221/ajte.2015v40n5.6.

Sigstad, H.M.H., (2017). The role of special education teachers in facilitating peer relationships among students with mild intellectual disabilities in lower secondary school. *Journal of Intellectual Disabilitiesi, 22*(4), 378-393. https://doi.org/10.1177/1744629517715788 .

Sigstad, H.M.H., Buli-Holmberg, J., & Morken, I. (2021). Succeeding in inclusive practices in school in Norway-A qualitative study from a teacher perspective. *European Journal of Special Needs Education*, https://doi.org/10.1080/08856257.2021.1997481 .

Stofile, S. Y. (2008). Factors affecting the implementation of inclusive education policy: A case study in one province in South Africa (Doctoral dissertation), University of the Western Cape.

UNESCO. (2017). A guide for ensuring inclusion and equity in education. Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000248254.

UNESCO. (1990). World Conference on EFA, Jomtien, 1990 | Education | UNESCO. Retrieved 1 October 2022, from, https://www.unesco.org/en/education.

UNESCO. (1994). *The salamanca statement and framework for action on special needs education*. Paris: UNESCO.

UNESCO. (2007). *A human rights-based approach to education for all: A framework for the realisation of children's right to education and rights within education*. NY: UNICEF.

UNESCO. (2021). Sub-education policy review report: Inclusive education. Jakarta: UNESCO.

World Health Organisation (2011). World report on disability. The world Bank.

Qi, J., & Ha, A. S. (2012). Inclusion in physical education: A review of literature. *International Journal of Disability Development and Education, 59*(3), 257-281. https://doi.org/10.1080/1034912X.2012.697737

Ydo, Y. (2020). Inclusive education: Global priority, collective responsibility. *Prospects*, 49, 97-101. https://doi.org/10.1007/s11125-020-09520-y

Research Article

The Negative Consequence of Teacher Directed Violence to Student Learning *

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Abstract

The study explores the experiences of secondary school teacher-directed violence. Violence directed at teachers can have a negative attitude towards their job, as well as not performing to expectations. Thus, it is important to increase knowledge regarding violence as educators experience it, so as to be able to work preventively and minimise the violence. The study is guided by the ınterpretative phenomenological analysis which seeks to understand the experiences of teacher-directed violence. Interviews were conducted with 10 teachers from various secondary schools at a neutral venue outside the respondents' schools and homes. Analysis revealed five main themes, namely absenteeism due to fear, fear for their safety, teacher turnover as result of violence, harassment, and intimidation. The findings revealed that more serious acts of violence on teachers affected their performance at school. If not addressed, this problem of violence has the capacity to render the education system dysfunctional. In conclusion, authorities must act against this threat on teachers in order to normalise the situation at schools throughout the country.

Keywords: Teacher-directed violence, safety, absenteeism, intimidation and harassment

1. INTRODUCTION

The study examines the consequence of learner violence on teachers' desire to work. The school environment has been characterised as violent when teachers are exposed to violence ranging from physical to verbal, to social forms of violence (Lokmić, Opić, & Bilić, 2013; Prpić, 2021; Ünsal & Atanur-Baskan, 2021). Assaults intended to cause bodily harm to teachers are rising and teacher-directed violence is contributing to a toxic workplace environment (Waheed & Youssef, 2007). Over the years, the Department of Basic Education (DBE) has tried various means to protect learners in schools, but, unfortunately, teachers' safety has been neglected (Mahome, 2019). This violence is a burning issue that needs to be addressed urgently in an effort to provide a safer environment regarding the work and safety of both learners and teachers (McMahon, Martinez & Espelage, et al, 2014; Wilson, Douglas & Lyon, 2011).

Furthermore, it is confirmed that teacher-directed violence contributes negatively to excellent teaching and increases fear, physical and psychological consequences to the victims, and low learner performance (Eddy & Camp, 2017; Huang, Gluschkoff, Elovainio, Hintsa, Pentti, Salo, Kivimäki, & Vahtera, 2020; Wilson et al., 2011). As well as the physical dangers posed by assault, theft, and vandalism, there are psychological and social side effects for teachers that cause anxiety and fear which need to be addressed (van der Westhuizen & Maree, 2010). A main concern is that continuing forms of violence, such as harassment and intimidation which are not as visible, may more than likely not be taken seriously, but have the potential to be more harmful to the victims (Bass, Cigularov, Chen, Henry, Tomazic, & Li, 2016).

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Teacher-directed violence, according to Nielsen and Einarsen (2018), is a worldwide phenomen with similar features and outcomes present around the world. According to Moon, Morash, Jang and Jeong, (2015), Canada and the United States reported 80% of teachers were victims of verbal, psychological, and physical violence. Similarly, 4% of a nationally representative sample of Israeli 7th-11th grade students reported they had threatened to hurt a teacher (Maeng, Malone, & Cornel, 2020). The Taiwanese situation is not different: a nationally representative sample of 14,022 Taiwanese youths reported that nearly one-third of students were involved in verbally and/or physically aggressive ehaviour against teachers (Moon, et al., 2015). In addition, teachers may feel blamed, powerless, or unsafe, especially if administrators do not step in to support them (Maeng et al., 2020).

Increased teacher turnover and greater health care costs negatively impact the overall culture of the school (Wilson, et al. 2011). Because both teacher-directed violence and teacher turnover are so prevalent, the extent to which these two issues are related is an important question. Teacher violence has demonstrated that it influences the teacher's decision to quit altogether (Peist, McMahon, Davis & Keys, 2020); however, there is still a dearth of research on teacher-directed violence in relation to turnover and retention of teachers (McMahon et al., 2014). Poor working conditions, school violence, a negative school climate, and ill-disciplined learners are directly related to the satisfaction of teachers (Lokmić, Opić, & Bilić, 2013). A teacher moving to a different school is directly related to their experience of being threatened with injury or being assaulted by a student (Moon, Saw & McCluskey, 2020). Poor working conditions, violence, ill-disciplined learners, and a negative school climate being directly related to teacher satisfaction and retention are also noted by McMahon, et al., (2014). These negative outcomes for teachers have subsequently been linked to low student achievement and adjustment (Espelage, et al., 2013; Gray, Wilcox, & Nordstokke, 2017; Khoury-Khassabri, Astor, & Benbenishty, 2009). Thus the aim of the study of the is to explore the the negative consequence of teacher-directed violence to student learning.

2. METHOD

Interpretative Phenomenological Analysis (IPA), which focuses on lived experiences of teacher-directed violence, is the most appropriate methodology. The choice of IPA was influenced by the "prime reason for choosing IPA over any other qualitative approach being be because it is consistent with the epistemological position of your research question" (Smith Larkin, & Flowers, 2009:46). The advantage of using IPA qualitative is that it provides the researcher the chance to speak directly with study participants and see the environments in which they worked, lived, and interacted (Lobiondo-Wood, & Haber, 2010). The semi-structured interview was designed to seek information on teachers-directed violece. With regards to the teachers-directed violence, interviews focused upon their personal experiences with violence, negative effects on their health and carrers. The questions were first first given a go ahead by a colleague in the department to assess its relevance to the topic. In ensuring validity participants' feedback on the transcript of the interview and determining whether the resultant themes and concepts accurately reflect the phenomenon under investigation was importan (Noble, & Smith, 2015). The reliability has to do with ability of the researcher to assess the'soundness' of the research in terms of the applicability and appropriateness of the methodologies used and the integrity of the conclusions drawn is satisfied.

2.1. Participants

Ten participants were purposively sampled. They came from local schools with entirely African teachers and students. Interviews were conducted with 6 females and 4 males teachers. Age ranges from 25 to 40 years, with an average experience of 5 to 12 years teaching experience. Most of the participants were African and spoke Sesotho.

2.2. Data Collection Procedure

Data collection which involves IPA is a process aimed at understanding the respondents lived experiences regarding violence at various schools. The data collection in the study involved a process over 6 months in which a maximum of ten in-depth semi-structured interviews were held. The researcher conducted the interviews throughout the study. The interviews each lasted for a maximum of one hour. Thereafter, they were subjected to a semi-interview which lasted for a maximum of 30 minutes.

2.3. Data Analysis

The raw data analysis was transcribed verbatim from transcripts using IPA (Smith et al., 2009). The six steps suggested by Smith (2011a, b) were utilized as follows: reading and re-reading the transcript carefully with the objective of themes identification, clustering of themes, refining the clustering of themes, cross case analysing to identify superordinate themes, labelling of super-ordinate themes, and writing of a narrative report. The researchers took an approach of openness and occupied themselves in the data, as was consistent with the approach taken on data collection. The researchers tried by all means to understand each participant's lived experience before taking the next move. During the analysis stage, the researchers were honest regarding each participant's lived experience, focusing mainly on lived experience whilst searching for common themes (Eatough & Smith, 2006). The researchers corroborated the themes which had been inferred through discussion.

3. FINDINGS and DISCUSSION

Themes 1: Absenteeism due to fear

The participants reported on the reasons behind high absenteeism of teachers. Most took sick leave when they were absent from the work, although the reason was to avoid the students.

> *"When I think of reporting to work, I always think about these learners who are going to make my life miserable at all costs. I develop an attitude not to see them I used means to stay away from work even to an extent of consulting a doctor to book me off for three day minimum a week then I know I see them only for two days in a week" (Respondent # 3).*

> *"I used all my days' sick leave days in a year and my leave days for the rest of the year also. I did that to be away from this unsafe environment. I think it is cause of this constant illness I suffered. I am now left with no option but to face these unruly learners daily." (Respondent # 7)*

> *"Within a week you can rarely find a full staff complement, there is always a staff member absent due to sickness or taken a leave. They cite the violence as the main reason why they stay away. It's a pity that committed learners suffer because these violent learners, because tuition cannot take place in this toxic environment" (Respondent # 5).*

> "*When I feel like staying away I do, because the school is so dysfunctional you think the learners are managers, because everything they say it goes, no questions. No one will ask you why you were absent for the last two days or three. It is very chaotic here, we do not even sign the register and most of us take an advantage of poor admistration and stay away" (Respondent # 9).*

The South Africa education sector is certainly not spared from teacher absenteeism. South African teachers lead with regard to absence from work when compared to their Southern Africa Development Community (SADC) region counterparts, with 19 days annually as opposed to 9 days in SADEC region. Chauke (2014) argues that teacher absenteeism contributes to students' underperformance in schools. It is assumed that between 10% and 12% of teachers avoid going to school, which amounts to 39,000 teachers on a daily basis. In addition, 77% of instances in which teachers are absent are Mondays and Fridays. The teachers affected by a 'stress' response to violence

have also been taking long leave and this extended absenteeism has further negative effects on teaching and learning at schools (Singh & Steyn, 2014).

Theme 2: Fear for their Safety

The teachers were more worried about their safety at school. They expressed having developed a fear for the learners – a fear for what might happen to them and their colleagues.

> *"I am afraid to discipline the learners, because you are not sure what will happen to you if you upset them. They carry the weapons with them to the schools. The random search done by police does not assist because there is no consequence management. They will display a knife when they are in wrong to threaten you not to say a word to correct the behaviour. I fear for my life every day when I am in classroom, I find myself teaching only twenty minutes and then I left the class" (Respondent # 1).*

> *"A colleague was attacked and killed by learners who were disciplined for an unruly behaviour at school. He was attacked at gate at his house and killed and fled with his car. They were arrested at border when entering Lesotho. The learner did this heinous act with the assistance his friends from Lesotho. They first flatten his motor car tyres at school I saw it as warning. I think we have lost our authority as teachers" (Respondent # 4).*

> *"They pour a full bucket of cold water on me and told me I am interfering in their business now they are teaching me not to poke my nose in their affairs. I have accepted that they are not prepared to be disciplined. I must put my life first and leave them" (Respondent # 8).*

The establishment of a safe school environment in which effective teaching and learning can take place is hampered by teacher-directed violence (Singh & Steyn, 2014). The learner violence against teachers creates an unsafe environment for teachers and is a prime source of teachers' strikes (Shields, Nadasen & Hanneke, 2015). According to Segalo and Rambuda (2018), teachers fear for their safety and thus opt not to deal with leaners behaviour. The use of weapons by learners to coerce teachers to submit to their demands not to be punished for their violence against their teachers has compromised the safety of teachers. Due to these incidents, teachers feel that fear and insecurity thwart their efforts to meet their professional responsibilities of creating a culture of teaching and learning in schools (Zulu, Urbani, van der Merwe & van der Walt, 2004).

Theme 3: Teacher turnover as a result of violence

Many good teachers have left the profession citing violence as one of the reasons. Those currently working planned to take a package and start something new, rather than live with the constant fear of being attacked or being killed in the line of duty.

> *"The learners have changed drastically unlike the learners I encountered them when I started teaching. I have made up my mind I am quitting at end of the year. I am taking early retirement is better than to die here. I fear these learners anything is possible with them" (Respondent # 10).*

> *"The reports that teachers are being killed make me not take my safety lightly, for the fear. I am taking a package at the end of financial year. I cannot wait another year I have made my life I am leaving. You have to watch your back every time you are in school premises. I might be the next victim who knows what these learners are planning behind my back" (Respondent # 1).*

> *"I was attacked by learner in a class with a scissor. I had to run around the table for my life until I got an opportunity to escape. I ran straight to the principal office. I reported the matter and the principal did nothing. I do not see any reason why I still have to work I am currently serving a notice, I am definitely leaving at end of the month. My life take a first priority" (Respondent # 8).*

Teacher-directed violence is a prime reason for teachers to leave their post (Peist, et al., 2020). This is confirmed by Moon et al. (2020) who state that violence contributes significantly to the decision to leave the profession altogether. There are, however, few studies that have examined the relationship between teacher-directed violence and teacher turnover. Teachers who reported experiences of being threatened with injury or being assaulted by a student were more likely to move to a different school the following year (Curran, Viano, & Fisher, 2019; Zurawiecki, 2013). Teachers have very often accepted that they have lost control over their classrooms; very often, they do not know of methods that can be used to replace corporal punishment with other non-violent corrective techniques (Botha & Zwane, 2021).

Theme 4: Harassment

The teachers reported a continuous harassment by learners. In their own words, they reported these acts of harassment:

> *"I am a victim of cyberbullying, which is a common form of harassment now of late. They are sending us messages on our cell phones. Mostly the messages are not appropriate for learners to be sent to teacher, they contain vulgar language. Moreover, they even insult us through Twitter and Facebook" (Respondent # 6).*

> *"I was referred as stupid for not allowing a learner to leave early for unsound reasons. He just wanted to knock early that Friday because I refuse and referred him to principal now I am stupid teacher. To add to that he started referring me as 'cow' meaning I am stupid. Now my official name to learners is 'cow'" (Respondents # 2).*
> *"The learners in my class has given me a nickname when they are gossiping about me they use it. They use it to warn others that you are coming, they must be careful. Other learners will quickly leave the class because they are aware you will ask for a homework, you will find an empty class to teach" (Respondent # 5).*

> *"In my class when I write on the board the whole class laughs and makes funny remarks referring me as a 'sheep' but immediately when you turn to them, they are all quiet" (Respondent # 3).*

It has been reported by McMahon et al., (2014) that harassment of teachers is more common than other forms of violence. According to Burns, Fogelgarn and Billett (2020), teacher-targeted bullying and harassment by learners has a real, detrimental, and continuing impact which is negative on teacher wellbeing. Kõiv (2015) conducted a study on teacher-targeted bullying in Estonian schools over a ten-year period from 2003–2013, which found that bullying or harassment against teachers increased on average by 300% over that period.

Theme 5: Intimidation

The teachers complained of intimidation from learners who resisted being disciplined for unruly behaviour. These acts of intimidation made them very uncomfortable because they were not certain when they would be attacked. They were constantly walking in fear in the school premises. They described the acts of intimidation as follows:

> *"I was threatened by a young learner and when the school knocks out, he was waiting for me at gate asking me to do what I was doing in the staff room. I was shocked and shaking not even know what the learners will do next. I was walking with colleague he quickly left me with the learner, I could see that he is afraid of the learner. My sin was to demand a homework from which I given them the previous day" (Respondent # 9).*

"I was threatened by a group of boys who has turned toilets into a dagga smoking area that if I do not leave them alone they will deal with me" (Respondent # 4).

"I met a learner from class in the township he was with other boys smoking dagga and he told me straight that it is not at school here if I open my mouth he will sort me. I must not act like a teacher outside school premises" (Respondent # 10).

Verbal abuse (insults, slander), intimidation, and disrespecting the instructions of the teacher are the most common source of violence endured by most of the teachers (Kopecký & Szotkowskis, 2017). Many teachers have reported acts of violence ranging from personal property damage to some being threatened with physical violence by the learners (Burns et al., 2020). This extends to fist fighting and throwing dangerous weapons at them.

4. CONCLUSION

Teacher victimisation incurs significant costs, including lost wages, lost instructional time/productivity, increased workers' compensation, litigation, and negative publicity (Levin et al., 2006). In addition, learners exit the system without completing schooling, in which case they face a bleak future with little hope of finding employment. Teachers fear to discipline learners because they fear for their safety. Therefore, there is an urgent need to better understand the nature and extent of learner-on-teacher violence to improve learners' and teachers' experiences and make school systems safer and more effective (McMahon et al., 2014).

Teacher-directed violence has included a range of acts of violence against teachers. It may be argued that systemic resistance or political indifference to how the teaching environment in classrooms today has altered has made it possible. the safety of teachers is very impotant for students to receive quality teahing, with violence against them thus make ipmposibel.

Acknowledgment

The data used in this study was confirmed by the researchers that it belongs to the years before 2020.

5. REFERENCES

Bass, B. I., Cigularov, K. P.,Chen, P. Y.,Henry, K. L.,Tomazic, R. G., & Li, Y. (2016). The effects of student violence against school employees on employee burnout and work engagement: The roles of perceived school unsafety and transformational leadership. *International Journal of Stress Management, 23*(3), 318–336. https://doi.org/10.1037/str0000011

Botha, R.J., & Zwane, R.P. (2021). Strategies to prevent leaner-on-educator violence in South African schools. *International Journal of Learning, Teaching and Educational Research*, *20*(9), 1-17. https://doi.org/10.26803/ijlter.20.9.1

Burns, E.A., Fogelgarn, R., & Billett, P. (2020). Teacher-targeted bullying and harassment in Australian schools: a challenge to teacher wellbeing, *British Journal of Sociology of Education, 41* (4), 523-538. https://doi.org/10.1080/01425692.2020.1755227

Chauke, P. (2014). Teacher absenteeism behind failing pupils. Available online: http://citizen.co.za (accessed on 11 January 2020).

Curran, C. F., Viano, S. L., & Fisher, B. W. (2019). Teacher victimization, turnover, and contextual factors promoting resilience. *Journal of School Violence*, *18*(1), 21–38. https://doi.org/10.1080/15388220.2017.1368394

Eatough, V. & Smith, J.A. (2006). I was like a wild wild person: understanding feelings of anger using interpretative phenomenological analysis. *British Journal of Psychology*, 97, 483–498.

Espelage, D., Anderman, E.M., Brown, V.E., Jones, A., Lane, K.L., McMahon, S.D., Reddy, L.A. & Reynolds, C.R. (2013). Understanding and preventing violence directed against teachers recommendations for a national research, practice, and policy agenda. *American Psychologist*,75-87.

Gluschkoff, K., Elovainio, M., Hintsa,T., Pentti, J., Salo, P., Kivimäki, M., & Jussi, V, J. (2020). Organisational justice protects against the negative effect of workplace violence on teachers' sleep: a longitudinal cohort study. *Occup Environ Med*, 74, 511–516. https://doi.org/10.1136/oemed-2016-104027

Gray, C., Wilcox, G., & Nordstokke, D. (2017). Teacher mental healt, school climate, inclusive education and student learning: A review. *Canadian Psychology/Psychologie Canadienne, 58*(3), 203e210.

Huang, F. L., Eddy, C. L., & Camp, E. (2017). The role of the perceptions of school climate and teacher victimization by students. *Journal of Interpersonal Violence*, 1-26. https://doi.org/10.1177/0886260517721898

Khoury-Khassabri, M,, Astor, R.A., & Benbenishty R. (2009). Middle eastern adolescents' perpetration of school violence against peers and teachers: a cross-cultural and ecological analysis. *Journal of Interpersonal Violence*, 24,159-182.

Kõiv, K. (2015). Changes over a ten-year ınterval in the prevalence of teacher-targeted bullying. *Procedia-Social and Behavioral Sciences*, 171, 126–133. https://doi.org/10.1016/j.sbspro.2015.01.098 .

Kopecký, K., & Szotkowski, R. (2017). Specifics of cyberbullying of teachers in Czech schools – A national research. *Informatics in Education, 16* (1), 103–119. https://doi.org/10.15388/infedu.2017.06

Lobiondo-Wood G., & Haber J. (2010). *Nursing research: methods and critical appraisal for evidence- based practice.* St Louis, MO: Mosby.

Lokmić, M., Opić, S., & Bilić, V. (2013). Violence against teachers – rule or exception? *International Journal of Cognitive Research in Science, Engineering and Education, 1*(2), 1-10.

Maeng; J.L., Malone; M., Cornell, D. (2020). Student threats of violence against teachers: Prevalence and outcomes using a threat assessment approach. *Teaching and Teacher Education*,87,1-11.

Mahome, M.M. (2019). The prevalence of learner-on-teacher school-based violence: a qualitative study. *Acta Criminologica: African Journal of Criminology & Victimology*, *32*(2), 91-104.

McMahon, S.D., Martinez, A. & Espelage, D.R.., Redy, L.A., Lane, K., Anderman, E.M., Reynolds, C.R., & Jones, A.B.V. (2014). Violence directed against teachers: Results from a national survey. *Psychology in the Schools*, *51*(7), 753-766. https://doi.org/10.1002/pits.21777

Moon, B., Morash, M., Jang, J., & Jeong, S. (2015). Violence against teachers in South Korea: Negative consequences and factors leading to emotional distress. *Violence and Victims, 30*(2), 279–292. https://doi.org/10.1891/0886-6708 .

Moon, B., Saw, G,. & McCluskey, J. (2020). Teacher victimization and turnover: focusing on different types and multiple victimization, *Journal of School Violence*, 19(3), 406-420, https://doi.org/10.1080/15388220.2020.1725529

Nielsen, M. B., & Einarsen, S. V. (2018). What we know, what we do not know, and what we should and could have known about workplace bullying: An overview of the literature and Agenda for future research. *Aggression and Violent Behavior*, 42, 71–83. https://doi.org/10.1016/j.avb.2018.06.007

Noble, H. & Smith, J. (2015). Issues of validity and reliability in qualitative research. *Evidence-Based Nursing*, *18* (2), 34-35.

Peist, E., McMahon, S.D., Davis, J.O., & Keys, C.B. (2020). Teacher turnover in the context of teacher-directed violence: an empowerment lens. *Journal of School Violence*, *19*(4), 553-565, https://doi.org/10.1080/15388220.2020.1779081 .

Prpić, M. (2021). Students' violence against teachers in relation to school climate. Varstvoslovje, *Journal of Criminal Justice and Security*, 4, 405-425

Segalo, L., & Rambuda, A.M. (2018). South African public school teachers' views on right to discipline learners. *South African Journal of Education*, *38* (2), 1-7.

Shields, N., & Nadasen, K., & Hanneke, C. (2015). Teacher responses to school violence in Cape Town, South Africa. *Journal of Applied Social Science*, *9*(1), 47–64. https://doi.org/10.1177/1936724414528181

Singh, G. D., & Steyn, T. (2014). The impact of learner violence in rural South African schools. *Journal of Sociology and Social Anthropology*, *5*(1), 81-93. https://doi.org/10.1080/09766634.2014.11885612

Smith, J. A., Larkin, M. H., & Flowers, P. (2009). *Interpretative phenomenological analysis: Theory, method and research.* London: SAGE

Smith, J.A. (2011a) Evaluating the contribution of interpretative phenomenological analysis. *Health Psychology Review*, 5, 9-27.

Smith, J.A. (2011b). Evaluating the contribution of interpretative phenomenological analysis: A reply to the commentaries and further development of criteria. *Health Psychology Review*, 5, 55-61.

Ünsal, Y.. & Atanur-Baskan, G. (2021). The problems of teachers who have immigrant students in their classes and solutions. *Journal of Computer and Education Research, 9* (17), 199-224. https://doi.org/10.18009/jcer.838228

van der Westhuizen, C.N. & Maree, J.G. (2010). Student teachers' perceptions of violence in primary schools. *Acta Criminologica, 23*(2),1-18.

Waheed A., & Youssef, I. (2007). Occupational violence against secondary schools' teachers in ismailia city. *Egyptian Journal of Occupational Medicine*, *31* (2), 185-208.

Wilson, C. M., Douglas, K. S., & Lyon, D. R. (2011). Violence against teachers: Prevalence and consequences. *Journal of Interpersonal Violence*, 26, 2353–2371. https://doi.org/10.1177/0886260510383027

Zulu, B.M., Urbani, G., van der Merwe, A., & van der Walt, J.L. (2004). Violence as an impediment to a culture of teaching and learning in some South African schools. *South African Journal of Education*, *24*(2), 170–175

Zurawiecki, D. M. (2013). *The impact of student threats and assaults on teacher attrition* (Unpublished doctoral dissertation). Rutgers, The State University of New Jersey, New Brunswick.

Review Article

Experiences and Challenges of Adapting to Online Learning during Covid -19 Induced Lockdown: The Case of Gweru Urban Tertiary Students in Zimbabwe *

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Abstract

The novel Corona virus resulted in lockdown measures being put in place in order to curb the spread of the virus. This led to the closure of all schools and tertiary institutions. In Zimbabwe, the Ministry of Higher and Tertiary Education, Innovation, Science, and Technology Development (MHEISTD) announced the suspension of face-to-face teaching and learning and indicated that learning would continue online. This was an unexpected new experience for tertiary students. This study sought to explore the experiences and challenges faced by tertiary students in Gweru in adapting to online learning during the lockdown induced by COVID-19. The study was a netnographic study in which a cybercommunity of fifty tertiary students from five different tertiary institutions in Gweru was created. Purposive and snowball sampling were used to select the students who participated in a WhatsApp group. The students participated in text discussions, voice calls, and group discussions and responded to questions probed by the researcher. The results showed that online learning was a new frontier in their learning experiences, and they faced several challenges in adapting to its use. The study concluded that tertiary institutions should embrace blended learning in order to adequately prepare for online learning by both lecturers and students in times of disasters and pandemics like COVID-19, which restrict face-to-face learning. The study recommended that tertiary institutions equip students and lecturers with the skills to adapt to online teaching and learning. Students should be provided with the requisite online learning tools in order to effectively participate in online teaching and learning activities.

Keywords: Blended learning, corona virus, lockdown, COVID-19, online learning

1. INTRODUCTION

COVID-19 is a highly infectious disease that is caused by the novel Corona virus. The disease is reported to have originated in Wuhan, China, in 2019. The disease was unstoppable, uncontrollable, and quickly spread in many countries throughout the world. The number of COVID-19 deaths across the world rapidly increased, with no end or immediate solution in sight. Zimbabwe was not spared. The World Health Organization declared COVID-19 a pandemic on March 11, 2020. WHO issued guidelines to mitigate the spread of the pandemic, and lockdown was one of the key recommended preventive measures. On March 23, 2020, Zimbabwe introduced lockdown measures in order to contain the spread of disease. The COVID-19-induced lockdown led to the closure of all learning institutions. Many countries adopted lockdown as a reactive and proactive measure to the outbreak of the disease (Erika & Nicholas, 2020). Reactive measures were the reactions upon the discovery of coronavirus cases, and proactive measures were the steps put in place to prevent the disease before it reached the doorstep.

A COVID-19-induced lockdown was a mass quarantine that included an order to stay home or obliterating entire movements of individuals in order to curb the spread of COVID-19 (Mali et al.

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2020). This meant that social life in public communities was restrained. Private organisations, businesses, and Educational institutions were temporarily closed. On March 24, 2020, the government of Zimbabwe announced the closure of all learning institutions. The decision to close institutions was in line with the principle that large gatherings of people would constitute a serious risk regarding the spread of the virus (IESALC, 2020). In Gweru, Mkoba Teachers College and Gweru Polytechnic were the two tertiary institutions in the province that were designated as quarantine centres for some Zimbabwean citizens returning from other countries.

The closure of tertiary institutions meant the cessation of face-to-face teaching and learning activities in tertiary institutions. This was a huge disruptor of student life and the functions of tertiary institutions (UNESCO, 2020). Students were restricted to their homes. Movement from one place to another was also restricted. The disease had brought an unprecedented way of life to the students. The pandemic added not only a fundamental transformational change to the way people lived but also to how students were taught throughout the world. Educational institutions had to resort to online teaching and learning. In Zimbabwe, the Minister of Higher Education, Innovation, Science, and Technology Development instructed that learning in tertiary institutions would continue to be taught online. This meant that tertiary institutions had to adapt to the use of ICT as pedagogical tools to ensure remote teaching and learning. Students were also expected to adapt to the use of ICT as learning tools. The remote learning meant that students had to forgo learning in a regular face-to-face class with lecturers in lecture rooms. Students had to learn from where they lived, usually through electronic means. This ushered in the intense use of technology-based learning. It was important to explore the experiences and challenges faced by tertiary students in adapting to this new mode of learning.

Gweru Urban is home to most students from Midlands State University, Gweru Polytechnic, Mkoba Teachers College, Zimbabwe Open University, foreign students, and other institutions throughout the country. Students from these institutions were trapped in their homes during lockdown. A new way of life and learning was ushered in by the announcement of lockdown. Some students had barely a fortnight of learning after opening, while others were just beginning industrial attachment and teaching practice. Students were left wondering what would become of their studies. COVID-19 posed challenges and complications of unprecedented magnitude to all students. Online teaching and learning was adopted in order to navigate the challenges caused by the restrictions of social distance and face-to-face learning. Online learning meant a situation in which students had to learn over the internet from where they lived. The type of learning required accessibility, connectivity, flexibility, and the ability to provoke different types of learning interactions (Moore et al., 2011). It was an innovative approach to the way teaching and learning had to take place.

1.1. Statement of the Problem

Online learning was a novel mode of learning that was adopted by tertiary institutions in Zimbabwe in order to ensure that teaching and learning continued during the COVID-19-induced lockdown. Most tertiary institutions did not have an online teaching and learning platform before COVID-19 (Tarisayi & Munyaradzi, 2021). Students and lecturers were not ready and fully prepared for the new mode of teaching and learning. There is limited information regarding the experiences and challenges experienced by tertiary students adapting to online learning during COVID-19 induced lockdown. It is in this context that the study was undertaken. The study sought to explore the experiences and challenges faced by students in adapting to online learning during lockdown.

1.2. Research Questions

The study was guided by the following research questions:

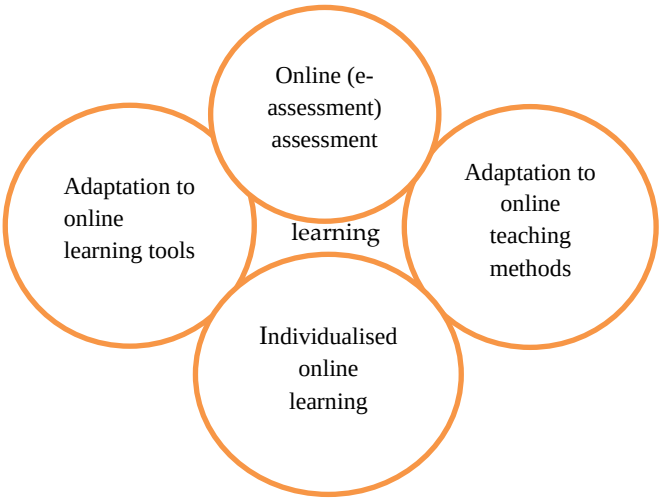
- Did tertiary students in Gweru urban mange to adapt to online line teaching learning mode and how did this affect their learning during lock down?
- What were the challenges faced by students in adapting to online learning?

- Which strategies did students proffer in order to ensure successful implementation of online learning in in future?

1.3. Review of Related Literature

1.3.1. Conceptual framework

The study looked at online learning as the central issue and how the students adapted to it in terms of four key aspects, namely, adaptation to the use of online learning tools, adaptation to online teaching and learning methods, online assessments, and individualised online learning, as shown by the diagram below.



Adaptation to online teaching methods entailed the use of Google Classroom, Moodle, Google Meet, Zoom, Microsoft Teams, and other online teaching and learning modes as teaching and learning tools. Students were expected to download and log in to these applications in order to take part in the learning process. The process required high technological competencies and literacy. The study thus wanted to explore the students' experiences with and challenges of adapting to these new modes of teaching and learning and the extent to which they managed to adapt to the use of the new learning modes.

Adaptation to online learning tools entailed students' ability to use ICT infrastructure in order to take part in online teaching and learning activities. The gate pass to taking part in online activities was possession of a computer or smart phone, access to the internet, and the ability to log on to links in order to be part of the virtual class. Students need to have the requisite ICT tools and ought to be able to use them (Rasheed, 2020) argue that a lack of technological competencies was a major challenge faced by students in adapting to online learning.

The study also wanted to explore students' experiences with and challenges of individualised home online learning. Lockdown restricted students to the home environment. There was a need for sufficient learning resources and adequate online learning space. Virtual lessons required students to have good time management skills, the ability to use online peer learning strategies, the ability to use complex technology (video projection, microphones, and speakers), and to be comfortable being the centre of attention during online lessons.

Assessment is a crucial component of teaching, for it helps monitor students' progress and offer required study material. During COVID-19, assessment changed from traditional face-to-face to online. Teachers were supposed to produce tests or exercises in order to access students' progress online. The study wanted to explore students' experiences with and challenges in adapting to this mode of assessment.

1.4. Online Learning

Online learning is a method of teaching and learning that enables educators to use internet and computer network media to provide learning material to learners during lockdown (Ompusunggu & Sari, 2019). This meant that lectures' communication and assessments were carried out in virtual environments. The method of teaching had two main approaches, namely synchronous and asynchronous learning (Watts, 2016). Synchronous learning is a situation where learners learn together in a virtual class, allowing greater participation and a sense of community. Asynchronous learning entailed a situation when students studied on their own using forums such as emails, materials, and messages at the expense of group interaction. If well adopted, online learning could present a lot of benefits to students and lecturers. Teaching and learning could be carried out anywhere and anytime. A significant amount of money could be saved since students and lecturers would not need to commute daily. Students with physical disabilities could also benefit from participating in virtual lessons since they would be spared the challenges of moving from one place to another. In a way, it is another platform for providing equality in educational provision. Above all, it was the best way to ensure that physical distance was maintained.

1.4.1. Experiences and challenges of online learning

There has been an explosion of studies on the effects of COVID-18 on education. Many studies zeroed in on the experiences faced by students during the COVID-19 pandemic. Students had to adapt to the new normal. The closure of educational institutions prompted a switch from face-to-face learning to online learning. This was meant to ensure that learning continued during the pandemic while curbing its spread. Studies by Kapisa et al. (2020) and Hew et al. (2020) indicated that students faced many obstacles during the online home learning environment. They lacked mastery of technology due to the high cost of internet and limited interaction between and amongst fellow students. The COVID-19-induced lockdown made significant disruptions to students' learning experiences. The home confinement to which students were exposed had a negative effect on their performance. On the other hand, a quantitative descriptive study by Singh et al. (2020) indicated that students appreciated and enjoyed the use of online learning. This could be a result of the students having adequate online learning tools and experience with online learning pedagogy.

Poor learning space was another challenge faced by tertiary students during lockdown. This was confirmed by a study by Barrot et al. (2021) which concluded that many students lacked access to fieldwork and laboratories. They also lacked appropriate ICT learning devices. A parallel study carried out in Ghana by Adarkwah (2021) also indicated that students faced similar challenges. Teachers who were used to the conventional teaching approach were forced to adapt to online learning despite their lack of ICT competencies. Online learning thus demanded the use of online learning equipment and competencies, which the students and lecturers did not have. Lockdown also deprived students of access to essential learning facilities like laboratories and workshops. Students who were majoring in practical subjects that required the development of skills through hands-on activities were the most disadvantaged. They were expected to learn with limited learning facilities, and this had a negative bearing on their performance. It can be concluded from the studies carried out that technical (poor internet infrastructure), methodological (content delivery), and personal challenges militated against the adaptation of online learning by tertiary students during COVID-19-induced lockdown.

1.5. Significance of the Study

The study is important in that it highlights individual and technology problems faced by students in trying to adapt to online learning. Furthermore, the study will help the Ministry of Higher and Tertiary Education Innovation, Science, and Technology Development take proactive actions regarding online learning so as to mitigate the effects of pandemics and disasters that may require the use of online teaching and learning in the future. The study also unpacks and adds literature to online learning about the challenges faced by students and strategies that can be used to overcome them. The

results will also help in removing, reducing, or solving the barriers related to distance learning that have been adopted by many tertiary institutions. The study also sheds light on the need to devise comprehensive strategies related to educational, emotional counseling, and stress management for students who have been psychologically disturbed. Provisions of solutions to the challenges faced by students in adapting to Online learning is another profound significance for the student. The study gives contextual solutions based on the students' lived experiences.

2. METHODOLOGY

This was a qualitative ethnographic study. A netnographic study is a research method that is used to access community members' knowledge and experiences online (Kozinets, 2002). The method uses online environments such as social media to collect data. The method was the most suitable for collecting data during the COVID-19 period since it enabled the collection of data while maintaining physical distance between the researcher and the participants. The researchers created a cybercommunity of fifty tertiary students from five tertiary institutions in order to facilitate research without physical contact. Moreover, the concealment of the physical presence of the researcher in the cybercommunity gave the netnographic study an advantage over other forms of ethnography. Virtual communities enable one to gather information on a collectively created topic without any physical contact (Chen et al. 2012). In this study, the researcher wanted to collect data on students' diverse experiences and challenges in adapting to online learning during lockdown. (Udenze & Ugoala, 2020) argue that a netnographic study is a bottomless pit capable of automatically archiving a quantum amount of data. It is also capable of narrowing and handling large digital data sets. The approach is also able to digitally analyse and contextualise data and navigate difficult online ethical matters.

A WhatsApp group made up of fifty students from five different tertiary institutions was created. WhatsApp was easy to use and convenient, and it was an affordable interaction platform during lockdown (Tarisayi & Munyaradzi, 2021). It provided an environment that reflected and included features of real life and was valuable in studying interactions among the students. WhatsApp also enabled the exploration of experiences and students' behaviours for monitoring their development over time. The researchers were also able to experience a sense of immersion and share experiences, attitudes, beliefs, and challenges faced by students in adapting to online teaching and learning.

Purposive sampling was used to select the first five tertiary students in the Midlands. Snowball sampling was further used to identify and supply contact details of fellow students from their respective institutions. The sampled tertiary students participated in text and voice call discussions. The data was automatically archived on the WhatsApp platform, which made it easy for the researchers to analyse it through conversational threads and themes. The researchers adopted an interpretivist paradigm to understand, explain, and demystify social reality through the eyes of different participants (Cohen et al., 2018). Meanings were developed through the interactions of social processes involving students in the cyber environment. A social constructivist approach was also used in order to understand the multiple meanings that the students made of the phenomenon under study. Furthermore, the apparent absence of a pre-discursive reality in cyberspace encouraged the adoption of constructivist frameworks (Udenze & Ugoala, 2020).

Procedure

Students who participated in the study received WhatsApp messages that explained the purpose of the study and invited them to take part in it. The students would give consent to participate through written WhatsApp messages. They were then included in a WhatsApp group named "Online Teaching and Learning Experiences." This became the cyber community in which the researcher presided during the WhatsApp focus group discussions, which took place over a period of one month.

3. FINDINGS

3.1. Adaptation to Online Learning Methods

Conversation threads indicated that a number of challenges militated against students' ability to adapt to online teaching and learning. The following table shows the students' responses.

Table 1. Main challenges face by students N = 50

Challenge	Number of students	Percentage
Access to good and uninterrupted Internet connectivity	3	6%
Unsuitable online learning space	45	90%
Inability to purchase e-learning bundles	50	100%
Technological complexities of joining virtual classes	46	92%

The majority of the students (94%) indicated that they had internet connectivity challenges. Data from the archived WhatsApp platform was saturated with responses that indicated that students' homes were not connected to the internet, as shown by the following popular responses:

1. '*We are not connected to the internet'*
2. *'Our family cannot afford internet charges'*
3. *'We are not connected'*

Lack of internet connectivity presented a major limiting factor in students' endeavours to adapt to online learning. (eLearning Africa 2020) argues that the success of online learning depends on the availability of the internet. The use of e-learning data bundles could have been a solution to this problem. However, all the students indicated that they could not afford to purchase e-learning bundles. Their family incomes were financially crippled by the fact that breadwinners were not working during lockdown. The few students who had the privilege of having internet connectivity complained of the technological complexities of joining the virtual classes. Female students confessed that they were not tech-savvy, and as a result, they could not benefit much from the online teaching and learning activities that were going on.

The students in the cyber community also complained about the unsuitability of the home as a virtual learning environment. Responses indicated that there was unlikely to be a quiet room or other quiet place to carry your virtual lessons. The home was a crowded place considering that everyone was at home during lockdown. It was very difficult to have a free virtual learning space. As a result, the students did not manage to take part in online teaching and learning activities in which they were scheduled to participate. Most of them failed to complete their coursework.

Social cohesion, which is consistent with cooperative learning, was also greatly disrupted. By learning alone at home, students felt they no longer belonged to an institution or a class. The social solidarity in which students helped each other to do tasks and assignments was missing for some students, as indicated by one student.

'I feel like in a quarantined learning environment. This is not different from being Covid 19 victim'

The remark showed that the student lost social capital due to lack of interaction with peers and lecture mates. Moiseyenko (2005) argues that social cohesion enhances the social networks and the norms of reciprocity and trustworthiness that arise from connections among individuals. Due to lockdown students missed connection and reciprocity.

Fear of being a victim of COVID-19 was another life-threatening experience that the students had. All students expressed fear of death. Hearing and seeing loved ones die of COVID-19 made them feel that death was waiting for them somewhere outside. The fear of being victims of COVID-19 ruined their peace of mind. Their dreams, prospects of finishing their studies, and hopes of continuing to live were locked down. They confessed to seeing darkness everywhere. They had no hopes of a bright future. This had a negative bearing on their studies, which were carried out in an unusual

learning environment using a new mode of learning. They were worried as to when they would be able to return to face-to-face learning.

3.2. Assessment during Covid 19-pandemic

Before to the pandemic, students were used to immediate written or verbal feedback from lecturers. They would receive marked written assignments, and lecturers would discuss their performances verbally. The lockdown presented assessment challenges to learners. Assessment and feedback are now provided online. Students felt that lecturers also faced challenges with the shift to online teaching and learning since some lecturers never communicated or gave feedback on the assignments they sent. Some students did not manage to submit assignments or participate in online testing due to a lack of internet connectivity. Technological complexities also inhibited them from accessing assignments and study material from the internet.

The technological complexities and lack of ICT competencies required when one wanted to join online teaching and learning activities were a motivating factor in participating in these activities. On short notice, students were flooded with new terminologies and skills that they were supposed to know and use. The terms Zoom, Zoom Link, Meeting Passcode, Google Classroom, Class Code, and Google Meet were now in use, and students did not know what to do, as some students remarked;

1. *'The lecture said use the code to join the google class and get tutorials. I did not know where to get the google class and enter the code'*
2. *'I did not know what to do when I was asked to join google meet for a lesson'*
3. *'The application needed me to download the application and I had no internet'*
4. *'I wanted to say something. I did not know what to do on the Google Meet platform'*

Noteworthy from the remarks was the fact that students did not have prior learning on the use of online learning modes of learning. Students could have found it easy to adapt to online modes of learning had they been given orientation on how to use online teaching and learning technologies. Online learning was abruptly introduced to them without their having had prior orientation on how to use it.

Table 2. Ability to use online learning platform used by lecturers

Platform	Total number of students expected to use the platform	Total number of students who were able to use it	Percentage
Online class platforms			
Google classroom	50	5	10%
Google meet	10	5	50%
Mobile Conversations	50	50	100%
Zoom	40	8	20%
Material Sharing Platforms			
E-mail	50	35	70%
WhatsApp	50	50	100%
Institutional websites	50	5	10%

Four different online learning platforms, namely Google Classroom, Google Meet, Mobile Conversations, and Zoom, were adopted by five institutions whose students participated in the cyber community. All the institutions used Google Classroom as a platform for online teaching and learning. Only 10 percent of the students indicated that they were able to use the platform for learning. This meant that the majority of the students were not able to access study material, submit assignments, or receive them through the application. An inquiry on the reason why the students did not use the platform indicated a saturation of the following responses:

1. *'It was a completely new method I needed training on how to use it'*
2. *' It was a complicated approach and I did not know how to join the class'*
3. *'From nowhere I was asked to join a class with a code. I did not know how to do it'*
4. *'There was no internet I never attempted to join the said classes'*

Noteworthy from the responses was the fact that the students were not capacitated to use the platform. To them, it was a complicated and novel method of teaching. This could be an indication that the students have no self-efficacy towards the use of ICT tools. Liaw et al. (2007) argue that the use and willingness to use ICT tools depends on one's confidence and ability to use the tools. Furthermore, these online learning platforms were not usable in the absence of the internet, which most of them had no access to. (eLearning Africa 2020) asserts that online learning platforms are only accessible to those with internet access. The net effect of the lack of internet connectivity and the inability to use the platforms was the inability to submit assignments and benefit from e-assessment. This had a negative bearing on their performance and mental health.

Fifty percent (50%) of students from one institution indicated that when Google Meet was introduced by their institution, they were able to successfully use the platform for learning. Thirty (30%) of these students indicated that they were quick to adapt to the Google Meet platform because they were studying information science. Those who failed to use the platform cited lack of training on the use of the platform, the internet, power outages, and home disturbances as factors that militated against their use of the platform.

Mobile communication was used by all students. The reason for the popular use of the platform was that it used smart phones, which most students used for communication. WhatsApp was the most popular mode of communication and material sharing platform (Maphosa et al. 2020; Rambe & Chipunza 2013) agree that WhatsApp has revolutionised communication due to its ease of use and affordability. It can enhance autonomous, collaborative, and learner-centered education. WhatsApp and e-mail were cited as the most used material sharing platforms during the pandemic. Institutional websites were not used by many students. It demanded good connectivity, which students and lecturers could not access.

3.3.1. Availability of online learning tools

The availability of online teaching and learning tools is key to successful participation in online teaching and learning activities. The study explored the teaching and learning tools to which the students had access. The results are shown in the table below.

Table 3. Online teaching and learning facilities accessible to tertiary students during lockdown N = 50

Online learning tool	Number of students who could accessed the facilities	Percentage
Wi-Fi connection	3	6%
Laptop	30	60%
Smart phone / Tablet	50	100%
E-learning bundles	0	0%

Results showed that about half of the students did not have the requisite online teaching and learning tools. Many students did not have access to the internet. This was made worse by the fact that all the students could not afford to purchase e-learning bundles. This had a negative bearing on the students' participation in online learning activities. As a result, many students did not manage to submit the required coursework and sit for the examinations. All the students admitted that their performance was lower in the end-of-term and semester examinations.

3.4. Students' Suggestions on how to Enhance Smooth Online Teaching and Learning

Because connectivity was the major challenge faced by students, they suggested internet connectivity should be a ubiquitous resource.

1 *We should have access to the internet any time anywhere for us to participle in on line learning*

2. Internet connectivity is the fuel that drive online learning vehicle. Without it no learning takes place

3. The government should negotiate with internet providers for subsided data bundles for students

The sentiments expressed by students indicated that adequate provision of the internet could enhance the smooth implementation of online learning. Nazan et al. (2011) argue that the internet is a storage house of information that offers communication without boundaries, interactive learning, and online research. Students can be deprived of these benefits if they do not have access to the internet. Students also suggested that they should also be provided with adequate ICT infrastructure for them to participate in online teaching and learning activities. These include computers, laptops, and smartphones and their use. They should also be able to make use of emerging online teaching and learning modes.

4. CONCLUSION

Higher and tertiary institutions did not fully embrace online teaching and learning during COVID-19 lockdown. Students had challenges adapting to the online teaching and learning method. They faced challenges with connectivity, an inappropriate online learning space at home, and the technological complexity required to participate in virtual online learning activities. The students suggested that internet connectivity should be a ubiquitous resource in order to ensure successful and smooth adaptation to online learning activities. They also need to be capacitated with ICT skills for online learning in order to remove the technological complexities faced when one wants to participate in online teaching and learning activities. Technically, both teachers and students lost teaching and learning time in terms of the coverage of the syllabus in time for examinations. COVID-19 exposed the government‘s reluctance to expedite online learning, which was proposed by the 1999 Presidential Commission on Education.

Recommendations

The study made the following recommendations:

1. Internet connectivity should be a ubiquitous resource in order to ensure the successful implementation of online teaching and learning. The government should enter into partnerships with internet providers so they could avail affordable "e-learning data bundles" for students.
2. Tertiary institutions should ensure that there is adequate and uninterrupted internet connectivity in order to enable teaching and learning activities online.
3. The government should assist students in acquiring online learning technologies so that they can successfully participate in online teaching and learning activities.
4. Higher and tertiary institutions should capacitate students and lecturers with online learning skills in order to remove technological complexities that are encountered when one wants to participate in online teaching and learning activities.
5. Lectures and students should be equipped with knowledge of a variety of online teaching and learning platforms.

Acknowledgment

The data used in this study was confirmed by the researchers that it belongs to the years before 2020.

5. REFERENCES

Adarkwah. (2021). “I am not against online teaching, but what about us?” ICT in post Ghana Covid - 19. *Education and Information Technologies, 26*(2), 1665-1685.

Africa, e-learning. (2020). *Effects of covid19 on learning in Africa and its implications for the use of technology: A survey of experience and opinions of technology specialists*. London: Ceative Common Attribution 4.0 International.

Barrot. (2021). Students' online learning experiences during the pandemic and how they cope with them: The case of Philipines. *Education and Information Technologies*. https://doi.org/10.1007/s10639-021-10589-x

Chang. (2012). Understanding knowledge -sharing ,motivation, incentive,mechanisms and satisfaction in vitual commnunities. *Social Behaviour and Personality, 40*(4), 639-648.

Cohen. (2018). *Research methods in education* (8th ed.). New York: Routledge .

Hew. (2020). Transition to the "new normal" of learning in unpredictable times: Pedagogical practices and learning performance in fully online fipped classrooms. *International Journal of Educational Technology in Higher Education, 17*(1), 1-22.

Kapisa. (2020). *Impact of lockdown on learning status of undergraduate and postgradaute students during covid -19 in West Bengal.* India: Children and Youth Sevices Review.

Kozinets. (2002). The field behind the screen:Using netnography for marketing research in online communities. *Journal of Marketing Research, 36*, 61-72.

Liaw. (2007). Surveying instructor learner attitudes towards E-learning. *Computers and Education, 47*(4), 1066-1080.

Mali. (2020). The rise of new corona infection-COVID-19: A recent update. *4*, 35-41.

Maphosa. (2020). AUTAUT evaluation of whatsApp as atool for lecture delivery duing the Covid-19 lockdown at a Zimbabwean university. *International Journal of Higher Education, 9*(5), 84-93.

Ompusunggu. (2019). Effectiveness of edmodo-based e-learning use on mathematical communication skills. *J. Curere, 3*, 58–66.

Rambe. (2013). *Using mobile devices to leverage students access to collaboratively-generated resources: A case of whatsApp instant messaging at a South Afican university*. International Conference on Advanced Information and Technology fo Education.

Rasheed. (2020). *Challenges in online componentof blended learning: A systematic review.*

Singh. (2020). MMedical Education during the Covid-19 pandemic: A single institutionexperience . *Indaian Pediatrics, 57*(7), 678-679.

Tarisayi & Munyaradzi (2021). A simple solution adopted duing Covid-19 pandemic: Using WhatsApp at a university of Zimabwe . *Issues in Educational Research, 31*(2).

Udenze & Ugoala (2020). Building community and construct ing identity on WhatsApp: A Netnographic Study. *World Media Journal of Russian Media and Journalism*. https://doi.org/10.30547/worldofmedia.4.2019.3

Watts. (2016). Synchronous and asynchronous communication in distance learning:A review of the literature. *Q. Rev. Distance Educ, 17*, 23–32.