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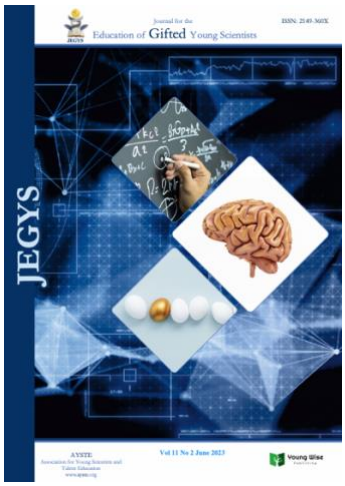

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From the Editor

Trends in gifted education: Evolutionary stages in sequence; Creativity, Giftedness, Entrepreneurship

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Abstract

Although gifted education finds its place in education with the popularization of the theory of evolution, the human species continues its development by changing its shell through interaction with biological, physiological, social and economic factors. "Entrepreneurship", which is the last stage with the pandemic, makes its hegemony felt seriously. What does entrepreneurship and opportunities mean for gifted youth? How is this different from normal ones? What approach should be taken in education? These questions may be questions that we seek answers to in at least 10-20 years.

Keywords:

entrepreneurship, gifted youth, gifted young scientists, opportunities, ICGYSE

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Theories put forward to understand the working of the human brain; Unlike other animals, it focuses on the ability of humans to produce new ideas (creativity) in problem solving. Creativity studies have progressed independently in educational research for a while, and have become popular and trended by improving aspects such as evaluation (Torrance). He entered the education of the gifted. I always say, "Creativity studies is a dead end, it will be exhausted in the future, it will only repeat itself, it will have to proceed like a parasite" . After creativity studies became a trend, Renzulli, who I think is very intelligent and gifted, places the creativity component in his theory. Because the "creativity" missile has been fired, if we put gifted education next to it, gifted education will also be activated. In describing the history of Stoeger's (2009) research on giftedness, we can see periods of hibernation and periods of flare-up. With the acceleration of gifted education, the concept of "giftedness" has become a trend and has led to the development of research in this field. After the periods of creativity and giftedness, especially with the pandemic, the phenomenon that economics is the most important science for humanity after health science has emerged. That's why "entrepreneurship" has been the most important issue for both normal people and gifted children and youth. It is clear that the most emphasized subject in the field of education (especially gifted education) for the current and the next 10-20 years will be **entrepreneurship skills and entrepreneurship education**.

The theme at the 4th ICGYSE this year; "Entrepreneurship and Opportunities". We draw attention to the congress and researches with this theme to the academicians who follow JEGYS.

Enjoy the pleasure of reading the articles

Dr. Hasan Said Tortop
Editor-in-Chief of the JEGYS

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Research Article

Chamber music examples and performance analysis for the development of musical talent for undergraduate education

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Abstract

The development of musical talent can be possible with the mentoring of scientists in the field of musical talent. Academics in the field of music have tested the effectiveness of examples, and their analyzes can make important contributions to the development of musical talent. This research has a qualitative character since it was conducted with a document analysis technique based on experience and observation, and it is an examination of the researcher's selection of materials to be used in music teaching, the reasons for this, and analysis. This study provides fifteen chamber works including string duos, trios, quartets, quintets, and sextets suitable for the undergraduate students. The aim of this study is during undergraduate education, the technical development of the student is prioritized in instrumental studies. Secondly, solo repertoire decision is made by teachers for the young student to expand their repertoire. Chamber music education is neglected in comparison to solo repertoire and technical repertoire. Playing together with other students is a very helpful to hear and play simultaneously. Therefore, this list will help students to analyze their chamber music repertoire and understand the technical difficulties as well as publisher info, timing etc.

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Introduction

The term “chamber music” could be traced back to the 17th century European courts (Biber-Oz, 2001). Chamber music instrumentation may vary depending on the repertoire. For instance, some compositions would have a string trio in which a violin, viola and a cello is needed, some other composition may have a piano quartet in which a violin, viola, cello, and a piano is needed. During music education, the priority of repertoire selection is based on many details. First, the starting age of the student, the instrument itself, talent, practice concentration of the student etc. When a student starts at a young age (between 3 to 5 years of age), the focus is learning the instrument from a technical point of view . As opposed to the early starting age, if a student starts learning an instrument after the age of 15, the focus of learning shifts into learning everything at the once which includes chamber music, theory, solo repertoire, history etc. The age also is a determining factor for muscle development and selection of the instrument based on child’s physical condition. This article will show the levels of difficulty and a variety of instrumentation.

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Method

This research has a qualitative character since it was conducted with a document analysis technique based on experience and observation, and it is an examination of the researcher's selection of materials to be used in music teaching. In the selection of the works, aspects such as performance difficulties and duration were taken into account.

Results

String Duos

Duos are important part of one's progress as an undergraduate student. It is the easiest understanding of playing together with another. Duos can include two violins, violin and viola, violin and cello and violin and bass.

Wolfgang Amadeus Mozart (1756-1791)

String Duo No.1 in G Major for violin and viola, K. 423

This work can be used to challenge the students' technical and musical abilities as well as their stylistic playing.

Performance Difficulties

This piece has three movements. First movement is an Allegro. Some of the performance difficulty of this piece includes, Scales, Arpeggiation, some grace notes, double stops. The importance of chamber music playing in this piece can be demanding also, since it involves only two instruments, some sudden changes and running 16^{th} notes can be hard to play together. There are some rapid changes of dynamic level in the violin part. This feature would not only help the violinist to be together with the viola but also listen and watch carefully, too.

The second movement is an Adagio. This movement includes lots of 32^{nd} notes and since it is the slow movement, it would be important for players to pay attention to each other's phrasings. In this movement, viola is serving more as an accompaniment instrument.

The third movement is a Rondo (Allegro-cut time). Technically, it would be a challenge to play this movement for both instruments. There are lots of triplets, trills, 32^{nd} notes. It would be a very demanding challenge for an undergraduate student to perform this piece

Performance time: 14 minutes

Publishers of this work: Alfred Music Publishing, International Music Company, Baerenreiter Verlag,

Recommended publisher: G. Henle Verlag

George Frideric Handel (1685-1759) and Johann Halvorsen (1864-1935)

Passacaglia Duo for Violin and Viola (or Cello)

Performance difficulties

This piece was edited by J. Halvorsen, who himself was a good violinist. The entire piece is combined with some technical difficulties such as double stops, spiccato sections, syncopated rhythms, scales, sudden pizzicatos, arpeggiation. The musicality is very demanding in this piece as well. This piece shows a very equal solo and accompaniment sections for both instruments. It may be given to more upper class students.

Performance time: Approximately 7 minutes.

Publishers of this work: Michael Press, International Music Company, Music Sales

Recommended publisher: International Music Company

String Trios

Nicolò Paganini (1782-1840)

Terzetto, string trio for Guitar, Violin and Cello

This piece has four movements. Paganini, in all the four movements, includes more solo sections for violin than cello and guitar. Since he, himself, was a guitar player also, the technical difficulty for the guitar can be also quite challenging. Violin and Cello share many of the same musical phrasings throughout the entire piece. The instruments in the accompaniment sections use lots of pizzicato while one instrument is playing the solo. The style of the piece is very light

except the third movement which is the slow movement in this trio. As it is expected, Paganini writes a demanding cello part as well as the violin part. There are some high notes in the cello part that require a high technical ability.
Publishers of this work: Masters Music Publications, Musikverlag Zimmermann,
Recommended publisher: Musikverlag Zimmermann
Performance Time: Approximately 23 minutes
Johannes Brahms (1833-1897)

Horn Trio in E Flat Major, Op.40
This trio has four movements. The instrumentation of this piece is Horn, Violin and Piano. This would be especially good for upper-class students to learn how to play with Brass instruments. It would be also quite helpful to understand the breathings that any brass or woodwind instruments have to deal with. In String Trios, students most of the time tend to adjust and change the bowings as they wish but with brass instruments, students would have a chance how other instruments have other things to adjust other than musical phrases.
Performance time: Approximately 30 minutes.
Publishers of this work: Edition Peters, Alfred Music Publishing, Dover Publications, International Music Company, Breitkopf and Haertel
Recommended publisher: Breitkopf and Haertel

Piano Trios
Anton Arensky (1861-1906)
Piano trio in D minor, Op.32
This trio has 4 movements. It is one of the most known works by Arensky. This trio may be given to those who are in final semester of their undergraduate degree. The musical aspect of this trio is very demanding. It is also very demanding technically, it has some leaps to high notes on the E string on violin as well as ***f.*** spiccato sections. The style of the second movement is very light as opposed to the first movement. Violin part has lots of *Ricochet* in this movement, so student should have finished many bow exercises prior to playing this piece. The third movement *Elegie* is a very challenging movement for musical ability. It can be helpful for students to learn how to work on their sound with their mute on. The last movement is very demanding for powerful sound and playing together with cello for the fast unison passages.
Performance time: Approximately 25 minutes
Publishers of this work: Edition Peters, Alfred Music Publishing, International Music Company, Walter Wollenweber.
Recommended Publisher: International Music Company

Dmitri Shostakovich (1906-1975)
Piano Trio No.2 in E minor, Op.67
This work has four movements. This should be one of the last chamber music pieces that an undergraduate can play in a chamber music ensemble setting. In order to play this piece stylistically, one should know many things about Shostakovich's life. Students should make sure to listen to many recordings and have an understanding of the piece. They should identify each movement in its own stylistic way as the similarity among movements is not very related.
Performance time: Approximately 26 minutes
Publishers of this work: International Music Company, Universal Edition
Recommended publisher: International Music Company

String Quartets
Olivier Messiaen (1908-1992)
Quartet for the end of time
This unique piece has eight movements. This should be given to students that have had modern theory classes or to students who are interested in playing experimental works. In this interesting work, Messiaen uses every moment to tell a story. This piece is particularly important to symbolize the instruments to the figures of nature and to religious figures.

Students should definitely read articles or search for the background of the piece in order to understand the piece completely. This piece also has a unique instrumentation such as violin, clarinet, cello and piano.
Performance time: Approximately 48 minutes
Publishers of this work: Editions Durand
Recommended publisher: Editions Durand

Ludwig van Beethoven (1770-1827)
String quartet No. 14 in C Sharp Minor, Op.131
This quartet consists of seven movements. This quartet was one of Beethoven's favorite quartets. The work was dedicated to Joseph von Stutterheim. It is indicated by Beethoven that the entire piece is to be played without any pause. The piece starts with a long introduction that lasts almost seven minutes, Adagio, and it continues to the fast second movement. This movement is challenging in terms of technique, playing together, dynamic level changes in different instruments. Third movement is like a transition to the fourth movement. The fourth movement is the longest movement in the piece and it has lots of variations, and expanded themes. Technically, this movement can be hard to play it together and to hear the other instruments since the dynamic level is pretty much the same for all the instruments. The last movement is a Presto and the most demanding one in terms of technical ability. It is important for the instruments to play the same melody together, sometimes it is viola, cello and viola and sometimes it is two violins. It is also important to play the pick-up notes together to be able to play the next downbeat together.
Performance time: Approximately 35 minutes
Publishers of this work: Dover Publications, Edition Peters, G. Henle Verlag, Schott Music, Universal Edition,
Recommended Publisher: G. Henle Verlag

Wolfgang Amadeus Mozart (1756-1791)
String Quartet in C Major, K. 465, "*The Dissonance* (or *Dissonant*)"
This work has four movements. This string quartet is specifically very important for students to listen how the chord structure resolves in a string quartet. It is important for them to understand where the important notes belong to and how they have their resolution before the Allegro section starts in the first movement. The style of Mozart should also be understood clearly by students in order to play this quartet stylistically. The clarity and dynamic adjustments, rhythmical changes are also demanding in this string quartet.
Performance time: Approximately 32 minutes
Publishers of this work: Emerson Edition, CD Sheet Music, Edition Peters, Dover Publications, Hal Leonard, Alfred Music Publishing, Universal Edition, Baerenreiter Verlag,
Recommended publisher: Baerenreiter Verlag

Bartók, Béla (1881-1945)
String Quartet, No.2, Op.17
This quartet has only three movements. Before an undergraduate finishes his/her degree, they should play at least one modern composition for a string group or any chamber music ensemble. It is quite important for them to try to understand the music and analyze the parts separately and try to give opinions about what they feel for specific movements. It is necessary for students to read the composer's biographical information and the background of the piece. Bartok, in this piece, uses folk motives and harmony of the piece is also very unique in terms of harmony, tempo changes, and dynamic level of instruments. Students should work on the harmony of this piece before they even play it as a group in order to understand the dissonance chords.
Performance time: Approximately 29 minutes
Publishers of this work: Boosey & Hawkes, Universal Edition, Hal Leonard, Masters Music Publications,
Recommended Publisher: Boosey & Hawkes

String Quartet with Voice
Samuel Barber (1910-1981)
Dover Beach for voice and String Quartet, Op.3
This work has only one movement. Barber composed this work in his early composition life. It is based on a poem by Matthew Arnold. The instrumentation of this work is a string quartet with a Baritone or a mezzo-soprano. This particular work would help students who are interested in playing in Opera orchestras. It would teach students how to synchronize with singing and their breathing timing. It would give them another opinion about playing with other musicians such as brass or woodwind players as well as singers.
Performance time: Approximately 11 minutes
Publishers of this work: G. Schirmer,
Recommended publisher: G. Schirmer

String Quintets with Bass
Antonín Dvořák (1841-1904)
String Quintet No. 2 in G major, Opus 77
This work has four movements. This piece can be given to upper-class students. It would be helpful for students to play in a quintet with a bass. It would also be helping students to adjust their dynamic level with more instruments which would give them the foundation of playing in larger ensembles. This piece has difficult moments for playing together, listening to one another, sudden dynamic level changes. Student should know where they have their individual phrases to adjust their dynamic level. Students also watch each other carefully to adjust sudden tempo changes.
Performance time: Approximately 35 minutes.
Publishers of this work: Praha, International Music Company, Schott Music
Recommended publisher: Praha

String Sextets
Johannes Brahms (1833-1897)
String sextet in B Flat Major, Op.18
This sextet includes four movements. The instrumentation for this work is two violins, two violas and two cellos. Students should have learnt about style of playing Brahms before they study this musically and technically demanding piece. The student should have learnt how to accompany other instruments as well as play with other instruments together prior to playing this piece as it requires a well-balanced chamber music playing skills.
Publishers of this work: Alfred Music Publishing, Edwin F. Kalmus, Schott Music, International Music Company
Recommended publisher: International Music Company
Performance time: 36 minutes

Piano Quartet
Aaron Copland (1900-1990)
Piano Quartet
This piano quartet has three movements. This work should be given to those who are also interested in theory as well as violin since this work was written in twelve-tone composition. It would be helpful for students to understand a modern composition with a different way of composition. Students should have listened to other modern compositions prior to studying this piece.
Publishers of this piece: Boosey & Hawkes
Recommended publisher: Boosey & Hawkes
Performance time: Approximately 22 minutes

Piano Quintets
Antonín Dvořák (1841-1904)
Piano quintet in A Major, Op.81

This work has four movements. This work would be a good example for students to learn other styles and nationalistic approach in compositions. Dvorak in this work uses an old ballad-form named "*Dumka*". It would be wise to ask the students to read about Dvorak and listen to some of his other works in order to understand his nationalistic style of composition that includes many traditional folk song from Czech.

Publishers of this work: International Music Company, Music Minus One, Praha, Simrock, Schott Music

Recommended publisher: Praha

Performance time: Approximately 42 minutes

Conclusion

After practicing, rehearsing, and performing the listed chamber music pieces, the students will get an overall understanding of the repertoire, historic performance, differences among music periods, publishers of compositions, duration of pieces etc. This will lead them into researching different composers from variety of music periods from renaissance to present. Chamber music performance is where each member of the ensemble has a unique presence. A career in chamber music may lead into becoming a great orchestral section player. Every body has a dream of becoming a soloist but once the students understand the value of performing together, they can have different career paths.

Biodata of Author

Dr. **Erman Türkili** started his music education at the conservatory of Cukurova University in Adana, Turkey In 1995. At a young age, he appeared as a soloist and chamber music musician. In 2005, he was awarded with an assistantship from Pittsburg State University to continue his graduate education under the direction of Prof. Selim Giray. He won 4 competitions and became the state champion of the competition held by ASTA (American String Teachers Association). In 2007, he was awarded with an assistantship from Pittsburg State University to continue his doctorate education under the direction of Prof. Eliot Chapo who served as concertmaster as New York Philharmonic, Dallas Symphony and such. At the age of 26, he finished his education and received the 'DMA – Doctor of Music in Arts' title. Between the years of 2009 – 2019, he investigated the benefits of learning an instrument by using symbols and colors. He has been working with kids with spectrum as well as kids at an early age. He founded a learning center in Istanbul "House of Arts and Sciences", www.bskcocuk.com He also serves as an assistant professor at Bahceşehir University Conservatory and currently as the principal of the conservatory.

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Research Article

Effectiveness of the SACs Support Education Program: Motivation and attitude towards primary school level courses designed for the gifted

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Keywords
Attitude
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Motivation
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Support education program

Abstract

In this study, it was aimed to examine the effect of the support education program applied to gifted primary school students Science and Art Centers on the motivation and attitudes of mathematics, science, social studies and Turkish lessons. In the study, pre-post test experimental design without control group was used. 17 gifted primary school 4th grade students studying at a Science and Art Center in the Eastern Black Sea Region (in the support education program) were included in the study with convenient case sampling. Motivation and attitude scales developed by different researchers for mathematics, science, social studies and Turkish lessons were used to collect the data obtained within the scope of the study. The data were analyzed with a statistical program. In the result of study, it was concluded that the support education program did not cause significant difference in the motivation and attitudes of the students the Turkish lesson. It was found that support education program didn't show significant difference in students' motivation in social studies and mathematics lessons, but showed a significant difference in their attitudes. In addition, it was concluded that support education program had significant difference the motivation the students the science lesson, but there was no significant difference in their attitudes towards the lesson.

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Introduction

Education programs for the gifted have been created in Turkiye as well as in the world. Some of these are Education Program for Gifted Students Bridge with University (EPGBU) (Tortop, 2014), Education Programs for Talented Students (EPTS) (Sak, 2010) and Science and Art Center (SAC) Education Program. The number of SACs is increasing in Turkiye and many workshops and lectures are given on the development of the framework program. Apart from the general framework, teachers are also encouraged to do activities. The SAC Training Program has a structure consisting of five stages. One of the most important stage is the Support Training Program and there are not many studies on the effectiveness of these programs.

Education Programs for Talented Students (EPTS)

Education Programs for Talented Students (EPTS) is a university-based gifted student education program established at Anadolu University. In the program, acceleration and enrichment training in science and mathematics is given to gifted students. EPTS, which is an after-school program, is given to students on the weekend and during the summer break.

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The aim of the program, which was developed to provide education to gifted students in primary and secondary education, is to add innovation and dynamism to the education of gifted students in Turkiye by making use of contemporary scientific education approaches. The program consists of six steps: diagnosis, curriculum, teacher format, teaching, assessment, and teacher training.

Education Program for Gifted Students Bridge with University (EPGBU)

Education Program for Gifted Students Bridge with University (EPGBU), put forward by Tortop (2014), aims to train gifted students in the academic field as scientists. The program, in which academics at the university and teachers in the SAC or science high school can mentor, and scientists in any field of science can be e-mentor, the program consists of three stages. In the first stage of the program, in which studies are carried out to provide self-regulation strategies to primary school 1st and 4th grade students, the field and mentor are determined, in the second stage, in-depth research and study design, and in the last stage, independent research and reporting are carried out (Tortop, 2015).

SACs Education Programs

SACs are one of the separate educational places where different activities are carried out for gifted students (Kurtdas, 2012). In SACs, five different education programs are applied to gifted students in order to gradually develop the talents of gifted students and to follow their development. The integration program, which is the first of these programs, provides activities to obtain information about the psychological, social and personal development of students, not exceeding two months. The second program, which is planned as two years for students who start their education in SACs in the 2nd and 3rd grades of primary school, and at least one year for those who start in the 4th and 5th grades, is the support education program. In this program, students are taught to acquire subjects such as scientific research, group work, problem solving, techniques, creative and critical thinking, effective use of resources, decision-making, learning skills, by making connections with fields such as Turkish language, mathematics, science, social studies or as workshops. The third program, the individual talent awareness program, lasts for 3 years and activities to make students aware of their talents are planned in such a way that they can create products according to their talents and make decisions by thinking about the product. Developing special skills is the fourth phase of the program and takes 2 years. In this program, the student conducts high-level studies in which he can use own knowledge, skills and achievements in the field of interest. The project program, which is the last stage of the program, is the program that the student continues until he graduates from high school and produces projects under the guidance of his advisor (Ministry of National Education of Turkiye (MoNET), 2019). In order for gifted students to be successful, their motivation must be high (Phillips & Lindsay, 2006).

After the orientation education, a support education program is applied to the 2nd, 3rd and 4th grade primary school students who start SACs. In support education programs, if the student is in the 4th grade, lessons are given by the primary school teachers or branch teachers, while the 2nd and 3rd grade students are given education by the primary school teachers. In the support education program, students are tried to gain the skills of cooperation, communication, learning to learn, working in groups, scientific research, problem solving, entrepreneurship, critical and creative thinking, efficient use of resources, social responsibility, technology literacy and effective decision making (MoNET 2020).

Motivation of Gifted to Academic Courses

Motivation is the power that activates and sustains a person for an activity to reach a certain goal (Schunk et al., 2008; Balaban, 2006). Motivation, it is divided into two as intrinsic and extrinsic motivation (Afzal & Khan, 2010; Aktan & Tezci, 2013). Intrinsic motivation; It is the power that activates the individual due to personal needs like interest and curiosity (Akbaba & Aktas, 2005). Intrinsic motivation; It plays an important role in supporting students' self-learning, increasing their learning, making what they learn permanent and learning skills, and it is the type of motivation that seems to be quite high in gifted students (Kwon et al., 2001; Skollingsberg, 2003; Su & Reeve 2011). Extrinsic motivation, which is another type of motivation; It differs from intrinsic motivation because the individual does not have control over himself and is around him (Yildiz, 2010). In extrinsic motivation, the force that pushes the individual to exhibit the behavior; it is not in the individual but in the reinforcers (Akbaba & Aktas, 2005; Yildiz, 2010). The lack of motivation underlies the academic failure of the majority of gifted students (Phillips & Lindsay, 2006; Sak, 2010;

Wigfield & Wentzel, 2007). To increase the motivation of gifted students in lessons; it is necessary to give feedback to students about their work, to encourage students to participate in national and international activities, to avoid difficult tasks that will distract students who have difficulty in doing the activities, to direct students to activities that improve their metacognitive skills, and to provide flexibility in activities considering the individual differences and group characteristics of students (Cildir, 2020). When compared to the activities in which gifted students can express themselves by revealing their talents and interests, their motivation increases as well as their lesson success and attitudes (Koshy, 2002; Rinn, Plucker & Stocking, 2010).

Attitude that affects people's behavior, hatred, love and learning, attitude that cannot be observed directly; are the innate tendencies that are learned over time that lead to exhibit various behaviors in the face of situations and objects (Demirel, 1993; Guven & Uzman, 2006; Morgan, 2005). Attitudes; they are tendencies that persist in certain periods of human life, stop people from exploring their environment, from looking impartially, and cause them to behave in a positive and negative way (Tavsancıl, 2010). There are many factors that affect the attitudes of gifted students. First of all, it is seen that attitudes of students who come from families with high level the education are high (Vu, 2011). Then, it is seen that the preparation of the programs for gifted students, the programs prepared, the schools reinforced with the educational materials in which these programs are applied, the teachers who receive education for gifted students and treat them with care, differentiate and enriched education positively affect the attitudes of gifted students (Eder, 1989; Gubbels, Segers & Verhoeven, 2014; Koc, 2016; Vogl & Preckel, 2014; Yetim-Karaca & Turk, 2020). In addition, cooperative learning environments prepared for gifted students also reflect positively on students' attitudes (Ramsay & Richards, 1997). The positive attitudes that gifted students develop towards school, teachers and lessons are also positively reflected in their success (Ehrman 1996; McCoach & Siegle, 2003).

In literature, there are studies examining views, motivations and attitudes of gifted students towards mathematics, science, social studies and Turkish lessons (Alevli & Okur, 2021; Asut & Köksal, 2015; Bolat, 2020; Gubbels, Segers & Verhoeven, 2014; Kahyaoglu & Pesen, 2013; Kanlı & Emir, 2009; Kunt & Tortop, 2017; Levenberg & Shaham, 2014; Okur & Özsoy, 2013; Tanrıkulu & Yogurtcu, 2018; VanTassel-Baska, 2003). In addition, there are studies examining the views and attitudes of students, teachers and parents of students about SACs and the education given in these centers (Epcacan & Ural, 2019; Koc, 2016; Saglam & Polat, 2020; Weiner, 1992). However, in the studies conducted, it is seen that how the activities applied in the mathematics, science, social studies and Turkish lessons in the support education program in the SACs reflect on the lesson motivations and attitudes of the gifted students. In this way, it is important to determine the effectiveness of the activities for the lessons applied in the scope of the support education program on the motivation and attitudes of the students. In addition, it is thought that investigating how the activities for each lesson applied during a term are reflected on the motivation and attitudes of the students will help to determine the special talent areas of the gifted students early.

Problem of Study

With this study, it was aimed to examine the effectiveness of the support education program applied to gifted primary school students in SACs on motivation and attitudes towards courses? Does the support education program make a significant difference in the motivation and attitudes of gifted students in Turkish/social studies /mathematic/science lesson?

Method

Research Model

This study, which was conducted to examine the effects of the support education program applied to gifted primary school students in SACs, on the motivation and attitudes of mathematics, science, social studies and Turkish lessons, was shaped according to the pre-post test the experimental design without a control group. The pre-post-test experimental design without the control group, in which there is no matching and randomness, is called a single-factor in-group or repeated measures design (Buyukozturk et al., 2013). Gifted primary school students were included in the

study in a single group and since they were included in the study without any selection, pre-post test experimental design was used without a control group.

Study Group

17 of gifted students were included in the study through convenient case sampling. Convenience sampling method is the sampling method used to accelerate the research and to reach people easily (Ekiz, 2009). Due to the easy accessibility of gifted primary school 4th grade students enrolled in a support program a SAC in the Eastern Black Sea region, the appropriate case was chosen by sampling. Eight of the gifted students participating the study are girls and nine are boys. 12 of the gifted students like the science lesson, 2 of them likes the mathematics lesson, 2 of them likes the physical education and game lesson, and 1 of them likes the mathematics lesson.

Data Collection Tools

As data collection tools, Turkish Lesson Motivation and Attitude Scale developed by Erdem and Gozukucuk (2013), Social Studies Lesson Motivation Scale developed by Gömleksiz and Kan (2012), Social Studies Lesson Attitude Scale developed by Ulu Kalin and Topkaya (2017) Mathematics Attitude Scale developed by Ocak and Sonmez (2010) and Mathematics Motivation Scale developed by Balantekin and Oksal (2014) were used. In addition, the Motivation Scale for Learning Science Lessons developed by Yilmaz and Huyuguzel Cavas (2007), and the Attitude Scale towards Science and Technology Lesson developed by Kenar and Balci (2012) were used.

Turkish Lesson Motivation and Attitude Scale

The scale developed by Erdem and Gozukucuk (2013) has 15 questions in the motivation section and 20 questions in the attitude section. It was observed that the Cronbach alpha value was calculated as .75 in motivation and .76 in attitude. The scale, which was prepared in a 3-point Likert style, was prepared to measure the Turkish motivation and attitudes primary school students.

Social Studies Lesson Motivation Scale

The scale consisting of 20 questions and developed by Gömleksiz and Kan (2012) was prepared in a 5-point Likert format. The KMO value of scale was calculated as .89, the Cronbach alpha value as .79. It was prepared in order to reveal the motivation of primary school students in social studies lesson.

Social Studies Lesson Attitude Scale

There are 12 questions in the scale developed by Ulu Kalin and Topkaya (2017). The KMO value of scale was calculated as .87, the Bartlett test was calculated as .00. In addition, it was observed that all differences in the averages of the upper and lower groups of 27% were significant. The scale, which was prepared in a 4-point Likert style, was prepared to measure primary school students' attitudes towards social studies.

Attitude Scale Towards Mathematics Activities

The scale developed by Ocak and Sönmez (2010) is a 5-point Likert scale consisting of 19 questions. The KMO value of scale was .83, the Bartlett test was .00, the Cronbach alpha extrinsic motivation value was .71, amotivation was .73, and intrinsic motivation was .74. It was prepared to reveal the attitudes of primary school students towards math activities.

Mathematics Motivation Scale

The scale developed by Balantekin and Oksal (2014) is a 5-point Likert scale consisting of 14 questions. The KMO value of scale was calculated as .90 and the Cronbach alpha value as .92. It was prepared to reveal the mathematics motivation of primary school students.

Attitude Scale Towards Science and Technology Lesson

The scale developed by Kenar and Balcı (2012) consists of 30 questions and is prepared in the form of a 5-point Likert scale. The KMO value of scale was calculated as .81, Bartlett test as .000, and Cronbach alpha as .83. It was prepared in order to reveal the attitudes of primary school students towards science and technology lesson.

Motivation Scale for Learning Science Lesson

The scale developed by Yılmaz and Huyuguzel Cavas (2007) is a 5-point Likert scale consisting of 23 questions. The KMO value scale was calculated as .91, the Cronbach alpha value as .87. It was prepared in order to reveal the motivation of primary school students to learn science lesson.

In the study, the pre-test data of gifted primary school students in Turkish, mathematics, social studies and science lessons were collected in the last week of the first semester of the 2021-2022 academic year. Then, from the first week to the last week of the second semester, the activities in the books prepared by the "Ministry of National Education, General Directorate of Special Education and Guidance, Department of Development of Special Talents" were applied. Each week, one activity from each lesson is definitely included. Post-test data were collected in the last week of the semester. The activities carried out in the lessons are shown in Table 1.

Table 1. Activities in Turkish, Mathematics, Science and Social Studies Lessons

Lesson	Activities
Turkish	Who will sit where?, I criticize, the story is completed, I stamp, I recognize-I introduce, I think, a story from Masnavi, signs and symbols, my games are timeless, creative reading, poetry illustration, book to book, my book tree, I listen to it in the library one day, every day
Mathematic	Multiplication with fingers, interesting number patterns, kendoku, field with origami, matabu, admiral sunk, 15 game, stone reduction game, broken key calculator method, Gauss method, proportion with table, fast running wins, orienteering
Science	Scientists, using the laboratory, using a microscope, making a support and movement system model, preparing TABU cards about the digestive system, separating the mixtures, my thermometer, I am making my planet, the power of the magnet, the submarine model, the balloon car, the examination of bacteria, the respiratory and circulatory system, discover buoyancy.
Social Studies	Who am I, I join social groups, I change as I grow up, the places I live, the little traveler, our place in the world, what's wrong with a city, we exist with our wayfinding tools, sun directions, cultural heritage items, traditions and customs, the beauties of Anatolia, my poems and tales, my region's folk dances.

The pre-post test data obtained in the study conducted to examine the effects of the support education program applied gifted primary school students in SACs on the motivation and attitudes of mathematics, science, social studies and Turkish lessons were analyzed by the SPSS 21.0 program. First of all, the data obtained from the motivation and attitude scales, which were applied to gifted primary school students as a pre-post test in Turkish, mathematics, social studies and science lessons, were analyzed descriptively (minimum and maximum points, standard deviation, arithmetic mean) and then pre-post tests of the scales. Statistically differentiating between them was analyzed by the Wilcoxon Signed Rank Test. Wilcoxon Signed Rank Test was applied because the number of students was less than 30. In addition, the effect size was calculated in cases where motivation and attitude were significant.

Results

In this part of the study, the results of the descriptive analysis and statistical analysis carried out to examine effect of the support education program on the motivation and attitudes of gifted students in mathematics, science, social studies and Turkish lessons are included.

The Effect of Support Education Program on Turkish Lesson Motivation and Attitudes of the Gifted Students

The results of the analyzes carried out to determine effect of the support education program on the motivation and attitude of gifted students in the Turkish lesson are given in Tables 2 and 3.

Table 2. Turkish lesson motivation and attitude descriptive analysis

Variables	Tests	N	Min.	Max.	X	Sd
Attitude	Pretest	17	1.25	2.80	2.01	.48
	Posttest	17	1.55	2.90	2.17	.37
Motivation	Pretest	17	1.40	2.80	2.20	.46
	Posttest	17	1.73	3.00	2.40	.36

It is seen that both the attitude and motivation minimum, maximum and average scores of gifted primary school students increased in the post-test compared to the pre-test, while the standard deviation score decreased. In this sense, it can be thought that the support education program applied to gifted primary school students SACs increases their

Turkish motivation and attitudes. The statistical significance of this increase was analyzed with the Wilcoxon Sign Ranks test and the results the analysis are shown in Table 3.

Table 3. Turkish lesson motivation attitude pre-post-test significance

Variables	Post-pre	n	Mean r.	Sum of R.	z	partial η^2	p
Attitude	**Neg.**	4	7.88	31.50			
	Pos.	11	8.05	88.50	-1.621	-	.11
	Equ.	2					
Motivation	**Neg.**	3	9.67	29.00	-1.763	-	
	Pos.	12	7.58	91.00			.08
	Equ.	2					

It was determined that the support education program applied to gifted primary school students in SACs did not create statistical significance in the motivation and attitudes of Turkish lessons (p> .05).

The Effect of Support Education Program on Social Studies Lesson Motivation and Attitude of Gifted Students

The results of the analysis conducted to examine effect of the support education program on the motivation and attitude of gifted students in the social studies lesson are given in Tables 4 and 5.

Table 4. Social studies lesson motivation and attitude descriptive analysis

Variables	Tests	N	Min.	Max.	$\bar{X}$	Sd
Attitude	Pre	17	1.08	4.00	2.87	.86
	Post	17	2.33	4.00	3.45	.58
Motivation	Pre	17	2.39	4.83	3.58	.66
	Post	17	3.00	4.48	3.68	.48

It is seen that gifted primary school students' social studies both attitude and motivation minimum scores increased in the posttest compared to the pretest, while the standard deviation score decreased. In this sense, it can be thought that the support education program applied to gifted primary school students in SACs increases their social studies motivations and attitudes. The statistical significance of this increase was analyzed with the Wilcoxon Sign Ranks test, the results are shown in Table 5.

Table 5. Social Studies Lesson Motivation Attitude Pre-Post-Test Significance

Variables	Post-pre	n	Mean r.	Sum of R.	z	partial η^2	p
Attitude	**Neg.**	1	6.00	6.00			
	Pos.	10	6.00	60.00	-2.401	.58	.02
	Equ.	6					
Motivation	**Neg.**	6	6.33	38.00	-.525	-	
	Pos.	7	7.57	53.00			.60
	Equ.	4					

While it was determined that the support education program applied to gifted primary school students in SACs did not create statistical significance in the motivation of the social studies lesson (p> .05), it was determined that it did in their attitudes (p< .05).

The Effect of the Support Education Program on the Mathematics Lesson Motivation and Attitudes of the Gifted Students

The results of the analysis conducted to determine effect of the support education program on the motivation and attitude of gifted students in the mathematics lesson are shown in Tables 6 and 7.

Table 6. Descriptive Analysis of Motivation and Attitude in Mathematics Lesson

Variables	Tests	N	Min.	Max.	$\bar{X}$	Sd
Attitude	Pre	17	1.00	5.00	3.07	.82
	Post	17	2.32	5.00	4.08	.82
Motivation	Pre	17	1.43	3.57	2.43	.51
	Post	17	1.86	3.36	2.52	.37

It is seen that gifted primary school students' mathematics lesson both attitude and motivation are minimum, their average scores increased in the post-test compared to the pre-test, while the standard deviation score decreased in motivation and remained the same in attitude. In this sense, it can be thought that the support education program applied to gifted primary school students SACs increases their motivation and attitudes towards mathematics lessons. The statistical significance of this increase was analyzed with the Wilcoxon Sign Ranks test, and the results are shown in Table 7.

Table 7. Mathematics Lesson Motivation Attitude Pre-Post-Test Significance

Variables	Post-pre	N	Mean r.	Sum of R.	z	partial η^2	p
Attitude	**Neg.**	2	2.75	5.50			
	Pos.	14	9.32	130.50	-3.233	.78	.00
	Equ.	1					
Motivation	**Neg.**	4	6.13	24.50	-.757	-	.45
	Pos.	7	5.95	41.50			
	Equ.	6					

While it was determined that the support education program applied to the gifted primary school students in the SACs did not create statistical significance in the motivation of the mathematics lesson (p> .05), it was determined that it did in the attitudes (p< .05).

The Effect of Support Education Program on Science Lesson Motivation and Attitudes of Gifted Students

The results of analysis carried out to determine effect of the support education program on the motivation and attitude the students in the science lesson are presented in Tables 8 and 9.

Table 8. Descriptive analysis of science lesson motivation and attitude

Variables	Tests	N	Min.	Max.	$\bar{X}$	Sd
Attitude	Pre	17	2.00	3.13	2.80	.32
	Post	17	2.58	3.39	2.90	.22
Motivation	Pre	17	2.30	4.70	3.34	.79
	Post	17	3.30	5.00	4.23	.48

It is seen that the minimum, maximum and average scores of gifted primary school students in science, both attitude and motivation, increased in the post-test compared to the pre-test, while the standard deviation score decreased. In this sense, it can be thought that the support education program applied to gifted primary school students SACs increases their motivation and attitudes towards science. The statistical significance of this increase was analyzed with the Wilcoxon Sign Ranks test, and the results are presented in Table 9.

Table 9. Science lesson motivation attitude pre-post-test significance

	Post-pre	n	Mean r.	Sum of R.	z	partial η^2	p
Attitude	**Neg.**	9	7.67	69.00			
	Pos.	8	10.50	84.00	.355	-	.72
	Equ.	0					
Motivation	**Neg.**	3	3.50	10.50	-3.125	.76	.00
	Pos.	14	10.18	142.50			
	Equ.	0					

While it was determined that the support education program applied to gifted primary school students in SACs did not create statistical significance in the attitudes of the science lesson ($p > .05$), it was determined that it created their motivation ($p < .05$).

Conclusion and Discussion

It was found that the support education program applied to gifted students in Science and Art Centers increased the motivation and attitudes of Turkish, social studies, mathematics and science lessons, but this increase was statistically significant in science motivation, social studies and mathematics lesson attitudes. Also, it was determined that it was not significant in Turkish lesson motivations and attitudes, mathematics and social studies motivations, and science attitudes.

Turkish Language Lesson

Although the support education program increased the Turkish lesson motivation and attitude of the gifted students, it was concluded that this increase was not at a significant level. Just like in the study, it is seen in some studies that the Turkish lesson attitudes of gifted students are high and the teaching of fairy tales by drama method has a positive effect on their motivation (Okur & Ozsoy, 2013; Tanrikulu & Yogurtcu, 2018).

Social Studies Lesson

It was determined in the study that the support education program increased the motivation and attitude the gifted students in the social studies lesson, but the increase was only meaningfully reflected in the attitude. In Bolat's (2020) study, it is seen that gifted students have a positive perception towards the social studies lesson.

Science Lesson

In the science lesson, it was found that the support education program increased the motivation and attitudes of gifted students, but the significant increase was only in science motivation. In some studies, it was concluded that the science motivation and attitudes of gifted students are high (Asut & Koksal, 2015; Dolu & Urek, 2013; Kahyaoglu & Pesen, 2013; Kanli & Emir, 2009).

Mathematics Lesson

In the mathematics lesson, although the support education program increased the mathematics motivation and attitude of the gifted students, the increase was found to be significant only in the attitude. In most studies, it has been concluded that gifted students have high mathematics attitudes (Adediwura 2011; Erdogan & Yemenli, 2018).

There may be many reasons why the education in the support education program applied in SACs does not create a meaningfulness in the attitude of the social studies and mathematics lesson and the motivation of the science lesson, but the motivation and attitude of the Turkish lesson, the motivation of the social studies and mathematics lesson, and the attitude of the science lesson. For example, gifted students think that the Turkish lessons taught in the SAC are not long and pleasant and do not contribute to their personal development. In addition, the fact that gifted students get bored with the lesson and cannot endure failure causes them to have negative feelings towards the lessons (Sağlam & Polat, 2020). In fact, the negative feelings that students who come to SACs after completing their education activities in their own schools develop towards the lessons as a result of the problems they experience in the questions in the exams at their schools and during the research process continue in the SACs (Celikdelen, 2010). When the families of gifted students have high expectations from their children, and students cannot find the physical equipment they expect in SACs, school becomes boring for students with high sensitivity and their motivation towards lessons decreases (Cetin & Dogan, 2018; Strip & Hirsch, 2000). However, if appropriate programs are prepared for gifted students in SACs and if differentiated and enriched methods that take into account their learning styles are used, students' motivation and attitudes increase (Camci-Erdogan & Kahveci, 2015; Gubbels, Segers & Verhoeven, 2014; Kanli & Emir, 2009; Rinn, Plucker & Stocking, 2010; Ysseldyke, Tardrew, Betts, Thill & Hannigan, 2004; Tomlinson & Alan, 2000).

In this context, well-equipped SACs for the positive development of the motivation and attitudes of the gifted students, the preparation of the programs for the gifted students well, the use of differentiated and enriched lesson activities in accordance with the learning styles of the gifted students, considering the individual differences of the gifted

students, how the families can respond to the special situations of their children. It can be thought that he should be supported in the way he should behave.

Recommendations

- In SACs, in order to improve the motivation and attitudes of gifted students, learning styles of gifted students can be determined and teaching activities can be continued with small groups as much as possible.
- Teachers in SACs can prepare enriched and differentiated lesson activities in order to improve the lesson motivation and attitudes of gifted primary school students.
- The support education program applied in SACs can also be made for the lesson concerns and interests of gifted students.
- The work carried out with the gifted students enrolled in the support education program can also be carried out with the students of the individual talent awareness program.

Limitations of Study

The study is limited to a single group of 17 gifted primary school students. For this reason, a simple experimental design was used to determine the effectiveness of the support education program, and since there was no control group, the effect of the support education program in different SACs could not be compared.

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Research Article

Evaluation of the support education room primary school Turkish activity book prepared for gifted ones in the context of the revised Bloom's taxonomy

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Abstract

There are many science and art centers established throughout our country within the scope of support services for gifted students. These gifted students have the right to benefit from the support training room in the schools where they study, apart from the science and art canters. On 04/11/2022, the Ministry of National Education published 9 Training Room Activity books for gifted students in different branches. In this study, it is aimed to evaluate the achievements contained in the Support Training Room for Gifted Students Turkish 2. 3. and 4. classroom activities book in the context of the cognitive domain steps of the updated Bloom Taxonomy. In the study, the achievements found at the 2. 3. and 4. grade levels were analysed using keywords compiled in the literature and it was tried to determine which step corresponds to the updated Bloom Taxonomy. In the study carried out with document analysis technique, one of the qualitative research methods, a total of 122 achievements, including 40 at 2 grade levels, 37 at 3 grade levels and 45 at 4 grade levels, were evaluated. As a result of the study, it was determined that 10% of the 2nd grade achievements were in the recall, 15% in comprehension, 42.5% in practice, 5% in analysis and 27.5% in creation. Also, it was seen that 8.1% of the 3rd grade achievements were in the recall, 16.2% in comprehension, 43.2% in the application, 8.1% in analysis, 2.7% in evaluation and 21.6% in the creation stage. Finally, it was found that 6.6% of the 4 grade level achievements can be associated with recall, 17.7% with understanding, 35.5% with application, 8.8% with analysis, 8.8% with evaluation and 22.2% with the creation step. Based on these findings, it can be said that the achievements at the 2, 3 and 4 grade levels of the Support Training Room for the Gifted Turkish activity book correspond to the most application and creation steps from the Updated Bloom Taxonomy cognitive field steps, while the evaluation step is the least included.

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Introduction

One of the most basic principles of education is to provide education to students at all levels of education systems in line with their interests and needs. This principle should help learners with different learning methods reach their potential by receiving training with appropriate arrangements. The term "gifted education" refers to educating students of above-average intelligence, talent, or potential. The idea of multiple intelligences has introduced new ways of thinking about

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students with special abilities. Traditionally, the term gifted refers only to students with unusually high verbal skills, but refers to performing particularly well on standardized tests of general ability or school achievement. Recently, however, the meaning of giftedness has expanded to include extraordinary abilities in many activities, such as music, creative writing, or the arts (Davis and Grim, 2005). Some schools offer special courses for students who are presumed to be more talented than their peers. In some countries, there is also a Decoupling between different types of schools in this way. Some of these courses primarily perform the process of grouping students.

The term "gifted" can be defined in many different ways. One reason for the different definitions is that there have been changes in people's attitudes towards intelligence throughout history. Some researchers believe that there is only one aspect of giftedness, while others believe that it is related to a combination of several factors. Some researchers claim that intelligence, which is arguably a key element in giftedness, is a genetic trait, while others note that environmental factors play an important role (Haight, 2005; Winstanley, 2005). Over time, academics have become aware of the social and political factors that affect the definition of giftedness and have recognized that talent is not in one frame that fits everyone (Rinn, 2021). In current studies, some authors discuss the difference between 'supported/advanced abilities' and 'innate abilities' (Brighouse & Swift, 2014; Giesinger, 2011). The concept of talent is closely related to productivity and success. Competencies are skills that make future success possible or easy. The reference to a person's abilities does not refer to the current abilities or other qualities that a person may have, but rather means the acquisition of these qualities in the future. For example, high math ability may allow a person to develop higher math skills in the future. Future achievements, such as musical or mathematical abilities, do not depend solely on a person's genes. They also rely on the efficient guidance of a highly qualified math teacher or math parents (Vopat, 2011). In order for such situations to occur naturally, education systems should focus on the needs of special abilities outside of the general educational process.

Since the educational process of schools usually focuses on the academic development of students, some needs are neglected and there are problems in meeting the educational needs of gifted students. Given the same educational resources, a more talented child will learn more in a certain area over a certain period of time. For example, even if a child is not better than her/his peers in mathematics when he goes to school, s/he will have success by doing what the teacher says and having better academic achievements (Meyer, 2021).

Gifted students are those who demonstrate high ability or excellence in one or more areas. They may have a wide range of skills, such as creativity, leadership, and problem solving. Gifted students may also have a deep interest in a particular topic or field. It may be difficult to identify gifted students, as there is no criterion for identifying these students. Instead, several indicators should be considered. These may include test scores, teacher and peer reviews, and evidence of outstanding performance in a particular field. On the other hand, it is also important to recognize that gifted students may face unique challenges. These can include feelings of isolation, boredom, and frustration. It is important to provide support and understanding to help them develop the skills and confidence they need to achieve their goals (Worrell et al., 2019).

Gifted students often need special educational opportunities to reach their full potential. Parents and teachers can help create a positive learning environment by encouraging and appreciating their achievements. At home, parents, especially teachers at school, can help children find resources and activities that can challenge them. According to Sayler (2021), schools can offer special classes or programs to meet the needs of these students.

Gifted students are students with exceptional abilities, usually in an academic or artistic field. It is important to give them the support they need to reach their full potential. Various education options are offered to meet the educational needs of these gifted students. This support can come in the form of tutoring, mentoring, and other resources tailored to specific interests and skills. With the right resources and guidance, these students can reach their highest potential. Creating an inclusive environment for gifted students is critical to their success. This means that teachers, administrators and other school personnel must be aware of their needs and provide them with the resources they need. These training opportunities are support education room applications that include both classroom exercises and extracurricular activities (Callahan et al., 2017). Every student, including gifted students, has the right to learn something new every

day, but unfortunately it is known that too many advanced students sit in the classroom waiting for new material to be presented to them. In addition, most gifted students with limited English proficiency – those with limited English proficiency, a disability or a minority or weak background – do not benefit from remedial services or attend schools that offer education services for the gifted. There may also be situations where classroom teachers do not have the necessary training to meet these needs in classrooms in schools with regular education.

In the post-republic period, especially in the 1960s, small steps in terms of talent accelerated again in the 1990s, but unlike what happened in the world, something was tried to be done with the efforts of only some foundations and the determination of a few educators. Various decisions have been taken throughout the history of the Republic, from identifying the gifted to giving them the most appropriate education. Regarding the definitions, the special pedagogy council of the Ministry of National Education convened in 1991 grouped the concepts of "gifted intelligence" and "high talent" under the title of "gifted talent". Here, gifted individuals are defined as "individuals evaluated by experts that they perform at a higher level than their peers in terms of general and/or special abilities" (MoNE, 1991). A new definition has been added to the directive of SAC as "Gifted student: A student who outperforms his peers in intelligence, creativity, art, leadership or special academic fields" (MoNE, 2022).

Various support trainings are held in Turkey in order to support the gifted. The most common and well-known of these educational applications is Science and Art Centers (SAC). Science and art centers, which make it easier for gifted students to receive education in different fields, and their number has increased in recent years, provide the support education that gifted students need. The Turkish Ministry of National Education, in cooperation with all stakeholders, has prepared an action plan for the development and implementation of a strategy to provide appropriate education for gifted students. MoNE is responsible for establishing education policies for exceptional students, including gifted students. The Ministry of National Education is also responsible for decisions regarding public and private education and private pedagogical programs in pre-primary, primary and secondary schools (MoNE, 2006).

It has become an accepted fact that the emotional and social development of gifted students, as well as their academic development, are supported by the effect of special education. However, it is still a matter of debate which training method is most suitable for gifted students. It is thought that the adaptation of these children to the normal education classes in schools affects their academic success relatively negatively. On the other hand, it has been determined that going to a private school separate from their peers may cause socio-emotional problems. This highlights the implementation of a support education room within the school as a temporary solution (Opengin, 2018).

Support Education Room

In addition to the education in general education classrooms, gifted students receive support education in a different classroom at certain times of the week according to their individual needs in the support education room (Rogers, 2002). It can be said that there is a transition between concepts in the literature about support education rooms applications. In the studies, extracurricular learning programs are sometimes examined together, and sometimes the support education room applications are considered as out-of-class learning (Mammadov, 2015; NAGC, 2015). Although there are many different ideas about the use of the support education room in the education of the gifted, the fact that there is a certain standard will facilitate the practices accepted by all segments. The idea that the education programs of the gifted should be within certain frameworks and that they have basic criteria was first put forward by Belcastro (1987) and the basic criteria were determined. According to these basic criteria, special education;

- It should have content related to the general curriculum.
- There should be a fair student determination system.
- Students should receive training every day.
- Students are educated with their peers who are mentally close to each other.
- There should be an educational content suitable for the learning styles and speeds of the students.
- The curriculum should have a content suitable for high-level thinking skills.
- It should be given by teachers who are experts in the field of education.

Since support education room applications are also included in special education, studies have been carried out on the need for certain standards in this regard, and as a result of these studies, meta-analytical studies have determined that support education room applications have a positive effect on gifted students (Kulik, 2003; Rogers, 2002). This situation is the same in Turkey as in the rest of the world. In Turkey, gifted students are evaluated within special education groups. However, gifted students are subject to the same rules as other special education groups. The Special Education Service Regulation (Ministry of National Education [MoNE], 2012) clearly includes provisions regarding the use of support education rooms by the gifted. Various metrics are used to improve the cognitive and social aspects of gifted people and to evaluate them in different ways. Bloom's taxonomy is the most important matrix known to reveal the goals that students need to achieve according to a certain indicator and to see concrete items.

Revised Bloom Taxonomy

Taxonomies created in the late 1950s to facilitate target setting received a lot of attention. Among these taxonomies is the cognitive domain taxonomy presented by Bloom et al. (1956). Bloom has worked in schools and coeducational institutions to minimize the impact of this gap and make it beneficial for students, families and society. The basic structure of taxonomy is to guide the quality of teaching by managing individual differences in perception that affect the student. This understanding argues that with extra time and effort, any student can learn or reach the desired level. With the current understanding of education, the need to update the taxonomy has emerged. Bloom's taxonomy has been reviewed by colleagues, students, and other distinguished researchers to meet the need for updating. Two reasons have been suggested for this update; The first is to try to get teachers to refocus on the original taxonomy, which is the old version. Because this taxonomy is not just a historical document, it contains many ideas about design, implementation, standards-based learning, and authentic assessment that are grappling with today. Another reason is the need to link the development of the USA and the world since 1956, up-to-date information in the field of developmental and learning psychology, teaching methods and techniques, measurement and evaluation to this taxonomy (Bumen, 2010).

The revised Bloom's Taxonomy consists of two dimensions: the knowledge dimension (factual knowledge, conceptual knowledge, functional knowledge, and metacognitive knowledge) and the cognitive process dimension (remember, understand, apply, analyze, evaluate, and create). In the original taxonomy, the knowledge dimension was changed to recall, the synthesis and evaluation stages were changed, and the understanding and synthesis stages were renamed as understanding and creation (Oey, 2010). Amer (2006) found in his research that the revised Bloom's taxonomy can be used for a clear, concise and visual analysis of curriculum objectives, helping teachers not to confuse achievement with activities, helping teachers understand the relationship between learning and teaching activities. He also noted that this taxonomy can be used for evaluation, review of acquisitions and materials, consistency, success, standards and tests. If we include the education process of the gifted in the taxonomy, the education of these students in the SAC and the supportive education they receive in the support room will find a place for themselves in both dimensions of the taxonomy. As a matter of fact, the training received in the support room supports the gains in the knowledge dimension, while the cognitive process dimension finds a place for itself here as the application dimension is mostly realized in SAC.

Problem of Study

In this study, it is aimed to evaluate the achievements in the Support Education Room Turkish 2nd, 3rd and 4th grade activities book published by the Ministry of Education for Gifted Students in the context of the cognitive domain steps of the renewed Bloom Taxonomy. While doing this, it is tried to express what the characteristics of gifted students are, what the education of these students includes, what the support education application is and how the renewed Bloom Taxonomy is. In addition, the Support Education Room Turkish 2nd, 3rd and 4th grade activities published by the Ministry of National Education are related to which achievements, which dimensions of the renewed Bloom Taxonomy are related to, and the Support Education Room Turkish 2nd, 3rd and 4th grade activities are tried to be explained. Problems of the study;

- In the context of the cognitive domain steps of the revised Bloom Taxonomy, which are the outcomes in the Support Education Room Turkish 2nd grade activity book published by the Ministry of Education for gifted and talented students?
- In the context of the cognitive domain steps of the revised Bloom Taxonomy, which are the outcomes in the Support Education Room Turkish 3rd grade activity book published by the Ministry of Education for gifted and talented students?
- In the context of the cognitive domain steps of the revised Bloom Taxonomy, which are the outcomes in the Support Education Room Turkish 4th grade activity book published by the Ministry of Education for gifted and talented students?

Method

Research Design

In this study, document analysis technique, one of the qualitative research methods, was used. Document analysis is the analysis of written sources of information about the phenomenon or phenomena that are intended to be investigated (Yildirim and Simsek, 2013). Document review is also a research technique that can be used alone (Bowen, 2009). In the study, taxonomic levels of 122 different learning outcomes (2nd grade: 40 outcomes, 3rd grade: 37 outcomes, 4th grade: 45 outcomes) in SER Turkish 2nd, 3rd and 4th grade Activity Books published in 2022 were determined according to the Revised Bloom Taxonomy.

Documents

As a data source in the study, the Turkish Activity Books for the 2nd, 3rd and 4th grades of primary school, which is one of the 9 Support Education Room activity books for Gifted Students in different branches published by the General Directorate of Special Education and Guidance Services of the Ministry of National Education on 04/11/2022 were used. In order to determine the taxonomic classification of the achievements in the activity books and the sub-steps of this classification, articles, theses, books and other internet resources related to the Renewed Bloom Taxonomy were also used.

Data Analysis

First of all, the studies carried out in the related literature were examined (Aktan, 2020; Ari and Gokler, 2012; Basbay, 2008; Canguven et al., 2017; Dalak, 2015; Dindar and Demir, 2016; Es, 2005; Girgin, 2012; Guleryuz, 2016; Kahramanoglu, 2013; Kuzu, 2013; Ozdemir et al., 2015; Sanli and Pinar, 2017; Tahaoglu, 2014; Tolan, 2011; Topcu, 2017) and a coding key for the cognitive domain sub-levels of the Revised Bloom Taxonomy was created. The characteristics and sample expressions of the steps of Bloom's Taxonomy, which is considered as a category in the study, are given in Table 1.

Table 1. Features of revised Bloom's taxonomy levels and example expressions

Digits	Features	Sample Expression
Recall	Basic concepts and principles of the child; It includes cognitive processes such as knowing, recognizing, reciting.	Naming the digits in Bloom's Taxonomy
Understanding	It includes processes such as assimilation of concepts gained at the knowledge level, comprehension and interpretation of their meanings, and expressing the knowledge in your own words.	Ability to chart the information of the digits in Bloom Taxonomy
Application	It consists of processes such as solving new problems, applying knowledge to operations, calculating, executing and showing, based on what the student has acquired at the level of comprehension.	Being able to prepare homework using the steps of Bloom's Taxonomy
Analysis	It includes the processes of breaking a whole into parts, finding and analyzing relationships, revealing similarities and differences, and using the deductive method.	To be able to reveal the difference of Bloom's Taxonomy from other classifications.
Evaluation	It includes the use of the individual's standards of appraisal such as being able to summarize, draw conclusions, criticize, reveal inconsistencies, reach judgment, and appreciate.	Ability to criticize the errors/deficiencies of Bloom's Taxonomy
Creating	It includes the processes of creating a new whole, presenting a new idea, designing original productions, teaching the acquired knowledge to others, and offering new solutions to problems.	Developing a new approach to Bloom's Taxonomy

(Anderson & Krathwohl, 2018)

Table 1 shows the step characteristics and sample expressions of the Revised Bloom Taxonomy. While analyzing the data in the study, similar acquisition statements in the SER Turkish Activity books were analyzed under the relevant steps and evaluations were made. All analyzes were carried out in this way, and the percentages at the grade level and the percentages in the general curriculum were calculated, and sample achievements matched with the steps of the taxonomy at grade levels were included.

In order to ensure the validity and reliability of the obtained data; Regarding which step verb expressions can be associated with in the revised Bloom Taxonomy; In addition to the researchers conducting the research, three more field experts, two experts in the field of qualitative research and one expert in the field of education programs, were consulted. The classifications created in line with the opinions of these experts were compared and the data table was given its final form. The reliability of the data obtained through document analysis was examined with the formula of Miles and Huberman (2021) "Agreement / (Agreement + Disagreement) x 100". The reliability rate among experts was determined as 89 %.

Results

The achievements used in the Turkish Activity Book for the 2nd, 3rd and 4th grades of primary school, which is one of the activity books of the Support Education Room for Gifted Students published by the General Directorate of Special Education and Guidance Services of the Ministry of National Education, were analysed according to the cognitive process dimensions of the renewed Bloom Taxonomy.

The distribution of SER 2nd grade Turkish activity book outcomes according to the revised Bloom's Taxonomy cognitive process dimensions is given in Figure 1.

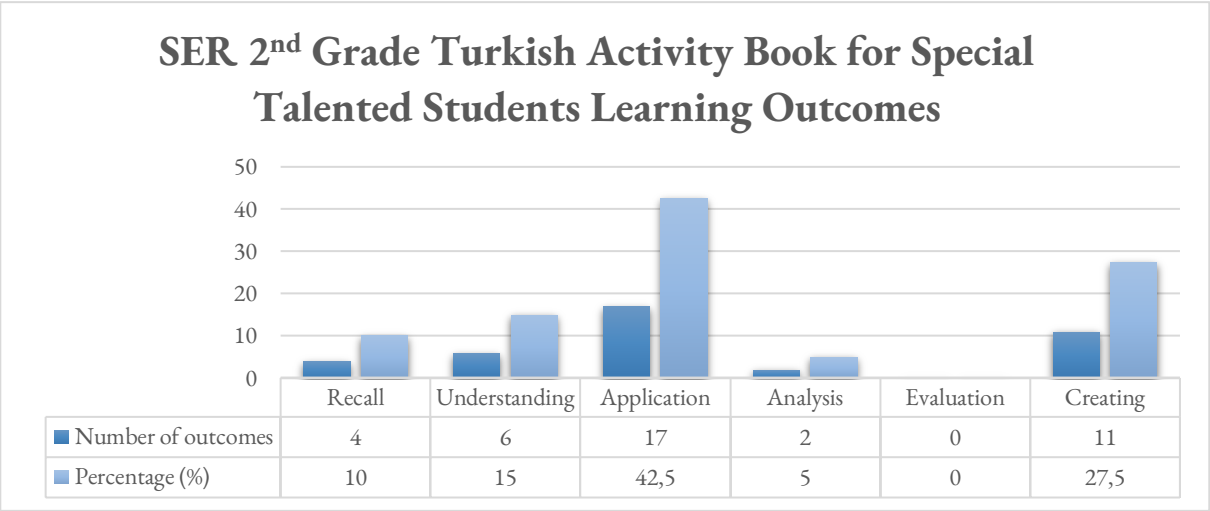

Figure 1. Distribution of SER 2nd grade Turkish activity book outcomes according to the revised Bloom's Taxonomy cognitive process dimensions

Looking at Figure 1, the distribution of the achievements in the SER 2nd grade Turkish Activity book prepared for the gifted according to the revised Bloom Taxonomy is seen. Accordingly, the 4 outcomes that correspond to 10% of the total 40 outcomes are Recall; Comprehension of 6 gains corresponding to 15%; Application of 17 gains corresponding to 42.5%; It is shown in Figure 1 that 2 achievements corresponding to 5% of them correspond to the Analysis step and 11 achievements corresponding to 27.5% of them correspond to the Creation step. There is no gain that corresponds to the evaluation step.

Table 2 shows the cognitive dimension of the revised Bloom Taxonomy of some of the achievements in the Support Education Room for Gifted Students 2nd Grade Turkish Activity Book.

Table 2. The equivalents of some of the acquisitions in the SER 2nd Grade Turkish Activity Book in the revised Bloom Taxonomy cognitive dimension

SER 2nd Grade Turkish Activity Book Sample Outcomes	
Learning Outcomes	**Digit**
Relates independent cause and effect sentences.	Creating
Implements writing strategies.	Understanding
He makes impromptu speeches.	Application
Comprehends written instructions.	Recall
Answers questions about the text reading.	Analysis

When we look at Table 2, it is seen that some of the acquisitions correspond to which step according to the revised Bloom Taxonomy in line with the keywords determined in the data analysis section. While the acquisition of "Associate independent cause and effect sentences" can constitute the Analysis step; "Applies the writing strategies" is an example of the Implementation step. While the acquisition of "Makes impromptu speeches" can be associated with the Creation step; The achievement of "comprehends written instructions" can be associated with the Comprehension step. The outcome of "Answering questions about the text read" can be given as an example of the Recall step.

The distribution of SER 3rd grade Turkish activity book outcomes according to the revised Bloom's Taxonomy cognitive process dimensions is given in Figure 2.

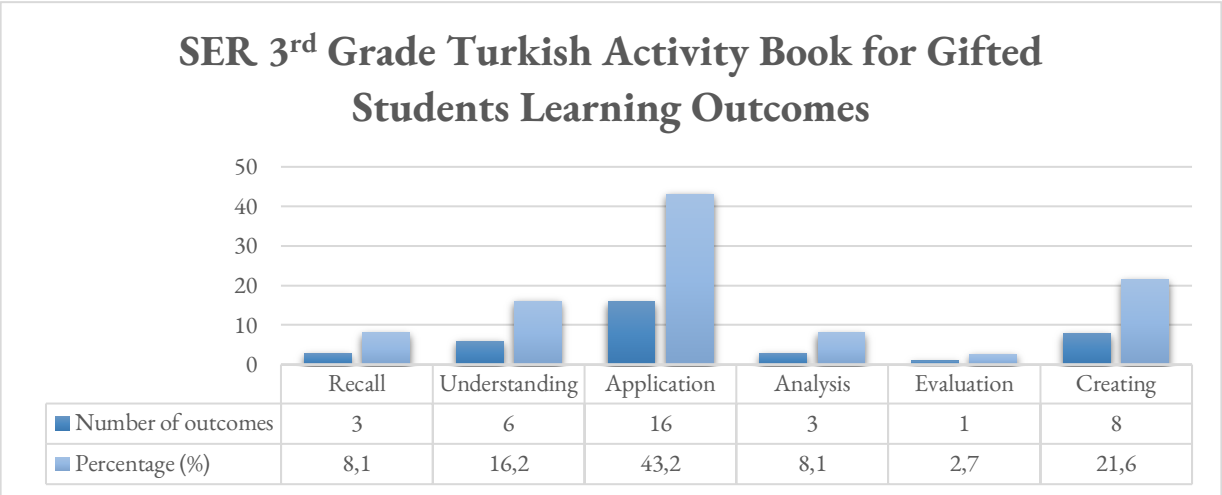

Figure 2. Distribution of SER 3rd grade Turkish activity book acquisitions according to the revised Bloom's Taxonomy cognitive process dimensions

When Figure 2 is examined, it is seen that the achievements of the SER 3rd grade Turkish activity book correspond to 3 Recall, 6 Understanding, 16 Application, 3 Analysis, 1 Evaluation and 8 Creation steps of the Revised Bloom Taxonomy. The total number of achievements in the SER 3rd Grade Turkish activity book is 37.

Table 3 shows the cognitive dimension of the revised Bloom Taxonomy of some of the achievements in the Support Education Room for Gifted Students 3rd grade Turkish Activity Book.

Table 3. The equivalents of some of the acquisitions in the SER 3rd Grade Turkish Activity Book in the revised Bloom's Taxonomy cognitive dimension

SER 3rd Grade Turkish Activity Book Sample Outcomes	
Learning Outcomes	**Digit**
Writes narrative text.	Creating
Understands the meanings of shapes, symbols and signs.	Understanding
Implements speaking strategies.	Application
He tells the main lines of what he has read.	Recall
Distinguish between text types.	Analysis
Evaluates the content of what they listen/watch	Evaluation

In Table 3, the achievement of "Write a text of storytelling" is combined with the Creation step of the Renewed Bloom Taxonomy, the "understands the meanings of shapes, symbols and signs" achievement with the Understanding level, the "Applies speaking strategies" achievement with the Application step, the "He/she describes what he/she reads" achievement with the Recall step, It is seen that the acquisition of "distinguish between text types" can be associated with the Analysis step, and the acquisition of "evaluate the content of what they listen to/watch" can be associated with the Evaluation step.

The distribution of SER 4th grade Turkish activity book acquisitions according to the revised Bloom's Taxonomy cognitive process dimensions is given in Figure 3.

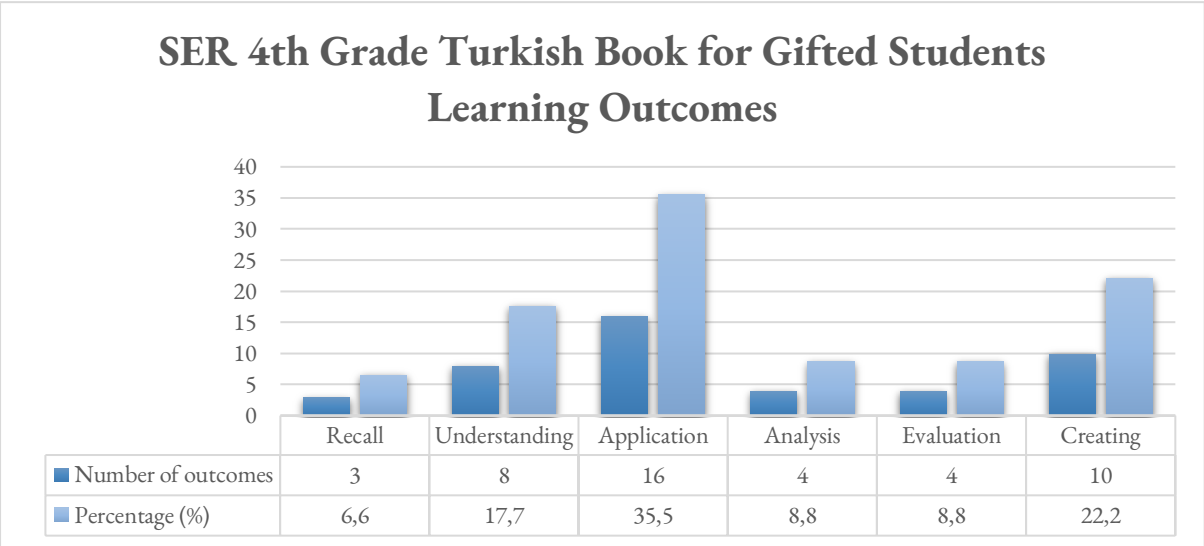

Figure 3. Distribution of DEO 4th grade Turkish activity book acquisitions according to the revised Bloom's Taxonomy cognitive process dimensions

Looking at Figure 3, out of 45 different outcomes in the SER 4th grade Turkish book, 3 of them have the Recall step of the Revised Bloom Taxonomy, 8 have the Understanding step, 16 have the Application step, 4 have the Analysis step, and 4 have the Evaluation step. and 10 of them correspond to the Creation step. Table 4 shows the cognitive dimension of the revised Bloom Taxonomy of some of the achievements in the Support Education Room for Gifted Students Grade 4 Turkish Activity Book.

Table 4. The equivalents of some of the acquisitions in the DEO 4th Grade Turkish Activity Book in the revised Bloom's Taxonomy cognitive dimension

SER 4th Grade Turkish Activity Book Sample Outcomes	
Learning Outcomes	**Digits**
Prepares an anthological source and writes an informative text about it.	Creating
Comprehends the contribution of idioms and proverbs to the meaning of the text.	Understanding
Evaluates media texts.	Evaluation
Distinguish between text types.	Analysis
Uses words according to their meanings.	Application
Answers questions about what they have listened/watched.	Recall

Looking at Table 4, the achievement of "Preparing an anthological source and writing an informative text about it" among the gains in the SER 4th Grade Turkish Activity Book is compared with the Creation step of the Renewed Bloom Taxonomy, and the "Concepts the contribution of idioms and proverbs to the meaning of the text" with the Understanding level. It is seen that the achievement of "evaluate the texts" can be associated with the Evaluation step, the achievement of "Distinguish between the types of texts" with the Analysis step, the achievement of "Uses words in accordance with their meanings" with the Application step, and the achievement of "Answers questions about what they listen/watch" can be associated with the Recall step.

Conclusion and Discussion

This research was carried out in order to evaluate the achievements in the Turkish 2nd, 3rd and 4th grade activity books of the Support Education Room prepared for gifted students according to the cognitive steps of the renewed Bloom taxonomy. Accordingly, it has been determined that there are 40 acquisitions at the 2nd grade level, 37 at the 3rd grade level and 45 at the 4th grade level in the books. When these achievements are examined according to taxonomy, it has been determined that the application and creation step has the most achievements, and the evaluation step is the least included step. It is expected that the books prepared for the gifted will have more gains in the analysis, evaluation and creation step of the taxonomy. In this sense, the fact that the examined books have many achievements in the creation stage can be evaluated positively, while the insufficient gains in the analysis and evaluation stage can be criticized. In

particular, when the evaluation step is examined, it is seen that there are 0 acquisitions in the 2nd grade, 1 in the 3rd grade and 4 in the 4th grade, and a total of 5 assessment acquisitions are included in the new 3rd grade level books. This number is quite insufficient, and the balanced distribution of high-level cognitive steps in taxonomy is important for the quality of the book.

Mayer (2002) emphasizes the importance of focusing on the processes of application, analysis, evaluation and creation for meaningful learning to take place. In accordance with the philosophy of the constructivist approach, the activities that students participate by doing and experiencing increase the quality of learning. For this reason, it is very important that the activity books prepared for students also provide opportunities for cognitive processes at a higher level, which will allow students to learn by doing and experiencing. Marlowe and Page (1998) state that the student who takes responsibility for learning in the constructivist approach should fulfill skills such as being an entrepreneur, expressing himself, communicating, critically evaluating, planning and using what he has learned in life. For this reason, activity books should support students in acquiring these skills.

It is expected that the gains in the course and activity books will show a balanced distribution according to the cognitive domain steps. Because these books are prepared to appeal to students from all corners of the country and from all levels. However, it is expected that a book that appeals to the gifted will include gains in the cognitive field at higher levels. According to Webb, Meckstroth, and Tolan (2006), gifted students tend to learn more quickly while they have longer attention and concentration periods than their peers. In addition, special talents have superior analytical ability, abstract thinking, critical thinking, creative thinking, flexible thinking and strategic thinking abilities (Chuska, 2005; Hoh, 2008; Moltzen, 2009). These distinctive features of the gifted make it necessary for the books prepared to appeal to them to have high-level achievements. As a matter of fact, when the activities in the Turkish Textbooks prepared for general use are examined, it is seen that the distribution is different from the books we have examined. Oryaşın (2021) examined the activities in the Turkish textbooks taught in our country from the 1st to the 8th grade according to the renewed Bloom classification. He determined that 13 of them took place in the evaluation and 5% in the creation step.

Recommendations

As a result, the content of the auxiliary resources that should include more than one outcome can be developed, the activities can be diversified and the activities can be categorized according to the acquisition status. In addition to a main resource for each discipline, different activity resources and project handbooks can be prepared in support education room studies. In addition, workshops such as creative thinking techniques and current science researches can be created that will enable gifted students to receive versatile education in the support training room.

Based on the research findings, the following suggestions can be made:

- The number of gains in the analysis step should be increased.
- The number of gains in the evaluation step should be increased.
- A balanced distribution of the gains in the upper level can be achieved.

Limitations of Study

This study is limited to the evaluation of the achievements included in the book Support Training Room activities for Gifted Students in the context of cognitive domain steps of the revised Bloom Taxonomy. Research area of the study are limited to Support for Education Room Turkish 2nd 3rd and 4th grade activities books Gifted Students.

Conflicts of Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Authors Contribution

The authors have contributed equally to the article.

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Research Article

The use of game-based learning to enhance student engagement in the acupuncture programme: South African students' opinions

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Abstract

Student engagement plays an important role in promoting student success at higher education institutions. It is of profound significance to improve student engagement through the utilisation of effective pedagogical approaches, such as game-based learning. However, there is a lack of study in the South African context focusing on game-based learning at higher education institutions. This study aimed to explore students' views and experiences on game-based learning at an identified university in South Africa. The constructivism learning theory was anchored in this study as a theoretical lens. In this study, the authors adopted a qualitative single case study design within an interpretivist paradigm. A purposive sampling technique was followed to recruit participants from a public university in South Africa since it is the only university that provides acupuncture programmes in this country. Six participants were recruited for this study. The authors utilised thematic analysis to analyse the data. The findings of this study revealed that participants shared positive views and attitudes toward game-based learning. They believed that game-based learning significantly motivated them in the learning process. Furthermore, game-based learning also reduced their stress in learning compared to the learning in normal classrooms. They reported that game-based learning not only improved their engagement in learning but also enhanced their knowledge and skills. This study also highlighted that game-based learning should be well-planned to avoid demotivating students. It can be concluded that game-based learning is an effective approach to improve student engagement. Further studies should be conducted with diverse research approaches at different higher education institutions.

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Introduction

Higher education plays a vital role in promoting students' competence in the world of work. However, the literature reveals that there is much criticism of poor student academic performance and achievement at higher education institutions [HEIs] (Lim, 2017; Schreiber & Yu, 2016; Ting et al., 2020). One of the most critical reasons cited is low student engagement at HEIs (Lewin & Mawoyo, 2014). Student engagement refers to students' participation in sound academic activities both inside and outside of the classroom (Delialioğlu, 2012; Mandernach, 2015). Kahu (2013) contends that student engagement is a crucial indicator of students' learning and achievement at HEIs. Fitzgerald et al. (2012) are of the view that engagement is of profound importance in improving students' achievements at HEIs.

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There are many factors that influence students' academic performance which are beyond the control of HEIs; De Villiers and Werner (2016) indicate that student engagement seems to be the one that can be enhanced. To improve students' engagement at HEIs, Plass et al. (2015) propose that game-based learning is an effective pedagogical approach. Game-based learning is defined as conducting academic activities through games to achieve learning outcomes (Adipat et al., 2021). This study aimed to explore students' views and experiences of game-based learning in an acupuncture programme at an identified South African HEI.

Game 1. 30s acupuncture quiz competition Game 2. Ba Duan Jin exercise

Figure 1. Game-based learning activities at the identified HEI

Schreiber and Yu (2016) articulate that the quality of South African higher education has improved significantly since 1994, post the first democratic election. However, Cloete et al. (2015) reveal that students' academic performance is an intractable challenge. This view concurs with Ivala and Kioko (2013) who affirm that poor academic performance at HEIs worsens the shortage of skills in the working world. Ivala and Kioko (2013) further highlight that lecturers should motivate students to improve their academic performance by implementing engaging pedagogies in teaching and learning (Yaccob et al., 2022). In their work, Mee et al. (2020) and Subhash and Cudney (2018) agree that game-based learning encourages students' engagement because games require collaboration, interaction, and teamwork. Students can share their opinions and engage in discussion and learning through effective teamwork in games (Anak Yunus & Hua, 2021). The authors are of the view that there is a need to employ pedagogical approach to effectively improve student engagement at HEIs. In the authors' opinion, adopting game-based learning in the acupuncture programme will significantly promote students' engagement in learning.

In this study, the authors employed a qualitative case study design within an interpretivist paradigm. Wawrzynski et al. (2012) articulate that little research has been conducted focusing on students' engagement and their academic performance in South Africa. Therefore, South African educators utilise concepts, theories, and models from developed countries, such as America, to guide their studies of student engagement. In the authors' view, this will negatively influence the value of research since the findings are from different contexts. Hu (2022) contends that it is of profound importance to explore contextualised phenomena. Wawrzynski et al. (2012) further emphasise that student academic performance is significantly influenced by student background and learning environment. Therefore, this study made contributions to enriching contextualised insights into the role of game-based learning in promoting student engagement in South Africa.

Literature Review

Importance of students' engagement at higher education institutions

Student engagement in HEIs has gained increased attention globally due to its important role in advancing students' academic performance. This view concurs with Collaco (2017), who reveals that it is crucial to improve student engagement in HEIs. Astin (1984) defines engagement as the energy that students devote to their academic experience physically and psychologically. Skinner et al. (1990) state that student engagement refers to behavioural involvement in academic activities. Similar sentiments have been expressed by Kuh (2009), who explains student engagement involves both time and effort that the student devotes to activities linked to required learning outcomes. Barkley (2010) points out that students' active thinking is of profound importance in identifying effective engagement. They are not merely

being entertained. Siddiqi et al. (2022) conclude that student engagement is critically important for instruction-based learning, particularly in HEIs, as it has a direct connection with the students' outcomes whose socio-psychological experiences steers them toward certain pre-determined goals. On the contrary, Ting et al. (2020) believe student engagement is about how the institution deploys its resources and organises the curriculum, other learning opportunities and support services to induce students to participate in activities that lead to the experiences and desired outcomes such as persistence, satisfaction, learning and graduation.

Solomonides (2013) articulates there is no one definition that satisfies all stakeholders; because no single research can investigate every perspective of student engagement (Kahu, 2013). Therefore, Bond et al. (2020) point out that it is important for researchers to define student engagement for their particular studies. In this study, student engagement refers to the time and effort invested by students for the purpose of improving the students' learning experience and learning outcomes (academic performance). Despite the disagreement on the definitions of student engagement, the literature reveals that researchers concur on the significant role of student engagement in promoting student learning and academic performance (Mandernach, 2015). Lim (2017) articulates that there is a need for lecturers to adopt diverse pedagogical approaches to motivate student engagement in learning. The reason is that low engagement will negatively influence learning outcomes (Lim, 2017). Kahu (2013) indicates that there is much research focusing on exploring the role of student engagement in advancing students' learning and achievements from theoretical and practical perspectives. Lewin and Mawoyo (2014) assert that the reason is due to the importance of student engagement in promoting their academic performance.

According to Lewin and Mawoyo (2014) and Schreiber and Yu (2016), student engagement is a reliable predictor of student academic performance at HEIs. Ting et al. (2020) agree with De Villiers and Werner (2016), who point out that there are two key components that significantly influence student engagement: the time and effort that students spend on academic activities and how lecturers or institutions organise learning activities. To gain a better understanding of student engagement, Astin (1984) and Fredricks et al. (2004) conceptualise the behavioural, emotional, and cognitive dimensions of student engagement with sociocultural theories. They believe student engagement can be enhanced from four dimensions: behavioural, psychological, sociocultural, and holistic perspectives (Kahu, 2013). According to Kahu (2013), the behavioural perspective refers to effective teaching practice and student behaviour, while the psychological aspect focuses on an internal process. The sociocultural perspective takes the crucial role of socio cultural context into consideration. The holistic perspective aims to involve all the above-mentioned perspectives at the same time. Schreiber and Yu (2016) suggest that student engagement provides a useful framework to examine higher education's promotion of student persistence and retention in South Africa (Wawrzynski et al., 2012). The authors identify game-based learning as an effective pedagogical approach to improve student engagement.

Introduction of game-based learning as an instructional tool

Game-based learning is an approach to education that involves using games to teach a range of skills and knowledge. It has gained popularity in recent years because of its potential to engage students and enhance their learning experiences. Game-based learning therefore fundamentally differs from gamification as it includes an actual game that creates the learning experience and teaches or reinforces knowledge and skills. It promotes the collaborative construction of knowledge achieved through learner-game, learner-learner and learner-instructor interactions coupled with meaningful feedback (Jääskä & Aaltonen, 2022). Trybus (2015) defines game-based learning as a process of adopting the rules of games and applying them to real-life settings to engage students. Hashim et al. (2019) state that game-based learning refers to a pedagogical approach with defined learning outcomes through the utilisation of games. Adipat et al. (2021) articulate that game-based learning is the application of digital games to facilitate stakeholders (lecturers and students) to achieve learning outcomes. However, Plass et al. (2015) argue that these games do not have to be digital games. Plass et al. (2015) believe the most important distinguishing characteristic is that games must facilitate the learning process to achieve learning outcomes.

In this study, games refer to a broader definition which includes any activities that are fun and interesting with the aim of improving learning outcomes. There are several elements in games that contribute to their significant role in

promoting student engagement at HEIs. Mee et al. (2020) and Subhash and Cudney (2018) articulate that fun in games is one of the most important factors that motivate students' interest in learning. In their work, Maasum et al. (2015) suggest that games require teamwork, collaboration and interaction, which are essential skills in the world of work in 21st century.

Game 3. Demonstration of acupuncture techniques

Game 4. Demonstration of cupping techniques

Figure 2. Game-based learning activities: Demonstration of acupuncture and cupping techniques

Value of game-based learning in promoting students' engagement

Adipat et al. (2021) articulate that game-based learning encourages students to learn by trial and error. It is achieved by arranging content knowledge with a set of pre-designed rules and consequences. According to Pyle (2018), rules are the key differential factors of games from play which is non-rule governed. In the authors' view, appropriate games make learning more effective as they provide for student-centred learning. This view concurs with Yaccob et al. (2022), who state that games are an effective pedagogical approach to engaging students in academic activities. Cheng and Su (2011) indicate that there are many advantages of employing games as educational tools; for instance, games are appealing to students and hence offer a more attractive learning environment; it is of particular significance to reduce student stress and pressure in learning; and it promotes teamwork in an entertaining environment (Akour et al., 2020). The motivational psychology involved in game-based learning allows students to engage with educational materials in a playful and dynamic way (Adipat et al., 2021). Game-based learning is not just creating games for students to play; it is designing learning activities that can incrementally introduce concepts and guide users towards an end goal (Plass et al., 2015).

Furthermore, game-based learning helps to improve students' learning by enhancing contextual understanding and thinking processes (Chow et al., 2011). It is increasingly becoming an effective approach to creating meaningful and engaging lessons (Yaccob et al., 2022). Rahmani (2020) reports that the benefits of game-based learning include enhancing motivation and attitudes, superior cognitive achievements and engagement in academic activities. Hashim et al. (2019) point out that it is important that game-based learning is appropriately planned and organised in order to effectively promote student motivation. The reason is that when there is a lack of motivation, it will be a challenge to engage students in learning. Therefore, Hashim et al. (2019) state that game-based learning is supported by constructivism learning in which students are the focus of the learning process.

Collaco (2017) states that it is important to increase student engagement in HEIs by adopting enjoyable academic activities that enhance interaction and teamwork. Motivation is a core influencer to promote interaction in the learning process. Alomari et al. (2019) suggest that learning outcomes will be improved by enhancing student engagement in classes through games. Pyle (2018) argues that when considering game-based learning as a teaching approach, HEIs should create a positive learning environment for students regardless of age. Furthermore, Plass (2015) contends that good games aim to be within a player's zone of proximal development. Buckley et al. (2017) report that extra attention is needed to avoid demotivating students when designing lessons with games. Welbers et al. (2019) caution us to be mindful that students may feel demotivated when they show poor performance in games.

Theoretical Framework

The theoretical framework underpinned in this study was the constructivism theory. Experts in the viewpoint of constructivism believe that knowledge is constructed by the student and that the student develops her/his own understanding through experience (Weegar & Pacis, 2012). Lev Vygotsky is considered to be the founder of constructivism, who stresses the role of social interaction and instruction in learning (Golder, 2018). Vygotsky believes that social life is primary in the learning process. In his work, he propounded that all learning occurs within the zone of proximal development (ZPD). According to Vygotsky, ZPD refers to the gap between students' existing abilities and the abilities that they can achieve with assistance (Hassad, 2011). Constructivism theory believes that social and group interactions contribute to individual's learning (Hassad, 2011; Muhajirah, 2020).

The major emphasis in constructivism is that students are active in constructing knowledge and meanings (Golder, 2018; Shah, 2019). Students develop the ability to identify, examine and solve problems by themselves. Furthermore, students should be motivated to be self-aware, self-facilitated and self-regulated. Shah (2019) indicates that students will acquire when learning in groups from each other. Constructivists contend that new knowledge is developed between students and environmental factors (Ertmer & Newby, 2013). Consequently, it is critical that learning takes place in authentic settings, which directly relevant to the students' lived experience (Burhanuddin et al. 2021). Golder (2018) is of the view that students build their knowledge through individual experiences and interactions, rather than by transferring knowledge externally. Therefore, constructivists believe that there is no objective reality that does not change.

Constructivists argue that learning must be integrated into the process of constructing knowledge rather than receiving knowledge (Muhajirah, 2020). The reason is that this learning strategy will better assist students in transferring and transforming knowledge which is the aim of education (Muhajirah, 2020). Constructivists agree that the existence of the objective world; however, they are of the view that we understand the world through subjective interpretations of individual experiences (Ertmer & Newby, 2013). According to constructivism theory, learning is a process of constructing meaning from experiences (Burhanuddin et al. 2021). Experts in the stance of constructivism stress the learning process instead of remembering knowledge and emphasising learning outcomes.

In Vygotskian classrooms, lecturers act as facilitators to provide guidance and support to students whenever they are needed (Muhajirah, 2020). Students are encouraged to engage to discussions, collaboration and teamwork. According to Piaget and Vygotsky, the ideal classroom is leading towards the concept of constructivism itself, which is to build knowledge from students' individual in the learning process (Burhanuddin et al. 2021). For this reason, it is of profound significance that learning takes place in the real world. The constructivist viewpoint believes that knowledge transfer can be supported by engagement in real tasks anchored in meaningful contexts (Ertmer & Newby, 2013).

Within the constructivist learning theory, students decide their learning process by developing the course syllabus, prioritising topic areas, establishing peer accountability, facilitating class sessions, and engaging in ongoing evaluation (Hains & Smith, 2012). Therefore, lecturers serve as facilitators who coordinate students' learning (Kitiashvili, 2020). Lecturers provide feedback on learners' progress and conduct assessments to improve learning; learners develop self-assessment skills (McCombs & Whisler, 1997; Weimer, 2002). Students feel accepted and supported; learning is based on participation. The more actively students can participate, the more they are empowered and responsible for their learning (Hackathorn et al., 2011). In the authors' opinion, the constructivist learning theory was suitable to be utilised as a theoretical lens in this study. The reason was that they believed that to effectively promote student engagement, game-based learning should be based on constructivism learning theory.

Research Problem

In this study, the authors asked the main research question:

- What are the students' opinions about teaching acupuncture programme with game-based learning?

Sub-questions:

- What are students' attitudes towards teaching the acupuncture programme with game-based learning?
- What are the benefits of teaching the acupuncture program with game-based learning?
- What are the challenges of teaching the acupuncture program with game-based learning?

Method

Research Design

Research methodology is a systematic process to identify and analyse information of research which includes research paradigm, research design and research methods (Venketsamy & Hu, 2022). In this study, a qualitative approach was adopted to explore students' views and experiences of game-based learning to promote their engagement in learning. A set of student directed game-based learning activities (Appendix A) were proposed and designed to promote students' understanding of acupuncture techniques and concepts, improve their confidence, stimulate their interest and increase their engagement with fellow students through vivid and appealing scenarios. The authors believed that qualitative study was suitable to be utilised in this study since they aimed to explore students' lived experiences. This view concurs with Hu et al. (2022) and Venketsamy et al. (2022), who state that qualitative research is of particular significance in exploring participants' experiences and characteristics. This study was conducted at an identified public university in Gauteng province. In this study, a single case study design within an interpretivist paradigm was adopted. The authors agree with Hu and Venketsamy (2022) and Yin (2018) that a single case study should be employed when a case is critical, unusual, common and relevant to the research. The selected case was critical since the authors acknowledged poor student engagement and academic performance in the identified programme. The selected case was also unusual because the identified case (acupuncture programme) was the only programme in the South African context. It is also a common situation since student engagement is a common issue globally. The identified case was relevant to the authors because they were lecturers at the identified university.

Participants

In this study, a purposive sampling technique was utilised to recruit participants. The authors placed a research invitation poster on the noticeboard on the identified campus. Students who responded to the poster were invited to participate in a semi-structured interview. The inclusion criteria included: a) students must be registered students for the Bachelor's Degree of Health Sciences in Complementary Medicine; b) participants had to be in the third or fourth year of their study in the acupuncture programme; c) participants must participate in the game-based learning activity (Appendix A); d) participants must be above the age of 18; and e) participants must express their willingness to voluntarily participate in the study. Six students agreed to voluntarily participate in this study by signing a research consent form.

Table 1. Biographical data of participants

No	Year of Program	Gender	Age	Codes
1	3rd year	Female	22	P1-F-23
2	4th year	Female	23	P2-F-23
3	3rd year	Female	24	P3-F-24
4	3rd year	Male	24	P4-M-24
5	4th year	Male	26	P5-M-26
6	3rd year	Female	23	P6-F-23

Data Collection Tools

The semi-structured interviews (See Appendix B) took place between February and March 2023 Table 1 below illustrates the participants and the respective codes used in the data analysis. To ensure confidentiality and anonymity, pseudonyms were used throughout the research.

Data Analysis

In this study, thematic analysis was utilised in data analysis. Hu et al. (2022) and Venketsamy et al. (2021) state that thematic analysis is a useful approach to identify similarities and dissimilarities of opinions in qualitative data. Furthermore, Hu et al. (2022) affirm that through thematic analysis, researchers will be able to clarify important aspects of the findings of studies. Therefore, the authors followed the six-step thematic analysis proposed by Creswell (2014) to analyse the raw data systematically. The data were analysed inductively. The authors reviewed the raw data several times to become familiar with the data (Step 1). The authors thereafter started to code data (Step 2) and recognised initial themes (Step 3). The initial themes were reviewed (Step 4) and refined (Step 5). In the end, the authors used these codes and themes to answer the research question. To ensure the trustworthiness of this study, the authors employed multiple techniques to improve the credibility, conformability, dependability and transferability of the findings. These techniques included well-planned research design and methods, thick descriptions of data, and an audit trail that was audited by a second coder.

Ethical Committee Permission

Ethical concerns were ensured. An ethical approval letter was obtained from a research committee at a public university in Gauteng province (Ref: REC-1443-2022).

Results

This study explored students' views ad experiences of game-based learning to promote student engagement at an identified HEI in SA. Participants shared positive views and attitudes toward game-based learning. They believed game-based learning effectively motivated their engagement in the course since this innovative pedagogical approach significantly improved their interest in the learning process. However, students also highlighted that sufficient time should be allocated to game-based learning. Furthermore, they believed that each game-based learning should be well-planned in advance. During the data analysis, three themes emerged from the raw data, namely: i) Students' views and attitudes toward game-based learning; ii) Benefits of game-based learning; and iii) Challenges in game-based learning. Verbatim quotes were included in the section below.

Theme 1. Students' views and attitudes of game-based learning

The findings of this study revealed that all participants acknowledged positive views and attitudes toward game-based learning in the acupuncture programme. They agreed that game-based learning not only was interesting but also significantly enhanced learning. Through the acupuncture quiz competition, they could identify their deficiencies in knowledge. With game-based learning they felt relaxed and refreshed after practising the Ba Duan Jin (an exercise in the game). P1-F-23 and P6-F-23 reported that game-based learning was beneficial for their mental and general health. They believed collaboration and teamwork in game-based learning strengthened their communication skills and improved their confidence. P1-F-23 said,

> I found the experience very fun! I feel it made engaging with our content and revising very effortless and enjoyable. I do feel that this method of testing each other and engaging with our academic content as well as other aspects of acupuncture in Chinese medicine is so beneficial to our learning. The entire day also gave us a breathing space where we didn't think about work or things that were due just for a few hours.

P2-F-23 added:

> I had a good time with the activities that we had, especially the 30 seconds game [acupuncture quiz competition]. I also got to be tested about things that I struggle with, especially when I needed to think rapidly of answers to the questions. The Baduanjin exercise was also amazing, and I was so much excited that we finally tried to perform it better than when we were practising before. Seeing the people interested in receiving treatment and also curious about who we are really made me happy because it is indicative of a successful event we had.

Both P3-F-24 and P4-M-24 reported that game-based learning was fun and facilitated them to identify weaknesses in their study without any stress. They further indicated that meeting students from different years and fields of study was a great experience. P3-F-24 said: "*There were things I remembered that I didn't even know I knew, and then there were things that I thought I knew but forgot under pressure*." P4-M-24 articulated: "*I had a wonderful experience during this day. I had so much fun and learned a lot about where I was lacking during the games we were playing*." P5-M-26 stated: "*It was a nice experience showing my profession to everyone, doing cupping and needling and being able to explain what acupuncture is to other people*."
P6-F-23 contended that:

> The play learning base improved my health not only by doing the therapeutic exercise but also improved my mental health as I got to be around people and smile. Most students normally live alone and don't socialise with other people. You can have fun and learn at the same time, and improve physical health because of the movements [Ba Duan Jin exercise]. Furthermore, it helped me with my communication skills, it felt amazing doing cupping while people were lined up waiting for me to treat them and seeing the interest in their eyes when they asked about cupping.

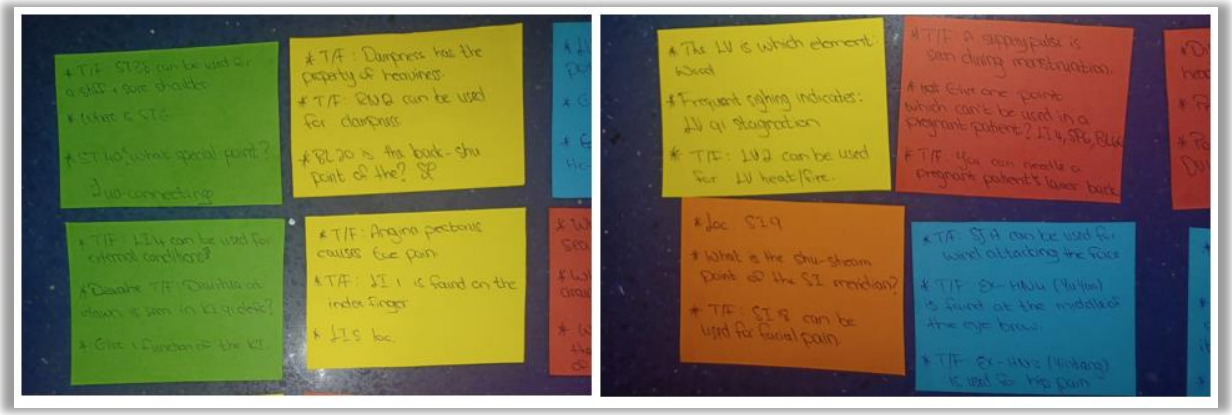

Figure 3. Acupuncture competition: Quizzes developed by students

Theme 2: Benefits of game-based learning

The findings highlighted several benefits of implementing game-based learning in the acupuncture programme. Participants indicated that the benefits included stress relieving, identification of strengths and weaknesses in the study, improving confidence and promoting teamwork. They concurred that games effectively motivate them to engage in learning; for instance, P1-F-23 stated: "*The adrenaline that comes with winning pushes me to study ten times more than I already am, and that will work in my favour in terms of revising the content that I need to cover because no one likes to lose*." P2-F-23 added: "*I got to see my strengths and weaknesses, I got challenged, felt energised and I got to socialise with other people.*" P3-F-24 said: "*I had to work with my classmates as a group in order to provide correct answers. This showed how helpful group work can be*." P3-F-24 further indicated:

> I feel we get to engage with the content in a fun way, which takes the stress and anxiety out. I also feel it makes us feel proud to represent our faculty on days like these [Note: Students were playing games in an outdoor area on campus]. We also get to interact with the other years which also makes us feel more like a unified group which I do feel we need a lot more of.

P4-M-24 articulated: "*It was fun yet informative, challenging in a good way and it pushed me to think quicker than usual. I am challenged to think quicker and that will work to my advantage in exams and in clinical practice."* He further explained that the acupuncture quizzes assisted him in identifying gaps that he needed to revise. P5-M-26 believed the benefits of the games were stress relieving. Furthermore, he reported that he felt it was easier to study in groups.
P6-F-23 said:

> Game-based learning was a great tool to practice accessing stored information and knowledge in a fast-paced and stressful manner, which I feel is the same situation we undergo during the reporting of cases to you after assessing patients. It was helpful to listen to the way that other students described points, syndromes, or theories that helped me find new ways of both understanding the work and better remembering it. It can help one to revise what they don't know, and you can also learn from others what you could not describe.

Theme 3. Challenges in game-based learning

Despite participants expressing positive views on game-based learning, they highlighted that there were some challenges. One of the most crucial perspectives that participants pointed out was the importance of well-planned programmes for game-based learning. To this, P1-F-23 said:

> I think next time, the date of the event [game-based learning] should be announced much earlier. This will allow us to spread the word about the event through posters and social media, attracting more people to come to the event. I also feel like we should also have some people who will always be on standby waiting for people to come or approaching people adjacent to us informing them of our profession and what we have to offer.

P2-F-23 said: "*I would definitely advise more of these types of play-based learning opportunities, preferably out of the sun though; i.e., in a shady area, or possibly a hall, where we could be more constructive.*" P3-F-24 stated: "*The only challenge was the time taking during the weeks to organise the event [game-based learning].*" P5-M-26 added: "*The only challenge I experienced was that we were doing the activities under the sun, and it resulted in me having a headache after the activities*."

Summarily: Graphically

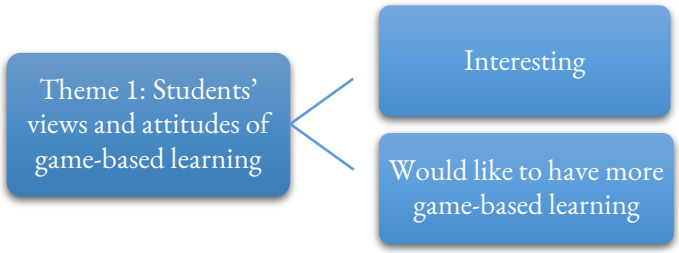

Figure 4. Codes of Theme 1: Students' views and attitudes of game-based learning

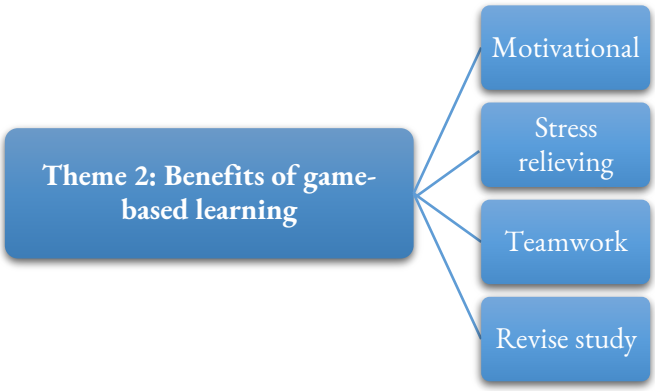

Figure 5. Codes of Theme 2: Benefits of game-based learning

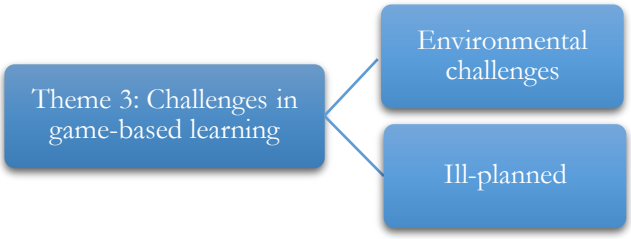

Figure 6. Codes of Theme 3: Challenges in game-based learning

Discussion

Student engagement plays an important role in improving academic outcomes at HEIs, which further influences students' success in the world of work. Collaco (2017) states that one of the challenges teachers face in higher education is engaging their students. Due to the critical role of student engagement at HEIs, De Villiers and Werner (2016), Lim (2017) and Lewin, and Mawoyo (2014) are of the view that there is a need to improve student engagement at HEIs. The findings of this study concurred that student learning outcomes are closely linked to their engagement in the study. Evidence can be found in P1-F-23's response, where she indicated that she would engage more in the study due to game-based learning. This finding agrees with Lewin and Mawoyo (2014) and Schreiber and Yu (2016), who emphasise that it is of importance to improve student academic performance through student engagement in learning. The authors believe the increased time spent on revising content knowledge will improve their learning outcomes in the programme.

The findings of this study also highlighted that game-based learning was an effective pedagogical approach to promote student engagement. The authors contend that well-planned academic activities utilising games will significantly motivate student engagement in the learning process. In their work, Adipat et al. (2021) articulate that psychological motivation is one of the key benefits of employing games in teaching and learning (Shah, 2019). The reason is that literature reveals games will effectively strengthen student motivation in learning. Mekler et al. (2017) point out that it will be a challenge to improve students' academic performance when there is a lack of motivation. The literature shows that student engagement can be strengthened from behavioural, psychological, sociocultural, and hosted dimensions (Kahu, 2013). In this study, the students planned the entire game-based learning programme (Appendix A). According to the constructivism learning theory, students are the key factor in teaching and learning (Golder, 2018; Kitiashvili, 2020). Students will be motivated to develop new knowledge from their existing knowledge if students engage in learning actively (Burhanuddin et al. 2021; Emaliana, 2017; Shah, 2019). In the authors' opinion, active involvement in the lesson plan for game-based learning assists students in extending their knowledge and skills from their existing knowledge. This is of particular significance since students' academic performance is affected by their background (Wawrzynski, Heck & Remley, 2012). Furthermore, Yaccob et al. (2022) agree with Cheng and Su (2011) that there are many other advantages of implementing games in teaching and learning.

The findings of this study affirm the significance of game-based learning in reducing student stress and pressure (Akour et al., 2020; Cheng & Su, 2011). According to the constructivism learning theory, students developed skills during communication and teamwork in the process of learning (Burhanuddin et al. 2021). The findings of this study also highlighted that students felt more supported and collaborative instead of being isolated. Consequently, the authors are of the view that it is of profound significance to employ game-based learning in the acupuncture programme at HEIs. This view concurs with Pyle (2018), who suggests that HEIs should provide a friendly learning environment for students regardless of their age. The authors agree that game-based learning is one such pedagogical approach that improved student learning experiences. To avoid demotivating students, game-based learning should be well-planned before its implementation (Welbers et al., 2019; Yaccob et al., 2022). Furthermore, sufficient time should be allocated to plan game-based learning.

Conclusion

Students' competencies are one of the most important concerns for higher education globally. The reason is that HEI should ensure graduates are competent in the world of work through effective teaching and learning. Although there are debates on the definitions of student engagement, the literature agrees on the importance of increased student engagement in improving student academic performance (Kahu, 2013; Lim, 2017). Therefore, it is of pertinent significance to promote student engagement at HEIs (Schreiber & Yu, 2016; Ting, Tan & Voon, 2020). This study reveals that game-based learning is an effective pedagogical approach to improve student engagement at HEIs. The findings of this study supported that game-based learning motivated students to be involved in their learning. Moreover, students felt less stress in game-based learning activities compared to normal classroom teaching. Active involvement in planning game-based learning will encourage students to be engaged in the learning process.

There is a lack of research focusing on student engagement at HEIs in the South African context, particularly in the field of health sciences. This study made contributions to enriching data on the contextualised lived experiences of African students with regard to game-based learning at HEIs. The findings of this study revealed that there were several benefits of game-based learning, such as increased motivation, reduced stress, and enhanced collaboration. Contextually, the findings of this study also concurred with Hu and Venketsamy (2022) who report that African students seem to prefer group study. The reason is that they do not feel isolated when studying in groups.

Recommendations

This study attempts to address the lack of research on game-based learning at HEIs through a case study in a contextualised HEI. Emanating from the findings of this study, the authors recommended the following:

- Student engagement plays an important role in predicting students' academic performance which significantly influences their competence in the world of work. It is recommended that HEIs should adopt diverse pedagogical approaches to improve student engagement in their institutions.
- Game-based learning is an effective pedagogical approach to improve student engagement at HEIs. It is therefore recommended that HEIs should consider employing game-based learning at HEIs.
- To effectively implement game-based learning and avoid demotivating students, it is further recommended all game-based learning activities should be well-planned. Lecturers should encourage students to be involved in planning the lessons.

Recommendations for future research

In the authors' opinion, this study should be explored at different HEIs nationally and internationally. They recommend that game-based learning also should be investigated using different research approaches, such as quantitative or mix-methods approaches.

Limitations of the Study

The authors employed a qualitative approach to explore students' lived experiences of game-based learning at an identified HEI in the South African context. This study was limited to exploring students' experiences at one HEI to which the authors had direct access. Consequently, the findings of this study lacked comparison. Although the authors followed a rigorous research design to ensure the trustworthiness of this study, the subjective analysis brought by the interpretivist paradigm was also considered as a limitation.

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Appendix A. Example of a game-based learning lesson plan

Game-Based Learning Activities

Modules: Complementary Medicine Practice 3
Clinical Practice 1 (acupuncture)
Location: Campus Library Parking
Time: 10:00-12:00 17 February 2023

Time	**Activities**	**Goals**
10:00-10:20	Game 1- Acupuncture competition 1 (30s quizzes)	Strengthen students' acupuncture content knowledge (Basic theories)
10:25-10:35	Game 2- Qigong exercise: Ba Duan Jin	Promote general health
10:40-11:00	Game 3- Acupuncture competition 2 (30s quizzes). *Demonstration of acupuncture techniques*	Strengthen students' acupuncture content knowledge (Acupoints and Meridians)
11:05-11:15	South African Performance	Promote culture integration
11:20-11:40	Game 4- Acupuncture competition 3 (30s quizzes) *Demonstration of cupping techniques*	Strengthen students' acupuncture content knowledge (Acupoints and Meridians)
11:45-11:50	Game 5- Qigong exercise: Ba Duan Jin	Promote general health
12:00	Signatures on the posters	
12:00	End	

Appendix B. Semi-structured interview questions

Semi-structured Interview Questions

Q1. Please describe your views of game-based learning in the acupuncture programme.
Q2. Please describe your experiences with game-based learning in the acupuncture programme.
Q3. What are the benefits of game-based learning in the acupuncture programme?
Q4. Please describe your challenges in game-based learning in the acupuncture programme.
Q5. What would you suggest to improve game-based learning in the acupuncture programme?

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Research Article

Opinions of classroom teachers on values education in primary school curriculum

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Abstract

In values education, the primary school period (7-9 years), which is the most important stage in the character development of individuals, and indirectly the classroom teachers are very important. Primary school teachers play a critical role in the implementation of the values education curriculum that has been given importance recently. The purpose of this research is to examine the views of primary school teachers on values education in primary school curriculum. In the study using descriptive survey model, quantitative method was used. Purposive sampling method was used in the research. In this context, the sample of the study consisted of 281 classroom teachers in the city center of Tokat in the 2020-2021 academic year. In the study, an opinion scale on value education developed by Başçı (2012) was used to collect quantitative data. Frequency, percentage, t-test for independent groups and one-way analysis of variance were used in the analysis of the data. Considering the results of the research; effective value education, value in the curriculum and the general sum of all sub-dimensions in favor of female teachers in the opinions of teachers on values education; in favor of teachers in the 20-29 age group in the general sum of all sub-dimensions; It was found that the views on the family-environment-media sub-dimension were in favor of the teachers working for 1-5 years. It was found that there was no significant difference in the grand total of all sub-dimensions according to the classes they taught.

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Introduction

In order for individuals to develop emotionally and socially, values should be adopted by children. Actions and behaviors are positive in children who develop emotional and social competences. Values not only regulate the social life of individuals, but also contribute to their personal and academic success (Koç, 2018). Curriculum has a high share in raising the human profile desired by the society and conveying the desired values to the students. The important thing in the curriculum is to support the students to adopt the values. In order to raise generations who can keep up with the society, some values should be gained in the lessons. Teachers are the ones who will give values education. Teachers have assumed the role of educational leaders in the society. They will provide values education in the classroom and convey the values needed within the scope of the curriculum to the students within the scope of the role models they have undertaken both in the society and at school. There are three cornerstones of values education: school, family and student. The emergence of success as a result of the planned and applied indicators in values education is as a result of this harmony (Shodhganga, 2019). Up to a certain period, family and society influence the adoption of values by individuals. The most important time period in transferring values to individuals is their school life (Bursa & Çengelci

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Köse, 2017). In his study, Çelik (2020) is based on the observations of administrators and educators who take an active role in the values education program, which is deemed appropriate to be transferred for primary school students. Demands for in-service training on teaching values to educators were determined. Erbaş and Başkurt (2020) worked qualitatively at the stage of revealing the process of how values education will be given in the life studies course, which is the major course of primary school students.

Problem of Study

The problem of this study is to investigate the opinions of the classroom teachers, who play an important role and are the education leaders, about the acquisition of values education in the curriculum. With this research, it is aimed to determine the values education in the primary school curriculum according to the opinions of the teachers. The sub-problems of this research are;

- Do primary school teachers' views on values education in the primary school curriculum differ according to gender?
- Do primary school teachers' views on values education in the primary school curriculum differ according to age?
- İlkokul öğretmenlerinin ilkokul müfredatındaki değer eğitimine ilişkin görüşleri mesleki kıdemlere göre farklılaşmakta mıdır?
- Do primary school teachers' views on values education in the primary school curriculum differ according to their age?
- Do primary school teachers' views on values education in the primary school curriculum differ according to the classes they teach?

Method

Research Model

This research was carried out according to the screening model, which is one of the quantitative research types, and the screening models aim to determine the existing characteristics of any group (Karasar, 2009). In this study, the changes in the views of classroom teachers on values education according to different variables were examined.

Study Group

The study group was formed at the primary school level in Tokat in the 2020-2021 academic year. It consists of 281 teachers teaching the classes. Criterion sampling, one of the purposeful sampling techniques, was used to determine the study group for the size of the study. The criterion sampling we have determined is that it provides a basis for the study of situations that respond to a series of criteria. Accordingly, the criteria for participation in the study group; 1-4 grades in primary schools in Tokat in the 2020-2021 academic year. It is the state of being a classroom teacher who implements the curriculum in the classrooms. In this context, 281 of 462 classroom teachers working in the city center of Tokat were reached.

Table 1. Characteristics of classroom teachers in the study group

Gender		**N**	**%**
	Female	126	44,8
	Male	155	55,2
Age			
	20-29 years	24	8,5
	30-39 years	83	29,5
	40-49 years	99	35,2
	50-59 years	67	23,8
	60 + years	8	3,0
Seniority			
	1-5 years	21	7,5
	6-10 years	25	8,9

	11-15 years	59	21,0
	16-20 years	49	17,4
	21-25 years	56	19,9
	26 + years	71	25,3
Level of Class Taught			
	1st grade	66	23,5
	2nd grade	66	23,5
	3rd grade	66	23,5
	4th grade	83	29,5

Data Collection Tools

The data collection tool used in the research consists of two parts. There is a personal information form and the "Values Educational Opinion Scale" developed to get the opinions of teachers.

Personal Information Form

Within the scope of obtaining the personal information of the teachers participating in the research, questions about the gender, age, professional seniority and class status of the teachers were included.

Opinion Scale for Value Education

In the research, a five-point Likert-type view scale for values education, consisting of 25 items, was used for the practice of examining teachers' views on values education in primary school curriculums (Başçı, 2012). With the scale used, it is aimed to determine the opinions of teachers about values education in primary school curriculum. The scale is a 5-point Likert type scale.

Procedure

Permission was obtained for the scale used in the research, and the data of the teacher value scale questionnaire were collected between 01 June and 01 July 2021. All necessary permissions were obtained from the Tokat Provincial Directorate of National Education. It was sent to our schools in an official letter, and the necessary information was shared and filled in objectively by our teachers.

Data Analysis

SPSS program was used in the analysis of the data obtained, and t-test and analysis of variance were used in statistical analysis.

Results

In this section, the views of primary school teachers on the content of values education in the primary school curriculum and the findings on their differentiation according to some variables are presented.

Values Education and Gender

Table 6. T-Test results on the differentiation of primary school teachers' views on values education in the curriculum according to gender

Sub-dimensions of Scale	Gender	n	$\bar{X}$	Ss	t	p
Parent-Environment-Media	Female	126	3,9762	,47136	-,685	,494
	Male	155	4,0202	,58187		
Effective value education	Female	126	4,2390	,53648	1,357	,176
	Male	155	4,1441	,61840		
Value in the curriculum	Female	126	3,5057	,40271	1,426	,155
	Male	155	3,4258	,51297		
Total of Scale	Female	126	11,7209	,36026	,899	,370
	Male	155	11,5901	,47503		

There was no difference in the general and sub-dimensions of the scale according to gender in the teachers' views on values education (p>.05).

Values Education and Grade Level Taught

Table 7. ANOVA results on the differentiation of primary school teachers' views on values education in the curriculum according to the class they teach

Sub-dimensions of Scale	Grade Level	Sum of Squares	df	Mean square	F	p
Parent-Environment-Media	Between group	,973	3	,324	1,136	**,**335
	Within group	79,074	277	,285		
	Total	80,047	280			
Effective value education	Between group	1,181	3	,394	1,156	,327
	Within group	94,315	277	,340		
	Total	95,496	280			
Value in the curriculum	Between group	,497	3	,166	,756	,520
	Within group	60,741	277	,219		
	Total	61,239	280			
Total of Scale	Between group	,827	3	,276	1,518	,0210
	Within group	196,296	277	,182		
	Total	198,123	280			

There was no difference in the sub-dimensions of the primary school teachers' views on values education according to the grade level of the teachers (p>.05). However, there was variation in the general dimension of the scale (p<.05). When the table was examined in terms of its general dimensions, a significant difference was observed (p<.05).

Values Education and Age

Table 8. ANOVA results on the differentiation of primary school teachers' views on values education in the curriculum according to their age

Sub-dimensions of Scale	Grade Level	Sum of Squares	df	Mean square	F	p
Parent-Environment-Media	Between group	3,170	4	,792	2,845	,024
	Within group	76,877	276	,279		
	Total	80,047	280			
Effective value education	Between group	9,601	4	2,400	7.713	,000 *
	Within group	85,895	276	,311		
	Total	95,496	280			
Value in the curriculum	Between group	2,248	4	,562	2,630	,035*
	Within group	58,990	276	,214		
	Total	61,239	280			
Total of Scale	Between group	3,555	4	,989	5,157	,001*
	Within group	194,567	276	,172		
	Total	196,123	280			

It was determined that the views of primary school teachers on values education differed according to the ages of the teachers in the general and sub-dimensions of the scale ($F_{(4-276)}$= 5,157, p<.05). In the parent-environment-media dimension, the opinions of the teachers in the 20-29 age group differ more positively than the opinions of the teachers in the 50-59 and 60 and over age group.

Values Education and Professional Seniority

Table 9. ANOVA results on the differentiation of primary school teachers' views on values education in the curriculum according to their seniority

Sub-dimensions of Scale	Seniority	Sum of Squares	df	Mean square	F	p
Parent-Environment-Media	Between group	2,656	5	,531	1,887	,097
	Within group	77,391	275	,281		
	Total	80,047	280			
Effective value education	Between group	10,115	5	2,023	6,516	,000*
	Within group	85,381	275	,310		
	Total	95,496	280			
Value in the curriculum	Between group	2,592	5	,518	2,431	,035*
	Within group	58,646	275	,213		
	Total	61,239	280			
Total of Scale	Between group	3,526	5	,705	4,075	,001*
	Within group	196,596	275	,173		
	Total	197,123	280			

In the general and sub-dimensions of the scale (except for the Parent-Environment-Media dimension) the views of primary school teachers on values education differed according to the professional seniority of the teachers ($F_{(5-275)}$= .707, p<.05). Considering all sub-dimensions, it can be said that the opinions of teachers with 1-5 years of seniority are more positive than the opinions of teachers with other professional seniority.

Conclusion and Discussion

Primary education level is a very important education level in giving values education and it is very important to determine the opinions of the classroom teachers who give education at this level on values education. In this study, the views of primary school teachers in the province of Tokat, which is a city of middle socio-economic level in Turkey, on the contents of values education in the primary school curriculum were examined.

It has been observed that there is no differentiation according to gender, there is a differentiation according to the law in the views of primary school teachers on values education, but the opinions of young primary school teachers with low seniority and younger age regarding the content of values education in the curriculum are more positive.

While there was no differentiation according to gender in the research, there was variation in the studies in the literature. In the study conducted by Canpolat, Kaya, and Küçüktağ (2010), it was seen that female teacher candidates studying as classroom teacher internalized spiritual values more than male teacher candidates. In his study, Can (2008) stated that teachers' views on values education practices differ in favor of female teachers. Gedik (2010) found in his study that female teachers attach more importance to the value of life satisfaction and security in value orientations, and male teachers to the value of power. This finding differs from my research.

Differentiation in terms of professional experience is also seen in the study of Kılcan (2010), but the findings differ and he found differentiation in 16-20 years of professional experience.

Recommendations

In the research, it is a quantitative study and it is limited only to the province of Tokat, and it can be ensured that the research is carried out on a large scale. In addition, qualitative research methods can be used to conduct in-depth research on values education.

Limitations of Study

The research is limited to the 2020-2021 academic year, primary school teachers' views on values education, classroom teachers (1-4) working in official institutions affiliated to the Tokat Provincial Directorate of National Education, and the resources provided about the research topic.

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Biodata of Author

Servet Ozcan graduated from Atatürk University, Faculty of Education, Classroom Teaching Department. He completed his master's degree without thesis in the field of classroom education at Gazi Osmanpaşa University. He worked as a classroom teacher and administrator in the province of Tokat. He has received many awards in his managerial position. He has attended many in-service trainings in his field. He still works at the Tokat Public Education Center. E-mail: sahibindenzcn60@gmail.com

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Research Article

High school of fine arts instrument education-examination of kabak kemane education books in terms of form and content[1]

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Abstract

The aim of this research is to examine the kabak kemane textbooks taught in Fine Arts High Schools operating under the umbrella of the Ministry of National Education in terms of form and content. The books in question were prepared and published in 2019 within the scope of the "Instrument Education-Violin Teaching Program", which was approved and published by the Training Education Board of the Ministry of National Education in 2018. Within the scope of the research, document analysis method, one of the qualitative research methods, was used. Books that have been designated for research; technical design and regulation were examined under the themes of teaching-learning activities and measurement-evaluation activities. As a result of the analyses, it was concluded that the 9th grade textbook differs for all three themes in particular, and that the books show similarities to each other according to the themes from the 10th grade onwards. It was also determined in the research that books are prepared according to the goals set within the scope of the "Instrument Education-Violin Teaching Program" prepared in 2018, study and performance of works are often included in the teaching-learning activities in books, and in the measurement and evaluation theme, students are given the opportunity to do original works such as "study, composition study", especially in the 11th and 12th grades. However, it has been determined that at the beginning of the units, no information was given about the achievements that students will achieve in the relevant unit.

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Introduction

Education is a process aimed at creating changes in human behavior. Music education, on the other hand, is thought to create permanent changes by improving a person's perception and ability of music. Through music education, it is expected that the interaction and communication between a person and his cultural, social and natural environment, related artistic and especially musical environment, in which changes in people's behavior affect societies and changes in societies affect people, will be more efficient, effective, healthy and orderly (Uçan, 2005, 30).

It is thought that music education gives direction to social values and cultures by following a sequence from private to general. While music education contributes to the development of the ability to express a person, it provides an

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opportunity for the proliferation of intercommunal cultural exchanges and intercommunal interaction (Yüksel, 2018, 27).

Instrument Training

In the instrument education process, which starts with music education on its basis, a person can switch to instrument education when the music education process is completed or while the music education process is ongoing, and continue both educational processes in parallel. Instrument education can be defined as "the education given in the process of teaching complex behaviors related to the instrument and converting these behaviors into skills". According to this, the two most important elements of the instrument education process are the teacher and the student (Çilden, 2001, 28).

Based on this idea, another of the most important elements in the instrument training process is that the person realizes the targeted behaviors by taking a model. The ability to accurately observe and reflect the modelling behavior is of great importance in terms of the instrument training process. In order for a person to receive healthy feedback on the behavior he is exhibiting and to be a good observer, it is necessary to perform one-on-one practical work with the instructor. In the process of one-on-one instrument training, it is necessary for a person to make sense of characteristics such as the right-left hand position, the way of holding the instrument and the posture of the body in a good way. Instrument education is a field of education that has a social aspect as well as a personal aspect. Taking into account the mentioned feature of instrument education, it can be stated that it is necessary to deliver this education to every point of society and to be adopted by every segment (Uslu, 1998, 7).

It is stated that instrument education, which is mostly given to interested and desirable people in order to develop talents and interests, is extremely important within the scope of attentive music education. Attentive music education is not a compulsory education for everyone at any level. On the contrary, it is an elective education depending on the opportunities required for active participation with predisposition, desire and interest (Uçan, 2005, 32).

Although trainings are mostly given within the scope of attentive education related to the instrument trainings in question, instrument trainings are provided in many official institutions that provide musical education, especially fine arts high schools and conservatories. One of the mentioned instrument trainings is kabak kemane training. Before going into the details of this training, information about kabak kemane was briefly included.

Kabak Kemane

The kabak kemane, which is among the folk music instruments, has a long-established history. The instrument in question, which dates back to the first Turkish ensembles, has been able to adapt to the time that has passed since then and has undergone transformation to a certain extent. On the contrary, it can be said that other instruments that have their origin do not move far away from sound colours (Yengin, 2019, 18).

String instruments are known as magic, ritual and epic instruments in Turkish societies. Kemence, one of the most beautiful examples in this regard, is among the most typical instruments known of Turkish cultural music. The instruments in question, where magic, fortune telling and healing prayers are also performed, have a purring and moaning sound coming from your nose and give the individual feelings full of magic and fear. Each part of the mentioned string instruments is made from natural materials, which are considered sacred in Turks. In Turkish societies, the expression string instrument has been met with the word "Iklig" for centuries, while the expression "kemence", which is widely used in Iran, has been used in the XV. starting from the century, it began to settle in the language of Turkish societies. Thanks to this, the Turks began to use the words "Iklig" and "Gicak" together with the word kemence (Kaya, 1998, 17).

Kabak kemane, whose body is made of calabash and whose heart membrane is usually covered on the cut face of the gourd, can be based on Iklig from an etymological point of view. In terms of the way it is played and kept, there are quite similar aspects to Iklig and each other. In this context, it is possible to use the expression "the ancestor of the kabak kemane" for Iklig. Iklig has come up to date in the Anatolian geography with various names such as Hegit, Gangili, Giygiy, Giygi, Givgiv, Çagana and Dizdir. Today, the name Iklig is mentioned only on two-stringed instruments, while the name "kemane" is used for three- and four-stringed types. All of the instruments in the string instrument family,

which have a leather cover, have a hemispherical body and are played with strings, are also defined as the "Iklig family" (Akyol, 2017, 164).

Although the kemane has not undergone significant differences over time in terms of shape, it has been used with different names. It seems that these mostly consist of the bow sounds that the instrument makes, the instruments used and the way it is played. Urhan (2014, 1), related to the subject, included the following statements:

Mankind has definitely put a name to every object or event that he has created, made. Based on this, an instrument made using a gourd was called "Oklug" because it was played with an arrow; "Iklig" was given the name because it gave a squeaky sound by pushing, and the word "Oklug" evolved into the word "Iklig" over time. The instrument in question, which is played with the help of an arrow, is referred to by various names in different regions and tribes of the Asian continent. In the Anatolian lands, this instrument made from calabash was called "kabaktan kemane", and in later times it was called "kabak kemane". In some regions of Anatolia, for example, the name "Giygiy" has been given in Nigde, Izmir and Malatya regions, "Giygi" in Denizli and Thrace regions, and "Giygirak" in Samsun and Corum regions.

Over time, the instrument began to become widespread under the influence of its cultural processes, and therefore changing process structures, and underwent structural changes. For example, although animal intestines were used as wire in the past, steel has started to be used for wire today with the effect of industrialization. Similarly, although horsetail hair was used for a bow in the past, fishing line is used today as a product of industrialization. While manual stretching is performed in the use of a bow made using a ponytail, the bow made using a fishing line has its own stretching system. The bow in question is the bow that is also used in the kemane. In the kabak kemane, which has been used with three strings in the past, a fourth string has recently been required both in terms of its richness in playing techniques and its ability to adapt to the orchestra and soloists it is located in (Yengin, 2019, 19).

Today, the most common form of performing the kabak kemane is the four-stringed one. Starting from the first string, which is the thinnest string in the execution of the instrument in question, the tuning format is in the form of "re-la-re-la". Four-string kabak kemanes are usually fitted with a steel binding wire. Accordingly, the first wire, which is the lowest wire of the instrument, is called the 0.20 binding wire, the second wire, which is just above it, is called the 0.30 binding wire, the third wire is called the thin *sirma* binding wire and the fourth wire is called the thick *sirma* binding wire (Çelik, 2018, 13).

In addition, it is observed that with the development of the music approach in Turkey every passing day and the spread of music education, different tuning systems have started to be used. The ability to adapt to the different sound spacing from individual to individual and the necessity of playing some works in different tuning systems have caused the use of tuning systems such as "re-la-re-sol" or "mi-la-re-sol". Another part of the kabak kemane that has undergone changes is its augers. Since the lower threshold of the instrument is located on a thin membrane of animal origin, changes in temperatures can quickly affect the chord of the kabak kemane. Mechanical augers, which are both born from this requirement and contribute to easy tuning, are more preferred augers today. This situation also shows that the kabak kemane continues to change. Similarly, the individuals who are producing the kabak kemane instrument today are also producing five- and six-string experiments of the instrument. Although it is not widely used by performers in the full sense, some performers use these five- and six-stringed instruments both in album recordings and television programs (Yengin, 2019, 20).

Kabak kemane, which can be performed while accompanying folk songs of almost any region in Turkey, is an instrument that is mostly identified with the region, which is referred to as the "Teke Region". Regarding the subject, Çelik (2018, 21) gives the following statements: As for today, the most important source from which even a little information can be obtained about the local performers of the kabak kemane living in our country is the official collections commissioned by the Ministry of National Education on behalf of the Folklore Archive of the Ankara State Conservatory between 1937 and 1952. The mentioned reviews have been made within the scope of almost every region of our country. It can be seen that the compilation studies related to the performance techniques of the Kabak kemane and its local performers have been obtained from studies conducted especially in the regions of Mugla, Isparta, Burdur and Antalya.

As a result of the extremely rapid development of technology and the communication tools connected to it, it can be said that the recognition of the kabak kemane has increased today. However, playing the instrument with a bow and without frets creates some technical difficulties in terms of playing. This situation has caused the kabak kemane not to be used as widely as the other folk music instrument, the baglama. The fact that new generation performers accompany different kinds of music has contributed to the arousing of curiosity of the instrument in other countries at the same time as giving a universal dimension to the kabak kemane (Yengin, 2019, 20).

As mentioned above, although the performance of the kabak kemane is not as common as the context, trainings are provided especially for individuals who are interested in this instrument and want to improve themselves.

Kabak Kemane Training

There are different institutions in our country such as higher education institutions that provide musical education, high schools operating within the scope of the Ministry of National Education, societies and associations. For the process of Turkish music education today, it can be said that "it is maintained within the scope of the master-apprentice relationship without adhering to any method". Within the scope of the vocational education approach, which differs from the old practices in music education departments and state conservatories in higher education institutions, it seems necessary to conduct a more systematic education within the framework of a method. With this approach, it can be said that the aforementioned institutions provide services for the education of educators who can gain target behaviors and realize music education in our country (Pelikoglu, 2007, 12-13).

When the literature is examined, it is seen that the first kabak kemane education process in Turkey was given within the scope of Istanbul Technical University State Conservatory of Turkish Music in 1976-1977 academic year, and in the following years, education began at Ege University State Conservatory of Turkish Music in 1984-1985 academic year (Field, 2022, 4).

Today, it is known that kabak kemane instrument education is given in Fine Arts High Schools and conservatories. Salih Urhan, who was appointed to the Turkish Radio and Television (TRT) institution with the title of kabak kemane artist and placed the kabak kemane instrument at the forefront of Turkish Folk Music instruments, published the first kabak kemane method, which he considered essential for kabak kemane education, in 2009. With the idea that it is caused by the lack of method of the kemane instrument, in 2019 Dr. Özgür Çelik has published a new method called "Kabak Kemane I" and developed it in 2020 under the name "Kabak Kemane II". Another valuable artist who has contributed to the field related to the subject has been Cafer Nazlibas. He has published the "Kabak Kemane I" method for the performance of the six-stringed kabak kemane instrument, which he developed with his own unique playing style, together with Mehmet Zeki Halhalli in 2019. Mehmet Akif Teke, who has been working in this field in 2021, also wrote "Kabak Kemane Method I. Position" (Alan, 2022, 5).

As it can be seen, important studies have been carried out in our country in recent years, especially in the field of kabak kemane instrument, aimed at method studies, which are the basis of instrument education. From this point of view, the study of books, which have an extremely important place in instrument education, has also gained importance.

Instrument Education - Examination of the Kemane Book

In instrument education, which is considered to have an extremely important place in the institutions where music education is provided, it is first determined which instrument should be trained depending on a person's ability, desire and interest. After the selection process of the instrument is determined, instrument trainings based on the program and plan prepared for the training begin to be given.

The general objectives of the curriculum prepared within the scope of the kemane instrument education, which is given in the 9th, 10th, 11th and 12th grades at the Ministry of National Education Fine Arts High Schools, have been determined as follows (Ministry of National Education, 2022, 3):

- To support the healthy development of students who have completed their preschool education within the scope of emotional, cognitive and physical areas by taking into account the personal development processes,

- To contribute to the fact that students who have completed primary school are individuals with a healthy lifestyle orientation by actively using scientific, numerical and verbal reasoning at the basic level that they will need in daily life, having self-discipline and self-confidence in the context of self-awareness and moral integrity in accordance with their own individuality and development level, have acquired aesthetic sensitivity and social skills,
- To ensure that students who have completed the secondary school level become individuals who have assimilated both national and spiritual values by being able to develop the competencies they have gained at the primary school level,
- To contribute to the students who have completed high school becoming people who have assimilated both national and spiritual values and transformed them into lifestyles, who contribute to the cultural, social and economic development of the country as effective and productive individuals, who are ready to live according to their abilities and interests, a profession and higher education in order to improve the competencies they have acquired at the elementary and secondary school levels.

The most basic resources that teachers use to achieve these goals are books. Books, which are expressed by the Japanese as "as valuable as a piece of land", are the first materials used in the process of teaching activities (Semerci, 2004). Within the scope of the Ministry of National Education Regulation on Books and Educational Tools (MONE, 2012), a definition is made for the book; "A book that is considered appropriate to be taught by the Training Education Board within the scope of both formal and non-formal educational institutions". Books are a basic environment that examines and explains information about the subjects included in the curriculum in a regular and planned way, educates and directs students according to the goals of the courses as a source of information (EARGED, 2008).

The reasons why books are used more widely compared to other materials include that they are suitable for the student's knowledge and age level, that they are prepared on the basis of educational programs, and that they are printed (Bayrakçı, 2005). The books in question are resources that can be accessed by students at any time and offer the opportunity to repeat and consolidate the topics. Many teachers organize their studies related to teaching-learning activities according to the teacher's guide book and book, rather than teaching programs. This situation also shows how important books are (Gülersoy, 2013).

Books are teaching materials that are frequently used not only in our country, but also in many countries of the world. While books are used as the main source in countries such as Japan, European Union member states, and the United States, a significant part of the course time is spent with the activities contained in the books (EARGED, 2008). It is extremely valuable and important that books, which are a tool in the process of implementing programs that guide classroom teaching and are seen as the "basis of teaching materials", can be evaluated and their shortcomings can be eliminated (Dane, Doğan and Balki, 2004). With the decision taken by the Ministry of National Education in 2003, it has implemented the "Free Book Distribution Project in Primary Education", which aims to provide books to students studying at the primary school level, which is the compulsory education level, without any charge. Teachers have been warned when they want to use any book other than the books in question as a "book". For this reason, it seems that the quality of the books being used throughout the country has also become extremely important. It is also obvious that it is extremely important that the books being used as sources are suitable for both teachers and students for every field. In particular, the suitability of the subject headings to the context, the inclusion of a conceptual explanation of the subject under consideration, the presence of visuals as well as conceptual explanations, the satisfactory, clear and explicit information provided, the ability of the books to keep up to date and achieve their goals provide important contributions to the processes (Bayrakçı, 2005).

In this context, no research has been found in the context of examining the books prepared on kabak kemane education. This situation encountered regarding the books in question, which is extremely important both for the teachers and the students, has formed the main problem of the research. The aim of the research is to examine the kabak kemane books being taught in Fine Arts High Schools in terms of content. The problem of working towards this goal

is; "How are the Instrument Education-Kemane books taught in Fine Arts High Schools in terms of content?" has been determined as. In this context, answers to the following questions were also sought:

- What are the technical design features of the "Instrument Education-Kemane" books being taught in Fine Arts High Schools?
- What are the teaching-learning activities in the "Instrument Education-Kemane" books taught in Fine Arts High Schools?
- What are the measurement and evaluation activities in the "Instrument Education-Kemane" books taught in Fine Arts High Schools?

Method

The Research Model

Within the scope of the research, document analysis method, one of the qualitative research methods, was used. Document analysis is a method that is being used for systematic and meticulous analysis of the content of written documents (Wach, 2013). The document analysis method is used for the purpose of examining and evaluating all documents in such a way that they are electronic and printed materials. Like other methods used within the scope of qualitative research, it requires data to be examined and interpreted in order to make sense of the document analysis method, to establish an understanding of the relevant topic, and to develop experimental knowledge (Corbin and Strauss, 2008).

Study Group

The basic documents used within the scope of the study are instrument education-kemane books prepared by the Ministry of National Education on the basis of classes for Fine Arts High Schools.

Data Collection

The basic resources within the scope of the research were obtained from the page of the Ministry of National Education Training Education Board Jul.

Data Analysis

The analysis of the data obtained as a result of the document analysis carried out within the scope of the research was carried out by content analysis.

The main purpose of content analysis studies is to shed light on the academic studies planned to be carried out later on the subject that has been covered and to determine the general trend related to the subject. Content analysis is also explained by three different methods in itself: descriptive, meta-synthesis (thematic content analysis) and meta-analysis (Çalık and Sözbilir, 2014). For descriptive content analysis, which was considered within the scope of the research; the expression "systematic studies prepared on a specified topic, published or unpublished, including the evaluation of research results and trends in a descriptive dimension by considering all studies" is used (Suri and Clarke, 2009; Lin, Lin and Tsai, 2014; Jayarajah, Saat and Rauf, 2014). In other words, all quantitative and qualitative studies conducted independently of each other, published or unpublished, within the scope of the determined topic, are reviewed and organized, and trends across the field are determined. In this way, it provides information about the general trend related to the subject to researchers who are conducting studies on the relevant subject and field or who wish to conduct research (Miles and Huberman, 1994; Cohen, Manion and Morrison, 2007). The results obtained by this method are expected to shed light on the planned future research on the targeted topics (Lune and Berg, 2017; Yıldırım and Şimşek, 2018).

The evaluation of instrument education-kemane books in the research was carried out in accordance with the Ministry of National Education Regulation on Books and Educational Instruments (MoNET, 2012); under the themes of technical design and arrangement, teaching-learning activities and measurement-evaluation activities. Books have been evaluated under these themes.

Findings

In the findings section of the research, the examination of kabak kemane books was revealed according to the themes of technical design and arrangement, learning-teaching activities and measurement-evaluation activities.

Theme 1. Technical Design and Editing

Under this theme, the Fine Arts High School-Kemane books were examined and the findings obtained were presented with tables according to the books at each grade level.

Table 1. 9th grade Fine Arts High School-Findings obtained from the technical design and arrangement aspect of the Kemane book

Unit No.	Unit Name	Number of Pages	Number of Images	Features of the Visuals	NPCTI	Number of Shapes	Year of Publication
1	Let's Get To Know The Kemane	16	20	In all units, all of them have been prepared as real pictures, clear and understandable visuals have been included. It offers important contributions to the facilitation of learning.	9	5	2019
2	Kemane Playing Posture Position and Holding Techniques	16	17		13	2	
3	Usage and Cycle on Broadcast Wires	24	7		7	1	
4	Kemane Playing Techniques	34	2		5	1	
5	Basic Bow Techniques	10	1		2	-	
6	Studies and Vocabulary	29	-		-	-	

NPCTI: Number of Pages Containing Theoretical Information

As can be seen in Table 1, there are a total of six units in the 9th grade Instrument Education-Kemane book published in 2019. In terms of the number of pages, it was determined that the first two units consisted of a total of 26 pages, however, an increase in the number of pages was noticed in the third and fourth sections containing basic information about the use of the instrument and performance techniques. The fifth chapter, entitled "Basic bow techniques", is the unit with the fewest pages of the book. The last part is the part where the information learned during the year is put into practice. It has been found that visual content is often included, especially in the first two sections, and the visuals decrease as the units progress. The fact that the images used in the entire book are real pictures is important for making learning easier. The second part of the book appears in the table as the section where theoretical knowledge is given the most space. Although it is important to include theoretical information in the unit, which contains information about the playing, posture and holding techniques of the instrument, it is also valuable to enrich it with visuals. As can be understood from Table 1, the decrease in the number of shapes has also attracted attention as the units have progressed. In summary, in the review of the 9th grade Instrument Education-Kemane book under the theme of technical design and arrangement, the most striking elements are that the images used throughout the book decrease as the units progress, however, the most comprehensively described unit is the fourth unit.

Tble 2. 10th grade Fine Arts High School-Findings obtained from the technical design and arrangement aspect of the Kemane book

Unit No.	Unit Name	Number of Pages	Number of Images	Features of the Visuals	NPCTI	Number of Shapes	Year of Publication
1	Themes Practices-I	16	-	-	3	2	2019
2	Coloring Techniques	6	-	-	2	2	
3	Themes Practices -II	28	-	-	2	2	

NPCTI: Number of Pages Containing Theoretical Information

When Table 2 is examined, it is seen that there are a total of three units in the 10th grade Instrument Education-Kemane book published in 2019. In terms of the number of pages, it has been found that the second unit, "coloring techniques", consists of very few pages, while the first and third units, entitled "themes practices", have more pages. The most striking feature of the book in question is that no visuals are included in any of its units. In addition to the lack of visuals, it was found that very little space was given to theoretical information, and there was a total of seven pages of theoretical information throughout the entire book (1. Unit = 3 pages, 2. Unit = 2 pages, 3. Unit = 2 pages). It is also seen that the shapes are distributed homogeneously within the units, but they are given little space.

Table 3. 11th grade Fine Arts High School-Findings obtained from the technical design and arrangement aspect of the Kemane book

Unit No.	Unit Name	Number of Pages	Number of Images	Features of the Visuals	NPCTI	Number of Shapes	Year of Publication
1	Themes Practices -I	26	1	In the units where the visuals are included, all of them have been prepared as real pictures, clear and understandable visuals have been included. It offers important contributions to the facilitation of learning.	2	2	2019
2	Coloring Techniques	8	1		2	1	
3	Themes Practices -II	30	-		3	3	
4	Studies and Vocabulary	26	-		-	-	

NPCTI: Number of Pages Containing Theoretical Information

When Table 3 is examined, it is seen that there are a total of four units in the 11th grade Instrument Education-Kemane book published in 2019. With the exception of the second unit entitled "Colouring Techniques", the other three units were prepared in numbers of pages close to each other. The second unit, on the other hand, consists of only eight pages, similar to the one in the 10th grade book. In the examinations carried out, it is seen that only one visual is included in the first two units, and these visuals are placed in a simple and understandable way as a real picture. It is understood that very little place is given to theoretical knowledge in all four units. Theoretical information mostly includes information about the authorities processed in the relevant unit. The figures in the book, which contain sequences of authorities related to these authorities, have also been prepared only for the representation of these strings.

Table 4. 12th grade Fine Arts High School-Findings obtained from the technical design and arrangement aspect of the Kemane book

Unit No.	Unit Name	Number of Pages	Number of Images	Features of the Visuals	NPCTI	Number of Shapes	Year of Publication
1	Themes Practices -I	22	-	-	2	2	2019
2	Colouring Techniques	6	-	-	1	1	
3	Themes Practices -II	36		-	3	3	
4	Studies and Vocabulary	55	1	The visual is used as a real picture, although it is black and white, it has an understandable structure.	-	-	

NPCTI: Number of Pages Containing Theoretical Information

When Table 4 is examined, it is seen that there are a total of four units in the 12th grade Instrument Education-Kemane book published in 2019, as in the 11th grade book, and the unit titles are the same. In terms of the number of pages, it is seen that the second unit titled "Colouring Techniques" is a unit with very few pages, while the last unit titled "Studies and Vocabulary" in particular, it has been found that the number of pages is quite high due to the large number of study and application examples. It has been seen that only one image is included throughout the book. However, as in other books, it has been determined that the number of authority information and authority strings transmitted within the scope of units constitutes the number of theoretical information and figures.

In summary, among the four books studied under the theme of technical design and arrangement, it was found that the 9th grade book contains more images due to the inclusion of information such as basic instrument information, instrument introduction, performance, these images are shared as real pictures, thus making learning easier, the shapes and theoretical information in the relevant books decrease as the classes progress, theoretical information and figures are included as well as the number of theme information and theme strings.

Theme 2. Learning-teaching Activities

Under this theme, the High School of Fine Arts-Kemane books were examined and the findings were conveyed with tables.

Table 5. 9th grade Fine Arts High School-The findings obtained from the learning-teaching activities in the book of Kemane

Unit No.	Unit Name	Number of Acquisition	Number of Studies	Number of Themes	Themes	Number of Sketches	Sketch-Region
1	Let's Get To Know The Kemane	5	-	-	-	-	-
2	Kemane Playing Posture Position and Holding Techniques	10	-	-	-	-	-
3	Usage and Cycle on Broadcast Wires	15	14	-	-	-	-
4	Kemane Playing Techniques	11	29	-	-	5	Malatya, Sivas, Sinop, Maraş, Ürgüp
5	Basic Bow Techniques	5	6	-	-	-	-
6	Studies and Vocabulary	4	7	-	-	26	Ordu, Kastamonu, Çankırı, Karaköse, Kars, Tokat, Bayburt, Mesudiye, Afyon, Çerkeş, Erzurum, Sivas, Kilis, Bolu, Yozgat, Urfa, Giresun, Kayseri, Siirt, Nevşehir

Table 5 shows that the first two units include information-based learning activities, the third unit is the richest unit in terms of achievement, at the same time, starting from the third unit, study studies are started with the aim of getting students to practice, especially in the fourth unit, it is aimed to provide learning with intensive practice activities. The fifth unit, in parallel with being the shortest unit, as expressed in Table 1, stands out as the unit where the fewest number of activities are carried out in terms of the number of achievements. The last unit, in accordance with its name, attracts attention with the number of studies and works it contains, as the unit in which students put into practice the studies they have learned throughout the year. At this point, the diversity of the regions of the sketches in the fourth and sixth units is also valuable for students to be able to perform works from different regions.

Table 6. 10th grade Fine Arts High School-Findings obtained from the learning-teaching activities in the book of Kemane

Unit No.	Unit Name	Number of Acquisition	Number of Studies	Number of Themes	Themes	Number of Sketches	Sketch-Region
1	Themes Practices-I	8	6	2	Buselik, Chargah	7	Kars, Sinop, Kirkuk, Erzurum, Kayseri, Tokat
2	Coloring Techniques	4	2	-	-	-	-
3	Themes Practices -II	8	6	2	Uşşak, Hüseyni	19	Erzurum, Şanlıurfa, Adıyaman, Akdağmadeni, Dinar, Divrik, Gaziantep, Kars, Erzincan, Burdur, Çorum, Bergama, Malatya, Niğde, Middle Anatolia, Ankara

When Table 6 is examined, it is seen that much more application activities are included compared to the subjects and achievements in the 9th grade book. However, since the first and third units included themes practices, the acquisition numbers were determined at the same level in parallel with the themes taught in both units. When the studies and works in the 10th grade book are examined, a process opposite to the one in the 9th grade book draws attention. Accordingly, while the excess number of studies in the 9th grade attracted attention, there was no place for formal education. On the other hand, in the 10th grade book, themes trainings have been started, and studies according to these authorities have been included. However, it was determined that the number of studies was kept low and that the performances of works specific to the authorities were included. On the other hand, it is valuable that the works in question offer diversity in a local sense.

Table 7. 11th grade Fine Arts High School-The findings obtained from the learning-teaching activities in the book of Kemane

Unit No.	Unit Name	Number of Acquisition	Number of Studies	Number of Themes	Themes	Number of Sketches	Sketch-Region
1	Themes Practices -I	8	7	2	Kurdi, Hejaz	11	Aydın, Bergama, Azerbaijan, Çankırı, Nevşehir, Trabzon, Giresun, Urfa, Bodrum
2	Coloring Techniques	2	1	-	-	1	Burdur
3	Themes Practices -II	12	9	3	Rast, Nihavent, Nikriz	15	Orta Anadolu, Kerkük, Sinop, Diyarbakır, Elazığ, Iğdır, İstanbul, Burdur, Isparta, Gaziantep, Muğla, Rumelia
4	Studies and Vocabulary	3	6	-	-	18	Lüleburgaz, Şarköy, Tekirdağ, Rumeli, Kırklareli, Giresun, Burdur, Muğla, Bodrum, Divrik, Erzurum, Yugoslavia, Elazığ, Urfa

When Table 7 is examined, it is seen that the gains in the first and third units entitled "Themes Practices" are greater. However, it has been determined that there are activities aimed at teaching two maqams in the first unit (Kurdi and Hejaz authorities) and three themes in the third unit (Rast, Nihavent and Nikriz authorities). When examined from the point of view of studies, it is seen that apart from the second unit titled "coloring techniques", all other units include study activities. When the number of works is examined, the increase in the number of works presented to students for performance attracts attention every passing year. As a matter of fact, it is observed that the performance activities presented in the 11th grade book are much more compared to those presented in the 10th grade. However, a significant diversity in the context of units is noticeable in terms of the number of works. The fact that the number of works and the local numbers of the works in question are not the same is due to the inclusion of more than one work from the same region. It is obvious that the diversity that exists in terms of the region of the work will create an important richness and repertoire for students in instrument performance.

Table 8. 12th grade Fine Arts High School-The findings obtained in terms of learning-teaching activities in the book of Kemane

Unit No.	Unit Name	Number of Acquisition	Number of Studies	Number of Themes	Themes	Number of Sketches	Sketch-Region
1	Themes Practices -I	8	5	2	Segah, Sadzam	13	Balıkesir, Yozgat, Azerbaijan, Black Sea Region, Çanakkale, Bolu, Giresun, Rumelia Region, Bodrum, Kirkuk, Çorum, Divrik
2	Coloring Techniques	2	1	-	-	1	Diyarbakır
3	Themes Practices -II	12	8	3	Karcığar, Saba, Eviç	16	Sivrihisar, Nevşehir, Silifke, Çiçekdağ, Sivas, Bursa, Mut, Diyarbakır, İstanbul, Ankara, Hatay, Tokat, Manisa, Isparta Azerbaijan, Kars, Divrik, Yozgat, Keskin, Erzurum, Sivas, Thrace, Görele, Tokat, Korkuteli, Muğla, Aydın, Fethiye, Rumelia Region, Giresun, Denizli, Burdur, Erzincan, Tercan, Skopje, Artvin, Kırşehir, Middle Anatolia, Amasya, Thessaloniki, Mardin, Kırklareli
4	Studies and Vocabulary	3	4	-	-	37	

When Table 8 is examined, it is seen that the number of achievements is higher with the effect of processing the issues of "Themes Practices" in the first and third units in terms of achievement. It is understood from the increase in the number of studies and works that the 12th grade book has activities that include more applications than the classroom books that came before it. Especially in the last unit named "Studies and Vocabulary", it is seen that a lot of works are performed based on the importance of 12th grade students, who have now graduated from secondary education, being

able to perform their instruments well. As with the books taught in all other classes, the diversity in the regions of the sketches in the 12th grade book is remarkable. It has been determined that the book, which contains examples of sketches from regions all over the country, also includes examples from outside the country. This situation gives students an important richness of performance and repertoire in terms of learning-teaching activities.

Theme3. Measurement and Evaluation Activities

Under this theme, the High School of Fine Arts-Kemane books were examined and the findings were presented with tables.

Table 9. 9th grade Fine Arts High School-The findings obtained in terms of measurement and evaluation in the Kemane book

Unit No.	Unit Name	Number of Tests	NOQ	Other activities for measurement and evaluation	Relationship with acquisitions
1	Let's Get To Know The Kemane	1	-	• Preparing a presentation • Preparing a short video • Filling the blanks • Matching-up • Puzzle	All measurement and evaluation activities included in the book are directly related to the achievements in the curriculum.
2	Kemane Playing Posture Position and Holding Techniques	1	5	• Explanation with items • True/False • Do with showing • Multiple choice • Observation/explanation	
3	Usage and Cycle on Broadcast Wires	1	3	• Matching-up • Practices (13 activities) • Explanation with items	
4	Kemane Playing Techniques	-	-	• Matching-up • Do with showing • Practices (11 activities) • True/False	
5	Basic Bow Techniques	-	-	• Practices (3 activities) • Fill the self-evaluation form	
6	Studies and Vocabulary	-	-	• Practices (4 activities) • Fill the self-evaluation form.	

NOQ: Number of Open-ended Questions

When Table 9 was examined, it was found that all units contained activities related to the desired achievements, as well as a multiple choice test was applied at the end of the first three units, questions related to the subjects transferred in the unit were included, open-ended questions were included in the second and third units, practical activities were included to evaluate the students' ability to perform their instruments from the third unit.

It has been determined that the answers to the questions in the tests given at the end of the unit are given at the end of the book. When viewed in general, the diversity in measurement and evaluation activities attracts attention. It is thought that this diversity will be useful for students to achieve the targeted achievements.

Table 10. 10th grade Fine Arts High School-The findings obtained in terms of measurement and evaluation in the Kemane book

Unit No.	Unit Name	Number of Tests	NOQ	Other activities for measurement and evaluation	Relationship with acquisitions
1	Themes Practices-I	-	-	• Listening to audio recordings • Practices • Rubric	All measurement and evaluation activities included in the book are directly related to the achievements in the curriculum.
2	Coloring Techniques	-	2	• Practices • Rubric • Composing work.	
3	Themes Practices -II	-	-	• Listening to audio recordings • Practices • Rubric	

NOQ: Number of Open-ended Questions

When Table 10 was examined, it was determined that the measurement and evaluation activities were application-weighted and related to the desired achievements. With the graded scoring key at the end of all three units, it is aimed that the student evaluates himself and realizes how much he has achieved the intended achievements.

In general, there is not much diversity in the measurement and evaluation activities. Based on the fact that the course is an application-oriented course, an intensification in this direction also attracts attention in measurement and evaluation activities. In addition, at the end of the second unit, students were asked to compose a composition. This is a very valuable activity in terms of measuring the students' mastery of their instruments and whether they can perform a study at the "synthesis" stage according to Bloom's taxonomy.

Table 11. 11th grade Fine Arts High School-The findings obtained in terms of measurement and evaluation in the Kemane book

Unit No.	Unit Name	Number of Tests	NOQ	Other activities for measurement and evaluation	Relationship with acquisitions
1	Themes Practices - I	-	-	• Listening to audio recordings • Practices • Creating a melody • Rubric.	All measurement and evaluation activities included in the book are directly related to the achievements in the curriculum.
2	Coloring Techniques	-	1	• Research • Practices • Listening activities • Clipboard preparation • Rubric.	
3	Themes Practices - II	-	2	• Listening to audio recordings • Practices • Rubric.	
4	Studies and Vocabulary	-	1	• Studies • Listening to audio recording • Fill the self-evaluation form	

NOQ: Number of Open-ended Questions

When Table 11 was examined, it was found that, especially unlike the 10th grade book, applications such as "melody creation, studies" began to be more given. Accordingly, the graded scoring key at the end of the first three units of the book and the self-evaluation form at the end of the fourth unit are seen as an important measurement and evaluation activity for students to evaluate themselves. The clipboard study and audio recording listening activities that students

are asked to prepare for reading parts are also activities used to measure the degree to which the goal has been achieved at the point of "understanding and transmitting reading". In general, it is seen that there is little diversity in measurement and evaluation activities, and the intensity is given to implementation activities.

Table 12. 12th grade Fine Arts High School-The findings obtained in terms of measurement and evaluation in the Kemane book

Unit No.	Unit Name	Number of Tests	NOQ	Other activities for measurement and evaluation	Relationship with acquisitions
1	Themes Practices - I	-	3	• Listening to audio recording • Practices • Rubric	All measurement and evaluation activities included in the book are directly related to the achievements in the curriculum.
2	Colouring Techniques	-	3	• Practices • Listening to sketches • Rubric.	
3	Themes Practices - II	-	3	• Listening to audio recording • Practices • Composing work • Rubric.	
4	Studies and Vocabulary	-	1	1. Studies 2. Practices 3. Fill the self-evaluation form.	

NOQ: Number of Open-ended Questions

When Table 12 was examined, it was found that activities similar to the measurement and evaluation activities that started especially from the 10th grade book continued in the 12th grade book. It seems that applications aimed at students to put forward their own original sketches based on what they have learned until the last grade, such as study preparation, composition study are included. The graded scoring key at the end of the first three of the four units that make up the book and the self-evaluation form at the end of the fourth unit are activities prepared for students to make individual evaluations.

When it was examined in general, it was found that the 12th grade Instrument Education-Kemane book focused on application in measurement and evaluation activities, however, activities were also put in place to prepare studies and composition studies in order to give students the opportunity to reveal their original sketches. However, it has been observed that the diversity in measurement and evaluation activities is not very high.

When the measurement and evaluation activities were examined at all grade levels, it was determined that due to the fact that the course is an applied course, there is a variety of measurement and evaluation activities applied for important subjects such as the introduction of the instrument, holding and performance in the 9th grade, from the 10th grade the weight is given to practice activities, in this context, studies and composition studies are included so that students can present their original works from the 10th grade.

Conclusion and Discussion

Within the scope of the research, it was aimed to examine the High School of Fine Arts Instrument Education-Kemane books at the classroom level according to the themes of technical design and arrangement, teaching-learning activities and measurement-evaluation activities. According to the findings obtained in the research, there are differences between the 9th grade book and other grade books in all three themes. Accordingly, based on the findings obtained, the results for each sub-problem were shared.

Evaluation of "Instrument Education-Kemane" books from the point of view of "technical design and arrangement". Under this theme, in the reviews of four books, it was concluded that the excess of theoretical knowledge and visuals in the 9th grade book is the most noticeable difference. Since the course is a practical course, it is aimed to provide important information such as the introduction of the instrument, the holding and execution of the instrument to the 9th grade students who have just started secondary education, therefore, it has been determined that

the embodiment studies with theoretical knowledge and visuals are more frequent. On the contrary, it has been found that theoretical knowledge and visuals have decreased in the books taught since the 10th grade.

Evaluation of "Instrument Education-Kemane" books in terms of "teaching-learning activities". In the examinations conducted under the theme of teaching-learning activities of the High Schools of Fine Arts Instrument Education-Kemane books, it was concluded that there are differences between the 9th grade book and other books, similar to the theme of "technical design and deconstruction". Accordingly, in the examination of the achievements aimed to be achieved by students within the framework of the curriculum prepared in 2018 at the classroom level, the excess number of achievements in the 9th grade draws attention. However, it has been determined that since the 10th grade, the emphasis has been placed on the activities of study, themes and sketches, and as we progress to the final grades, there has been an increase in activities, especially for the performance of studies and works. This situation was shaped according to the students' "knowledge of the instrument" in the 9th grade and their "performance with the instrument" achievements in the following years. At this point, especially since the 10th grade, a serious variety and richness in the regions of the works presented to students within the scope of application activities have attracted attention. It is thought that as a result of performing many works from different regions, students will be able to access a wealth of knowledge, practice and repertoire. In addition, the pieces presented in the "reading part" section at the end of the units in the books also provide an opportunity for students to develop themselves in the field of culture, tradition, music and gain awareness. Despite all these mentioned, the fact that the "achievements" section determined within the scope of the unit is not included at the beginning of the unit, students are not informed about what and how much they will learn throughout the unit, stands out as the missing point.

Evaluation of "Instrument Education-Kemane" books in terms of "measurement and evaluation activities". In the examination of Instrument Education-Kemane books, it has been concluded that it shows parallels to the studies carried out under "teaching-learning activities", especially in measurement and evaluation activities. In other words, in the examinations conducted within the scope of the research, the 9th grade Instrument Education-Kemane book includes measurement and evaluation activities specific to the units and subjects prepared based on the students' first acquaintance with the Kemane instrument, whereas the 10th grade instrument book includes measurement and evaluation activities specific to the units and subjects prepared based on the students' first acquaintance with the Kemane instrument. It has been concluded that the activities in question have changed from the classroom level. Especially in the 9th grade book, due to the large amount of theoretical information, it is seen that while the diversity in measurement and evaluation activities draws attention, the emphasis is placed on applications from the 10th grade onwards. In the 11th grade book, it was tried to evaluate the level at which students develop themselves in composing and performing points with their instruments, individual, original studies in the direction of "composing work" were started for students, these activities continued in the 12th grade, and these studies were used to evaluate the students' self-improvement in composing and performing points.

It is also understood that before starting the relevant unit at each grade level, studies aimed at improving the students' readiness levels are included under the heading "Preparatory Studies", and graded scoring keys and self-evaluation forms in measurement and evaluation activities at the end of the unit provide opportunities for students to evaluate themselves. However, since the achievements to be obtained from this unit are not shared with the students at the beginning of the unit, there are situations where the students cannot make an adequate level of evaluation in the evaluations at the end of the unit. This situation may need to be reconsidered. It can be said that the measurement and evaluation activities have been prepared in accordance with the achievements specified in the 2018 academic program.

Recommendations

Within the scope of the research, the following suggestions are included according to the results obtained;

- In order for students to improve their knowledge and skills, it may be appropriate to multiply the number of studies and works included in the Instrument Education-Kemane book.

- Introduction of the instrument, performance techniques, etc. in the 9th grade book that will be prepared especially on instrument education, the availability of units that will include in-depth knowledge and applications in matters is extremely valuable for students to learn the instrument in question and develop their performing skills. For this reason, it would be useful to include images related to a simple and understandable language in the book.
- Within the scope of measurement and evaluation activities, it is necessary to include different measurement and evaluation methods. For this purpose, it is as important to focus on the application of measurement and evaluation from the 10th grade onwards as it is to diversify the measurement and evaluation activities from this grade level onwards. In this context, it may be useful to include different measurement and evaluation activities.
- In order for students to decide whether their goals have been achieved or not, it would be useful for them to be informed about the achievements at the beginning of the unit first. Accordingly, it would be useful to include a section at the beginning of the unit of the books in question under the title "Behaviors that students are aimed to win in this unit".

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Research Article

Examining a neurodevelopmental problem that affects reading skills: saccadic eye movement abnormalities in children with HIV/AIDS on HAART[1]

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Abstract

Reading is a complex psychological task that involves rapid movements of both eyes in the same direction (saccades) from one word to the next, or, occasionally, backwards to previously encountered text. Eye movement provides a sensitive window into cognitive processing during reading and reading skills are associated with various eye movement parameters, total number of saccades and saccadic amplitudes. This is due to the knowledge that brain areas compromised by HIV infection also control saccadic eye movements. The aim of this study was to investigate the relationship between saccadic eye movements in children with HIV/AIDS on Highly Active Antiretroviral Therapy (HAART). With a descriptive cross-sectional design, 128 conveniently accessed male and female participants of ages 6 years to 13 years 11 months had their saccadic eye movements evaluated. The tool used to screen for saccadic eye movement abnormalities was a numerical reading test called the Development Eye Movement (DEM) test. Descriptive and inferential statistics was developed using SAS. Seventy-eight percent (78%) of participants had minimal immunosuppression and 65% had undetectable viral loads. The DEM test classified participants into four Behaviour Types based on their performances in this timed reading test. Ninety-three percent (93%) had vertical times and 92% had horizontal times that were outside of the specified test norms. The Behaviour Types revealed that 53% had automaticity problems (Type 3), 22% had both eye movement and automaticity problems (Type 4), 8% had no problems (Type 1) and only 3% had eye movement problems (Type 2). The association between the viral load with Behaviour Types (p=0.2) and the CD4 count against the behaviour types (p=0.17) were not statistically significant, hence no relationship could be established. More than half of the sample population manifested automaticity problems. What could not be determined was whether the automaticity problems found in this population were related to the neurocognitive functioning or neurodevelopmental delays which are known to exist in children with HIV/AIDS despite being on HAART, or if it was due to other factors. No relationship could be established between the Behaviour Types specified in the DEM test and the HIV biomarkers despite the DEM performances being largely outside of the standardised norms.

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Introduction

Higher education plays a vital role in promoting students' competence in the world of work. However, the literature Central nervous system (CNS) areas that are involved mediating eye movements can be found in almost every corner of

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the brain (Leigh & Zee, 2006). It is for this reason that value is placed in studying eye movements in different disease states that affect neurologic function. Neurological and mental illness are the most prevalent of chronic diseases and make up approximately 13% of all diseases worldwide (WHO, 2006). Neurological disorders are increasingly prevalent in Sub-Saharan Africa due to various factors of malnutrition, adverse perinatal conditions, malaria, human immunodeficiency virus and the acquired immune deficiency syndrome (HIV/(AIDS) (Silberberg & Katabira, 2006). Clinicians are often challenged to investigate neurological disorders as they are costly, invasive, carries a level of risk and bare a huge economic burden in resource-limited settings in developing countries. There is a constant need to reach early diagnoses through cost-effective, accurate and through non-invasive means (Fitzgerald & Fenniri, 2017). Developing screening tools to identify disease early enough and in a pre-symptomatic stage will support quicker management interventions (Iragorri & Spackman, 2018). Eye movement testing is intrusive yet non-invasive and provides us with a window to the functionalities of the central nervous system. Children represent a vulnerable population as their CNS is developing and susceptible to damage with long-lasting consequences, hence screening tools for early detection with minimal discomfort requires special attention. Early detection, accurate diagnosis and appropriate treatment of HIV-associated neurologic disorders in children often leads to favourable outcomes (Antinori et al., 2013).

Eye Movements with Reading Skill

Reading is a complex psychological task that involves rapid movements of both eyes in the same direction (saccades) from one word to the next, or, occasionally, backwards to previously encountered text (Nikolova et al., 2018). Eye movement provides a sensitive window into cognitive processing during reading (Grace Kim et al., 2022). The relationship between reading skills and eye movement behaviour has been documented in English speaking cohorts. Research in the US with Grade 1 to Grade 3 learners revealed a rapid decrease in temporal eye-movement measure and an increase in spatial eye movement measure in both oral and silent reading. Therefore Krieber et al. (2016) argues that reading skills are associated with various eye movement parameters. It has been found that better reading skills were associated with an increased efficiency in eye movement but were primarily linked to spatial reading parameters such as the number of fixations per word, the total number of saccades and saccadic amplitudes. Studies have found that speed reading was a more reliable predictor for eye movement than reading comprehension. Findings revealed that eye movements where highly correlated across reading tasks which indicates consistent reading performances. Nikolova et al., (2018) believes that fast reading is one of the major skills required for the competent language learner. They argue that it is a matter of training that determines how out eyes moves as quickly as they can be trained to send comprehensive signals to our minds for processing the information in printed material.

Fast reading is one of the major skills required for the competent language learner, although even some native speakers find difficulty in reading fast with full comprehension. It is a matter of training that determines how our eyes move as quickly as they can / are trained, and at the same time send comprehension signals to our minds for processing the information in the printed material.

HAART and the CNS

Progression of HIV to the CNS occurs quite rapidly and during the early stages of infection where the virus remains in the CNS compartment (An et al., 1999; Lindl et al., 2010). Neurologic preservation through viral suppression and elevated immunologic function are some of the key outcomes of antiretroviral therapy. Although Highly Active Anti-Retroviral Therapy (HAART) are effective at eradicating the virus from specific bodily systems, children still continue to exhibit HIV-related neurocognitive decline. There is mounting evidence that Highly Active Anti-Retroviral Therapy (HAART) can control the disease but not eliminate it, especially from the CNS which acts as a sanctuary site due to the blood-brain barrier (Albright et al., 2003). Even in the presence of HAART the pathological features of HIV encephalitis do persist, as was found through post-mortem analysis (Gelman et al., 2013; Masliah et al., 2000). Infected children on HAART are able to sustain their ability to function within normal limits and succeed in school but are at high risk for developmental delays and may exhibit deterioration in the major domains of cognition, speech/language, motor functioning abilities (Boissé et al., 2008) working memory (Bisiacchi et al., 2000), processing speed and other executive functions (Haase et al., 2014). Unfortunately, insufficient scientific information exists regarding the neurocognitive strengths and weaknesses in infected children and adolescents on HAART (Martin et al., 2006) with

limited research on eye movement abnormalities in the paediatric population in this HAART era with no known established relationship to immunosuppression.

Biomarkers of HIV infection

A CD4 cell count is an immunologic biomarker that is a direct indicator of how healthy the body's immune system is (Garcia & Guzman, 2022) with >500cell/mm^3 indicating a healthy immune system. The HIV viral load (VL) is the best indicator of how active the virus is in the blood. Viral load testing is a useful predictor of clinical disease progression (Oliveira et al., 2010). These two parameters however do not share a distinct inverse relationship but demonstrate a modest to poor correlation as some patients can have an undetectable viral load but with a weakened immune system (Mellors et al., 1996; Mofenson et al., 1997). A meta-analysis of five Paediatric AIDS Clinical Trials Group studies have shown that viral load and not CD4 counts were predictive of cognitive decline in children beyond the infancy stage (Lindsey et al., 2000) whereas Shanbhag et al (2005) demonstrated that viral load and CD4 count are marginally predictive of neurocognitive testing outcomes (Shanbhag et al., 2005). The viral load and CD4 count are independent predictors of disease progression and mortality risk but with the combined use of these two biomarkers, prognosis of infected individuals can be more accurately determined (Langford et al., 2007; Palumbo et al., 1998).

Eye movement studies in different disease states

The study of eye movements has been a useful source of information to clinicians and scientists, where specific functional impairments provided information about the location of an active disease process and to monitor of existing disorders or diseases (Leigh & Zee, 2006). Over the past three decades, eye movements have been used as an experimental screening tool to gain insight into AIDS-related diseases, learning-related disorders, psychiatric disorders, neuromuscular disorders, fetal alcohol spectrum disorders and neurological disease. (Bittencourt et al., 2013; Green et al., 2007; Jaafari et al., 2011; Nerušil et al., 2021; Shmukler et al., 2021). Due to the overlap between brain areas that mediate saccadic eye movement function and that which are injured by HIV persistence, specifically the basal ganglia and deep white matter (Boissé et al., 2008) saccadic eye movement testing may provide valuable insight into CNS of people diagnosed with HIV/AIDS. All of these studies reporting eye movement dysfunctions in HIV/AIDS subjects were in the pre-HAART era where there was limited to no control viral replication, hence the need for eye movement research in the HAART era which currently remain scarce. Saccadic eye movement screening has contributed significantly to other areas of human biology in the understanding of disease processes. For this reason, it is thus prudent to investigate the value and reliability of this tool in contributing knowledge in HIV/AIDS pathogenesis.

Screening for saccadic eye movements abnormalities

Screening for eye movement abnormalities that form part of a basic optometric examination (Adhikari et al., 2013; Bilbao & Piñero, 2021) has the potential to provide evidence in support of further investigation and management through early referral. Saccadic eye movements are rapid eye movements that occur to align the visual axes of both eye with objects of interest where the eyes make a conjugate movement to jump from one object to the next (Johnston & Everling, 2008). Typically, about three saccadic eye movements are made every second in everyday life without even being aware of it (Rayner, 1998) making it the most common type of eye movement action that we voluntarily and involuntarily use in everyday life.

Eye movement evaluations are traditionally done by gross observation through induced motility tasks with rating scales to grade the eye movements (Bilbao & Piñero, 2021). In a clinical setting, an alternative to the routinely employed gross observation methods of saccadic testing is the use of psychometric tests that create a reading environment. This class of tests are based on the principle of verbalizing numbers that are read as quickly as possible without the use of a finger to guide the reading (Orlansky et al., 2011). Such tests based on this principle are the Pierce Saccadic Test, the King-Devick Test (K-D), New York State Optometric Association King-Devick Test (NYSOA K-D) test and the Developmental Eye Movement Test (DEM), which was later developed (Orlansky et al., 2011). The Developmental Eye Movement test (DEM) is a simple psychometric test that is recommended as an appropriate oculomotor assessment tool in optometric clinical practice for school-aged children (Tassinari & DeLand, 2005). The DEM test falls into the domain

of Rapid Automatic Naming (RAN) tests where its purpose was to quantify the efficiency of saccadic eye movements based on the speed and accuracy that a series of single digit numbers could be recognized and verbalized (Rouse et al., 2004).

Aim and Problem of the Study

This study aimed to investigate the relationship of saccadic eye movement abnormalities in children with HIV/AIDS on HAART. The objectives pursued to investigate this research inquiry was to determine the prevalence of saccadic abnormalities in children on HAART and if a relationship existed between saccadic eye movement abnormalities and immunologic and virologic biomarkers.

Considering that the saccadic eye movement centres located in the brain are targets sites for HIV-related structural damage, could abnormal saccades be a hallmark indicator of CNS damage from HIV? What further remains elusive is the point at which children would manifest with neurologic or neurocognitive impairment while on HAART and if the presence of abnormal saccades could be associated with the CD4 count and viral load parameters.

Methods

Research Model

A descriptive cross-sectional study design was adopted as data was gathered at a single point in time from the population. This non-interventional study was observational in nature as the characteristics of the data and existing variables helped explain the results obtained through epidemiological methods.

Participants-Sampling

All children were diagnosed with HIV/AIDS and on HAART of ages ranging from 6 years to 13 years 11 months living Free State province in South Africa. All Participants were of African ethnicity and used the home languages of Sotho or Afrikaans but were familiar with English. A sample size 128 participants met the inclusion criteria from 185 children that were accessible to the researcher. Participants were sourced from 8 public health facilities where they were registered at to access their treatment. Inclusion criteria comprised of vertical exposure from mother-to-child-transmission (MTCT), identical ARV regimen, no history of neurological and psychological disorders and excellent ocular health and vision. Participants had to be knowledgeable of numbers. The latest CD4 count, and viral load information was extracted from the health records of each participant from the health facilities. Demographic profiles;

Gender distribution was 48% males (n=61) and 52% females (n=67). The mean age was 10 years and 1 month. The most frequent age group was the 9 year olds 23% (n=30) with the 6 year olds being the lowest amount, 3% (n=4). Home language of subjects varied between Afrikaans, Sotho and/or Twana with 0% having English as a home language.

Data Collection Tool

The Developmental Eye Movement (DEM)

The Developmental Eye Movement (DEM) test was the instrument used due to its non-invasive design to evaluate eye movement performances in children It is a visual-verbal reading test which is less intimidating and similar to a child's experience in his/her school environment where reading activities are done. The DEM test (version 1) was developed by two optometrists, Jack E. Richman and Ralph P. Garzia in 1987. The DEM Test booklet is made up of 4 reading tests. The first is a pre-test to prepare the child for what is expected. This is followed by a Vertical Test A and a Vertical Test B, each of which are made up of 2 vertical rows of numbers to be read out aloud. The final test is a Horizontal Test C made up of 16 rows of horizontally displaced numbers of varying number spacing between each digit. A DEM Score Sheet was used to calculate and record the results of each participant for analysis and interpretation.

Patient Recording Form

A Patient Recording Form was used with each accessible participant. Information recorded was Phase 1 - demographic information and medical history including ARV treatment CD4 count and viral load, Phase 2 - results of the vision screening and eye health assessment results and Phase 3 - DEM Test result. If the patients met the inclusion criteria from the phase 1 and phase 2, they were then included in the study sample to proceed to phase 3 – DEM testing.

Procedure

The researcher was seated next to the participant at a table with the DEM test placed in front of the participant. A room in each of the data collection site was used where there was minimal distraction. The researcher also placed a timer on the table. The researcher provided instruction to the participant in line with the DEM instruction manual. The participant had to first do the DEM Pre-test prior to performing the main DEM test made up of Test A, Test B and Test C. The subject was expected to read out aloud the single digit numbers as fast and accurately as possible on the pre-test without using a finger to visually track the numbers being read out. The participant was not informed that he/she was being timed. The pre-test assured the examiner that the participant was familiar with the numbers and instructions. No recording of time was need with the pre-test. The examiner has the DEM scoresheet placed in front of him to follow what is being read by the participant and mark any errors that was made. The time was recorded written down on the DEM Score Sheet for all of the 3 sub-tests. The duration of the DEM test did not exceed 10 minutes making it least imposing to the participants.

Data Analysis

The raw data from the DEM scoresheet of each participant assessed four components i.e. the Total Vertical Time (TVT), Horizontal Time (HT), Errors and a Ratio score which is determined by taking the horizontal time and dividing it by the vertical time. The DEM allowed adjustment of the HT by taking the errors of omissions and additions into account when computing the horizontal time by presenting an 'adjusted' horizontal time (AHT) as a more authentic computation of the time. These results were then compared against the normative table of established norms of the DEM test according to the chronological age of each participant. (Garzia et al., 1990). Based on the results of the parameters for each participant, the DEM test then approaches to diagnose participants by classifying them into one of four Behaviour Types.

Table 1. List of Behaviour Types and interpretation

Behaviour Type	Vertical Time	Horizontal Time	Ratio	Characteristic
Type 1	normal	normal	normal	Normal automaticity and oculomotor skills
Type 2	normal	high	high	Oculomotor dysfunction only
Type 3	high	high	normal	Deficiencies in automaticity skills only
Type 4	high	high	high	Deficiencies in automaticity and oculomotor skills

Table 2. Non-standardised Behaviour Type that is not specified in the DEM test.

Behaviour Type	Vertical Time	Horizontal Time	Ratio
Type 5	high	normal	Low to normal

The Statistical Analysis Software (SAS) version 9.2 was used to compute the data by the biostatistician from the Faculty of Health Sciences at the University of the Free State. The statistical framework was based on non-parametric assumptions. Descriptive statistics were used to evaluate the categorical and numerical data such as age, gender, time from birth diagnosis, time from diagnosis to treatment initiation, duration on HAART, CD4 count and viral load across the different age groups, mean performances in the DEM per age group, prevalence of Behaviour Types from the sample. Measurements of central tendency was be computed to provide information on the distribution of the data for single variables during a univariate analysis. For the inferential statistics, a correlation analysis was done between the CD4 count and the viral load which was expressed using Spearman's Correlation Coefficient (r). Statistical significance testing between the categorical variables was evaluated using the Fisher's Exact Test. Precision of the estimates were assessed using a 95% confidence interval.

Ethics

An expedited ethics review was requested by the University of Kwa-Zulu Natal Biomedical Research Ethics Committee after submission of the study proposal. This type of review was requested as there were no invasive procedures to be

performed during the data collection process categorising this study as negligible or minimal risk. Permission to use the 8 public health facilities to access the participants, their health records and the use such facilities as the data collection sites was requested from the Head of Health for the Free State province.

A signed informed consent was obtained from the caregivers of all participants. Information sheet and the consent form outlining the research process and patient rights was available in English, Afrikaans and Sotho languages. The anonymity of the participants was maintained as no names were be used in the data collection form, but a code for each subject was allocated. There was a 7-digit code developed for each subject. The confidentiality of the participants' health status and their medical history was also maintained as the knowledge of such was only held by the researcher who was the only data collection personnel along with the nursing staff that provided assistance at the data collection sites.

Results

Biomarker characteristics

The immune status of the sample indicated 5.5% (n=7) of subjects had severe immunosuppression (<200 cell/mm^3), 16.4% (n=21) had moderate suppression (200 – 500cells/mm^3) and 78.1% (n=100) of participants had satisfactorily healthy immune systems with minimal/no suppression (>500 cells/mm^3). The highest mean CD4 count was in the 9-year-olds with 995.77 cell/mm^3 the lowest mean CD4 count in 13-year-olds with 584.54 cells/mm^3. All age groups had a mean CD4 count above 500 cells/mm^3 indicating a healthy sample population. The sample was also categorized according to the viral load parameter with 65% (n=81) had undetectable viral loads, 25% (n=32) had viral loads between 40 – 1000 copies/ml and 10% (n=12) subjects had viral loads exceeding 1000 copies/ml. The median viral load was <40copies/mm^3 indicating an undetectable viral load or adequate viral suppression.

HAART characteristics

The median value for the duration of the sample population on HAART was 2yrs 10 months (34 months) with the minimum being 4 months and the maximum being 6 years and 8 months (92 months). From the period of birth to treatment initiation the median value was 7 years (83.9 months) with the minimum duration of 10 months and maximum duration of 13 years and 6 months (162 months).

DEM test results

When the TVT results for the total sample were compared against the standardized DEM norm, 92.97% of the total participants averaged times beyond (higher) the expected norm. The mean TVT for the vertical tests was 87.85 (±29.19) seconds. The DEM norm was 44.17 (±8.39) seconds. For the AHT, 92.19% of subjects averaged times outside (higher) of the expected norm. The mean AHT was 111.72 (±47.48) seconds. The DEM mean was 57.78 (±14.93) seconds.

Figure 1 shows that the TVT per age catergory were well above the DEM mean norm across all age groups. As the ages of the subjects increased, the performance on the vertical tests improved in both the DEM norm as well as in this study sample. From ages 6 to 9 years, the difference in times is the greatest between the TVT and the DEM norm.

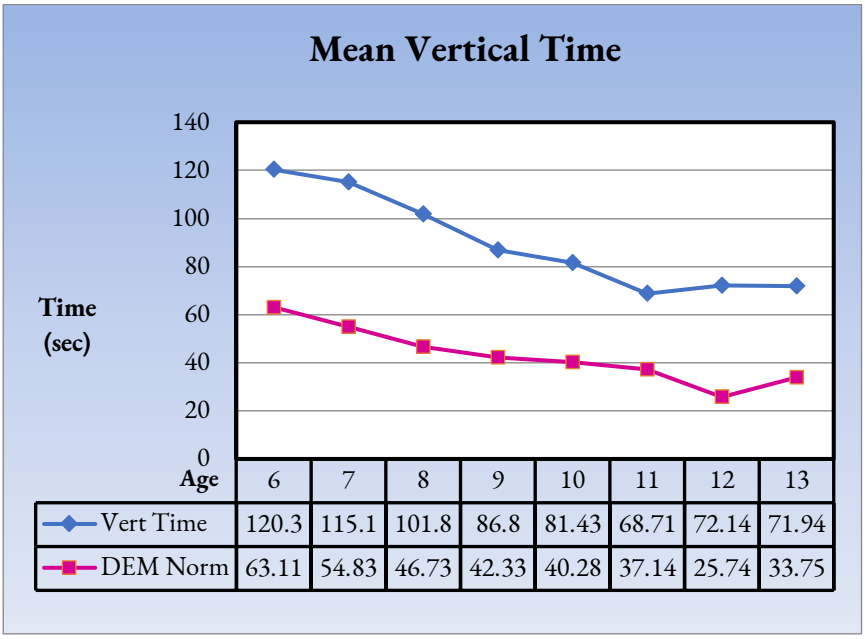


Figure 1. The mean TVT of the study population for each age category is presented with the DEM norm.

Figure 2 shows us that for every different age group, the mean AHT is higher than the DEM norm. The mean AHT decreases with age as the participants whom are older perform the test faster. From 9 years old, the difference in mean times between the age groups is decreased and reached a plateau. From the 6 to 9 year olds, there is a large difference in the mean times in those age groups.

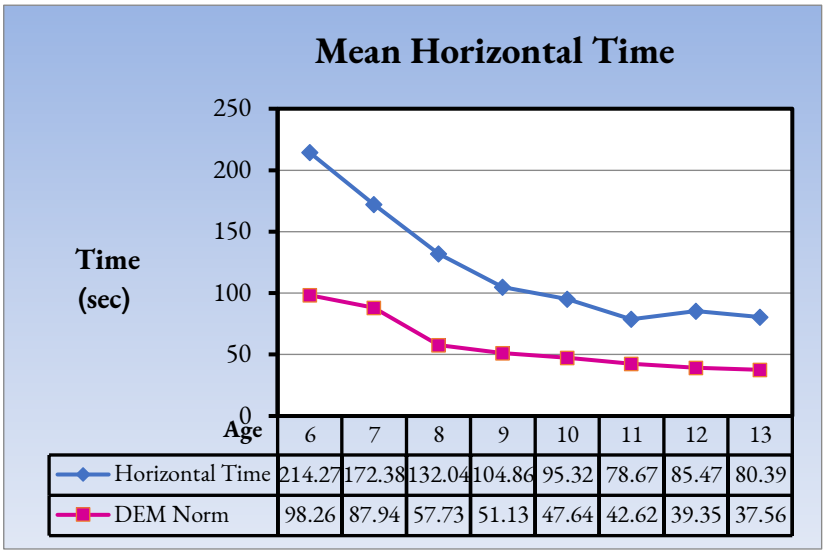


Figure 2. The mean AHT from the study population versus the DEM norm.

The mean Ratio Score was 1.27 with 55% of the total sample falling within the mean of DEM norm and standard deviation. The DEM norm for the ratio score was 1.28. Except for the 6-year-old age group, the other 7 age groups had Ratio scores that where within range of the DEM norm.

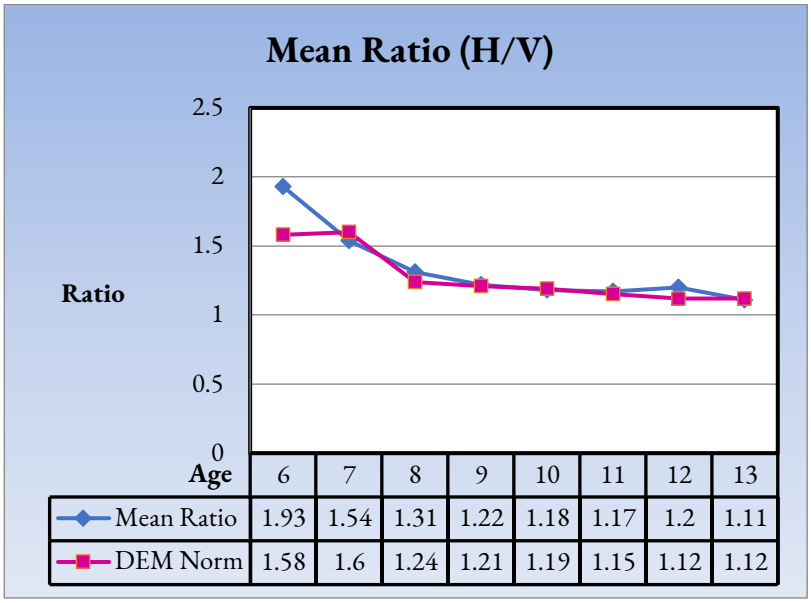


Figure 3. Mean ratio score per age group in this study versus the DEM ratio norm.

Behaviour Types Classification of the participants

Behaviour Type prevalence showed that 53% (68) of the subjects were classified as Behaviour Type 3 (Automaticity problems), 22% (28) were Behaviour Type 4 (Automaticity & Oculomotor dysfunctions), 8% (10) were Behaviour Type 1 showed normal findings, 3% (4) were Behaviour Type 2 (oculomotor dysfunction) and 14% (18) were unspecified type. A surprising 14% (18) of subjects fell into an unspecified category of behaviour types. The distinct characteristic of this type 5 is the low ratio. Of the 18 subjects in this category, 13 had increased horizontal and vertical times displaying similar characteristics to type 3 and type 4 but with a low ratio outside of the norm for those participant's age.

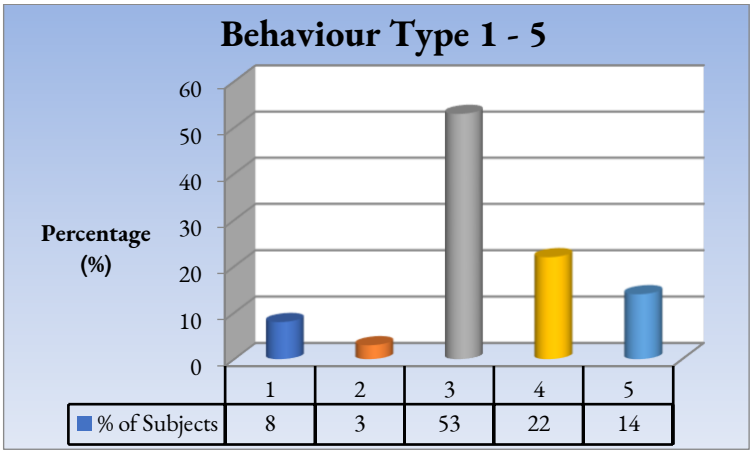


Figure 4. Percentage of subjects classified into the different behaviour types from 1 – 5.

In pie chart (a) displaying the behaviour trends in 6 year old subjects, the only behaviour types that are present is behaviour type 2 and behaviour type 3. The sample size (n) in this age category is only four which then means that one of the four exhibited pure oculomotor dysfunction. In pie charts (b) – (d), the behaviour type 2 once again featured as the smallest percentage of the pool but yet again still represented only one subject. The reason the percentage of behaviour type 2 decreased with age is because the sample pool in the different age categories increased from 13 in 7 year olds, 24 in 8 year olds and 30 in 9 year olds. Consistently, it was noted that behaviour type 3 made up no less than 57% of the sample in the different age categories. Behaviour Type 5 (light blue) featured at the age group 9 category representing 6 of the 30 subjects in this age group. In pie chart (e) – (h) there is an absence of behaviour type 2 (red) from the 10 year old age group where we see the 1st appearance of Behaviour type 1 (dark blue) which is the normal behaviour types. There is a progressive increase with normal behaviour types from the 10 year old age group to the highest prevalance found in the 13 year old age group.

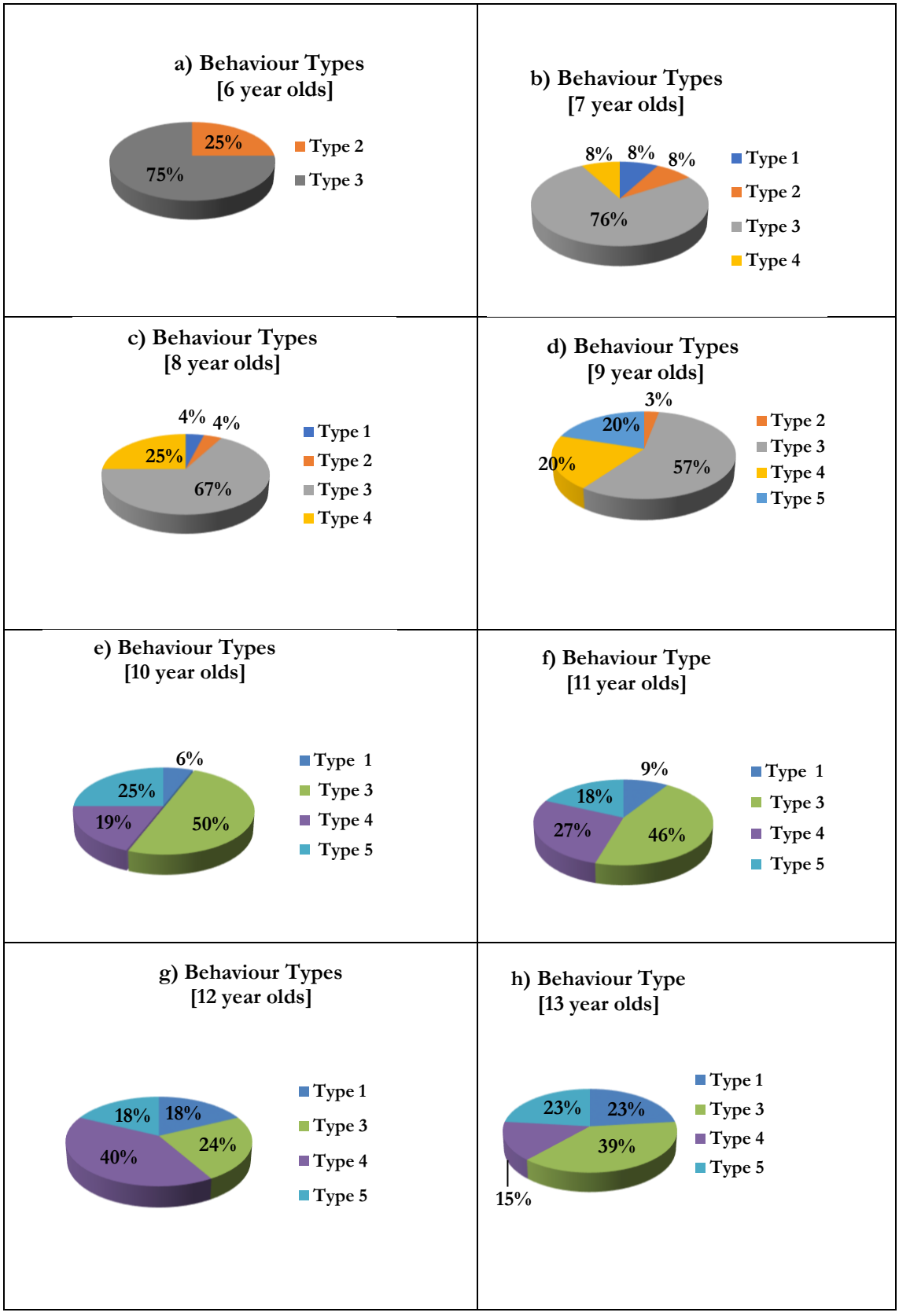
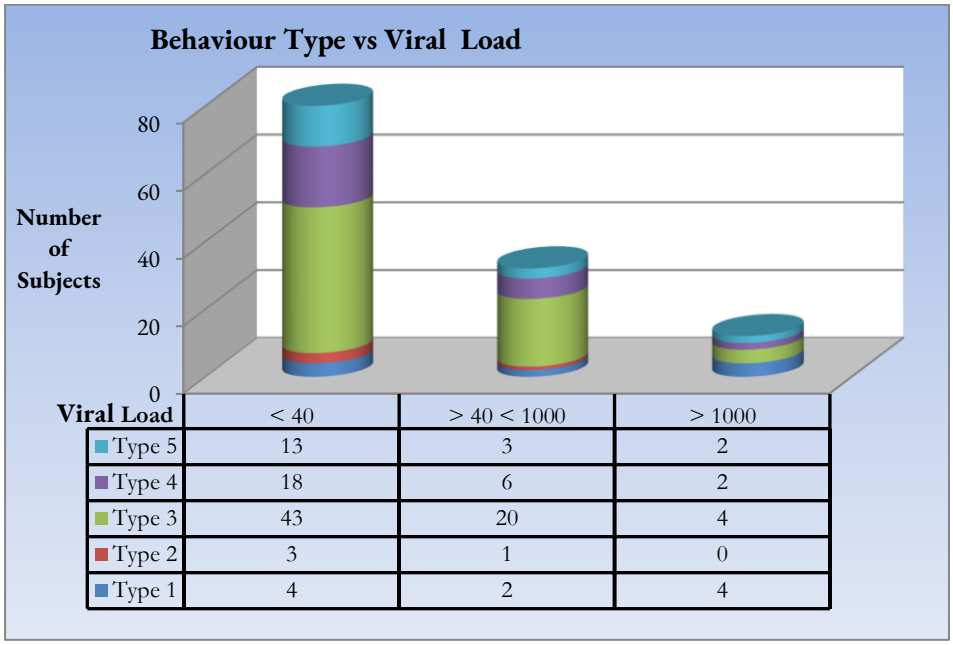


Figure 5. A presentation of the behaviour type prevalences in the age groups 6 – 13 years old.

Each cylinder comprised of the different Behaviour Types that is prevalent in the three virologic categories. The data table showed that with a very high percentage of 65% of the participants having an undetectable viral load (n = 81), this skewed the data where most of the Behaviour Types where prevalent in this group except for an outlier in Behaviour Type 1 with 4 participants in the high viral load category equalling the same number of participants in the undetectable viral load category. The prevalence of the Behaviour Types from 2 to 5 decreased from the undetectable viral load

category to the virologic failure category. Behaviour Type 3 (green) is the most prevalent type in all three virologic categories. Behaviour Type 2 (red) is the least prevalent and is absent in the high viral load category.

Significance of association between the viral load and the Behaviour Types with a 3 x 5 Chi Square analysis indicated poor reliability as 53% of the cells had expected counts that were less then 5. The Fisher's Exact test was conducted with n = 125, and p >0.05. The precise determined was *p-value* = 0.2. The *p-value* indicated that there is weak evidence against the rejection of a null hypothesis, hence the null hypothesis was accepted. This indicated that there was no statistically significant difference between the categories of the behaviour types and the viral load.

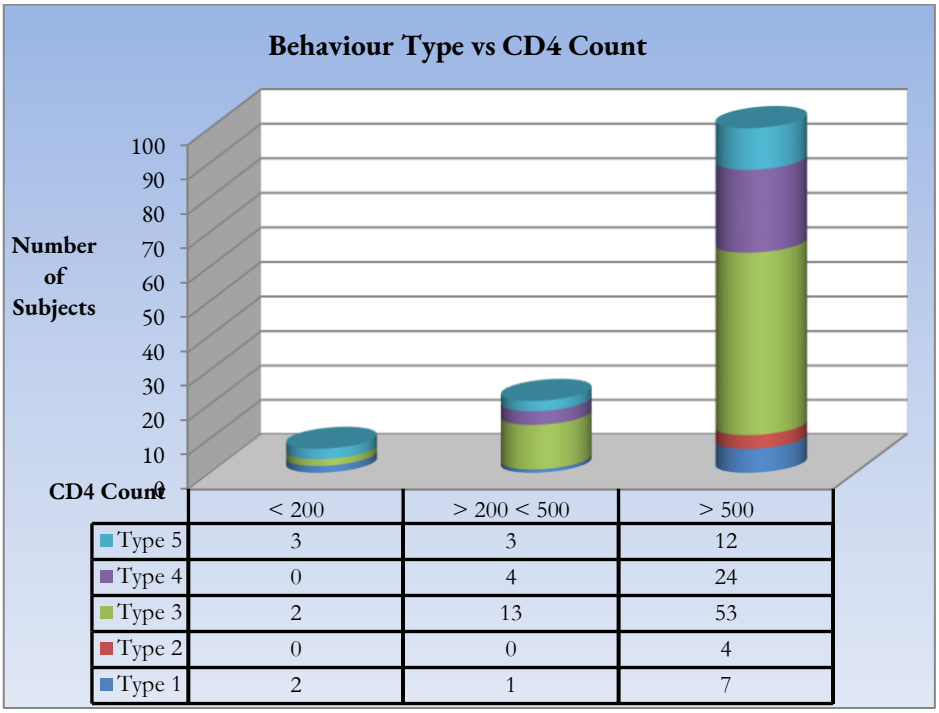


Viral Load	< 40	> 40 < 1000	> 1000
Type 5	13	3	2
Type 4	18	6	2
Type 3	43	20	4
Type 2	3	1	0
Type 1	4	2	4

Figure 6. A presentation of the prevalences of the different behaviour types in the three virologic status categories of the sample

In Figure 6, each cylinder comprises of the different Behaviour Types found for participants in the three immunologic categories. The number of participants classified with the different Behaviour Types in the 3 immunologic categories are found in the data table. Participants with minimal or no immune suppression (>500 cells/mm^3) were in the category with the highest number of subjects that reached 78% (n = 100). This skewed the data where most of the Behaviour Types had the higher prevalence in this group because of the largest proportion of the sample located in that immunologic category. It was observed that Behaviour Type 3 (green) is most prevalent in this sample population with the highest number found in the healthiest immune category.

Significance of association between the CD4 count and the Behaviour Types with a 3 x 5 Chi Square contigency table indicated that 67% of the cells had counts less than 5 so the use of the Chi square test in this case was not valid. The Fisher's Exact test revealed with n = 128, p > 0.05, the precise *p-value* = 0.17. This *p-value* indicated that there is weak evidence against the rejection of a null hypothesis. This indicated no statistical significance between the categories of the Behaviour Types and the CD4 count variables.



CD4 Count	< 200	> 200 < 500	> 500
Type 5	3	3	12
Type 4	0	4	24
Type 3	2	13	53
Type 2	0	0	4
Type 1	2	1	7

Figure 7. A presentation of the Behaviour Types in the three immunologic status categories

Discussion

With almost a quarter (23%) of the sample being 9-year-old participants, only 4 were from the 6 to 6 years and 11-month-old category. The reason for a small sample of 6-year-old children was because they were largely illiterate and moderately familiar with verbalizing numbers and these factors excluded them in line with the exclusion criteria. Even though it is noted in the health records that the mode of infection amongst all subjects in the sample is from mother-to-child-transmission, there is no guarantee that horizontal modes of infection are not possibilities. Such modes of transmission include sexual abuse, iatrogenic transmission from hospitals or clinics and receiving of breast milk from HIV positive mothers who are not the biological mothers (Brody, 2003).

Analysis of the CD4 count results and the viral load revealed that a significant proportion the participants in this sample are largely "healthy" with adequate viral suppression and immunocompetent levels. This can be largely attested to the HAART. The reasons for virologic failure in participants on HAART could range from poor treatment adherence to failure of the initial drug regimen resulting in viral rebounding due to activation of latent viral reservoirs. Poor adherences in children are due to many social and psychosocial reasons, which make compliance more difficult with children than with adults. A study by Haberer and Mellins (2009) that looked at paediatric adherence found that child characteristics differ from caregiver characteristics with non-adherence to treatment resulting in failure of HAART (Haberer & Mellins, 2009).

The vertical and horizontal times of the DEM test were distinctly slower across all age groups in this sample when compared to the specified DEM norm. However, the mean ratios and the mean errors were within the specified norms. There are many intrinsic and extrinsic causative factors that may have contributed to the overall slower times. Blanchette et al (2002) indicated that in specific areas like information processing speed, there may be subtle deficiencies within this population, which is a plausible cause for the subnormal rates in both vertical and horizontal tests (Blanchette et al., 2002). Puthanakit et al (2010) studied neurocognitive function in Thai children aged 6 to 12 years using the Welscher Intelligence Scale for Children III (WISC III) and showed that neurocognitive functioning in HIV-infected children on HAART are lower than that of non-infected children (Puthanakit et al., 2010). A study by Martin et al (2006) concluded that HIV-infected children on HAART functioned within normal limits in certain neuropsychological tests, however, differences in performances did exist between subjects with varying levels of brain neuroimaging abnormalities

(Martin et al., 2006). This study emphasised the importance of incorporating neuropsychologic assessments as part of medical care in children with HIV/AIDS.

Other intrinsic factors relate to the neuropathogenesis of the disease and how effective HAART is in controlling CNS viral load, which this study had limited insight into due to inadequate research in these areas of paediatric HIV neuropathogenesis within the African population. The reversal of neuropathologic deficits in infected children on HAART still remains unclear as studies by Chirboga et al (2005) and Lindsey et al (2007) showed modest improvement whereas a study by Nozyce et al (2006) showed persistent mild behavioural and cognitive impairment in the presence of HAART (Chiriboga et al., 2005; Lindsey et al., 2007; Nozyce, 2006).

Extrinsic factors which may have contributed to a sub-standard performance demonstrated by the DEM test results, relate to the social environment and educational support that may have influenced the neurodevelopment and cognitive potential of the subjects. Most of the subjects in this study are from rural and semi-rural areas that attend school in those areas and access the public health services. A South African study by Smith et al (2008) using a battery of standardized cognitive tests that described verbal and non-verbal intelligence scores, showed that HIV-infected children on HAART were much lower than those of non-infected children. The study further indicated that neurocognitive development in HIV/AIDS children are influenced by their socio-economic factors, poor household educational stimulation and nutritional profile (L. Smith et al., 2008).

None of the 128 subjects used English as their home language. The home languages of the subjects were Sotho and Afrikaans. However, English was used in school along with Afrikaans, Sotho and Tswana during the teaching process and informal communication outside of the classroom. One of the possibilities of reduced rates in the DEM test was that the test was conducted in English and the children had to verbalise the numbers in English. Information processing delay may have contributed in part to reduced horizontal and vertical times. The DEM test has standardised norms developed with American children. The participants in this study are all non-English speaking learners and all were from poor socio-economic backgrounds. Fernandez-Velazquez and Fernandez-Fidalgo (1995) from their study on Spanish-speaking norms concluded that the DEM is a reliable tool independent of language differences (Fernandez-Velazquez & Fernandez-Fidalgo, 1995). However, Pang, Lam and Woo (2010) proposed DEM norms for Cantonese-speaking children and cautioned that population-specific norms must be established to minimise bias caused by factors such as language and education (Pang et al., 2010). Bapista et al (2011) described in their study using the DEM test in Portugese-speaking children that language, educational and cultural differences may influence the performance on the DEM test (Baptista et al., 2011). The implications of the conclusions drawn from the previous studies mentioned above does entertain the possibility that the findings in this current study may possibly have been influenced by similar factors as was experienced in those studies in their different populations, or possibly not.

Behaviour Type 3 was distinctly the most prevalent in the study showing that RAN was a significant problem that was revealed in this population with eye movement dysfunction manifesting in an insignificant proportion of the subjects. Deficient automaticity skills may or may not be due to HIV, however, as described in this study, it does exist within the population of school-aged children with HIV/AIDS on HAART. The causes for the automaticity problems could be multifactorial ranging from pathological to socio-economic factors as was with the overall performance in the vertical and horizontal scores. When behaviour type prevalences were compared to the age variable an apparent age-dependant trend was visible. Subjects with eye movement abnormalities were most prevalent in the youngest age group but reduced as age increased and was absent from 10 years onwards. Normal DEM performances (type 1 behaviours) were absent in the 6-year-old and 9-year-old age groups but increased significantly from 10 years upwards with the highest prevalence in the 13-year-old age group. Deficiencies in automaticity skills or RAN, which were the highest with the 6- and 7-year-olds reduced significantly in the 12- and 13-year-old groups showing that there is a trend towards normality as the subjects aged. These findings were independent of their virologic and immune statuses showing that it had no impact on the trend found as age progressed.

Due to the high prevalence of subjects in these 'healthy' categories, all five behaviour types were most prevalent in these two categories rendering any viable comparison of different behaviour types to different viral load and CD4 count

levels, inconclusive. This finding challenged the notion that subjects with higher viral loads would perform poorer on the DEM test and be symptomatic of eye movement problems. It was found that no subject with type 2 behaviours were found in the category with VL > 1000 copies/mm^3 and 4 of the 12 subjects in this viral load category had normal DEM performances (Behaviour Type 1). A similar result was demonstrated when comparing CD4 counts to different behaviour types as was with the comparison done with viral load. All behaviour types were significantly higher in the single category of minimal immune suppression with CD4 counts > 500 cell/mm^3. Subjects classified as having saccadic eye movement problems (Type 2) were not severely immunocompromised, hence no link between their immune and virologic status to their diagnosis based on the DEM was established. This finding further did not support the expectation that unhealthy and severely immunocompromised subjects would have significantly lower performance rates on the DEM. It also did not support the preconceived notion that there would be a high prevalence of behaviour type 2 subjects in the lower immunity categories. There was no statistically significant difference between the different behaviour types and the CD4 count and viral load categories.

There were no reliable indications of immunologic and virologic biomarkers influencing the performance on the DEM test without a convincing relationship to eye movement problems in this population. A relationship between the performances on the DEM test and the disease biomarkers remains unlinked. The only finding that supports a possible relationship with the DEM performance was that of the age of the subjects with the behaviour type trends. There was a progressive increase in the normal scoring in the DEM test (Type 1) with the ageing of the subjects however, it was still below the established norms. The DEM test showed different behaviour types in the sample population, but it failed to show that those with poorly sustained immune systems and high viral burdens had oculomotor dysfunctions.

The obvious finding that was evident in the study was the significant automaticity deficits of the population. Deficient automaticity skills were the highest across all age groups, but its prevalence decreased with ageing children. Furthermore, children with the longest duration on HAART had higher automaticity and eye movement problems but were in the younger age groups. There was no relationship established between poor automaticity skills and disease parameters of CD4 count and viral load in this study but relationships between these parameters to other neurocognitive functions by other neuropsychological tests have been demonstrated (Martin et al., 2006; A. B. Smith et al., 2008). Efficient automaticity requires good cognitive ability as the DEM test is a visual-verbal test. The essence of the DEM test is that it is patient-reliant, hence it is a subjective instrument. Cognitive functions such as visual memory, visual discrimination, visual information processing, processing speed and verbalisation are important components for performing the DEM Test and these are cognitive-dependant skills. Automaticity problems may a predictor or risk factor of neurocognitive impairment as it is cognitive-dependent. Other neurocognitive testing would need to be conducted to confirm if the findings of the DEM test is a reliable indicator of neurocognitive impairment, which is known to occur in this population. The DEM test has value as a screening tool in a subtest of neuropsychological tests beyond its description as an eye movement test as the dependency of this test is heavily reliant on a series of cognitive skills. A study by Ayton et al (2009) concluded the DEM failed to correlate well with other objective measures of saccadic eye movements to be a reliable test of oculomotor function but that it is an indicator of children at risk of reading and academic delays due to its reliance on cognitive functions such as verbalisation and information processing speed (Ayton et al., 2009).

Strong immunity and low viral load as detected in the blood are not reliable indicators that the CNS is unaffected. Studies by Cysique, Maruff and Brew (2004) and Dore et al (2003) showed that since subjects have been started on HAART earlier, the incidence of HAD reduced but the increase in the prevalence of HAND occurred with increased survival due to HAART(Cysique et al., 2004; Dore et al., 2003). A study by Ruel et al (2012) showed that HIV infected children with good CD4 counts, who were not eligible for HAART, manifested with neurocognitive and motor deficits which then questioned the WHO threshold guideline for eligibility for treatment (Ruel et al., 2012). If eye movement dysfunction is not characteristic in this population of HIV-infected school-aged children on HAART but deficiency in RAN is evident it may be plausible that automaticity skill may be indicator of neurocognitive impairment or neurodevelopmental delays.

The DEM in essence still has validity and reliability as a screening tool in clinical practice as its function extends beyond the detection of eye movement dysfunctions and should be used in parallel with other tests of neurocognitive function that are used by optometrists. Screening of neurocognitive function in a school-aged patient is important for the monitoring of their neurodevelopment and for optimal multi-sensory learning in the HIV/AIDS population of school-aged children and even those unaffected by HIV/AIDS. The question arises as to whether the automaticity problems found with the subjects in this study are due to norms developed by a different population or if it's related to HIV/AIDS with the possible existence of neurocognitive impairments in the current population of subjects. This study supports the suggestion by Martin et al (2006) in emphasising that neuropsychological testing needed to be done in all HIV-infected children regardless of their treatment status. Optometrists need to play a more significant role in screening and referring such children as part of a universal health care approach beyond just the attention to primary visual functions especially when confronted with children with HIV/AIDS on HAART.

Conclusion and Recommendations

Neurologic dysfunction due to persistent HIV in the CNS cannot be predicted from eye movement testing using the DEM test in children with HIV/AIDS on HAART. There was no association found between the Behaviour Types of the DEM test and the immunologic and virologic biomarkers. The prevalence of saccadic eye movement abnormalities in children with HIV/AIDS on HAART was very low. There was a high prevalence of automaticity problems found in this population. This unexpected finding cannot confirm or rule out the presence of existing neurocognitive or neurodevelopmental impairment in this population. Performance in all 3 subtests of the DEM was significantly reduced in all age groups according to the standardised DEM norms.

New norms for a DEM test based on non-English speaking children in a South African population should be established. South Africa is a nation of multiple home languages with diverse cultural backgrounds, it should ideally have standardised norms developed from and for its own population for adoption. This could strengthen the reliability and validity of the results that infer deficits in eye movement and automaticity problems for the South African population.

Since social and educational factors influence performance on neurocognitive and neuropsychological tests, a study using the DEM test to compare children of different social, economic and educational backgrounds beyond language differences, should be undertaken.

The DEM test can be used or tested as part of a battery of neuropsychological tests in school-aged children with vertically acquired HIV to determine if its results are consistent with other neuropsychological tests.

A similar descriptive study with an analytical design should be done by comparing the cognitive ability in performing the DEM test amongst subjects who are treatment-naive HIV-infected subjects, HIV-infected subjects on HAART and an HIV-uninfected control group. A control may be valuable to determine if HIV has a negative effect on a child's eye movements and neurocognitive development that is manifested through the DEM test.

To enhance the accuracy of eye movement testing using the DEM test, instructions relating to controlling of head and upper body movements could be given additionally to the prescribed instructions stipulated in the DEM test manual. If newer tests or modifications for this test are researched, these instructions can be recommended to be included to strength the reliability of the results.

Testing of eye movements in paediatric subjects should ideally be done objectively limiting the variability, improving reliability and repeatability of the results. For research purposes, visual tracking devices using infrared technology can be utilised as instruments of choice for analysing eye movements as the sensitivity of these instruments and objectivity is highly reliable.

As current research has shown that HIV-associated neurocognitive disorders are still persistent in the presence of HAART, children with developing systems are still at risk of CNS disease. In consideration of this, eye care professionals could use this knowledge in clinical practice through specific paediatric tests to screen for and monitor neurodevelopmental anomalies beyond the assessment of just the primary visual functions. In the domain of

neurodevelopmental and neuropsychological testing there are an insurmountable number of tests that are used in paediatric assessments by various health professionals. The DEM test should be emphasised in this specific population along with a battery of other neuropsychological tests that optometrists currently use such as the Tests of Visual Analysis Skills (TVAS), Tests of Auditory Analysis Skills (TAAS), Tests of Visual Perceptual Skills (TVPS) and the Developmental Tests of Visual Motor Integration (Beery VMI). The role of health care providers should be to actively identify at-risk patients to get the appropriate medical attention and rehabilitation that is needed at an earlier stage. This action is critical to prevent children from being handicapped by their condition as HIV-associated neurocognitive disorders could be debilitating. This holistic approach to health care could benefit children with HIV/AIDS in levelling the playing field to allow them the same opportunities, success and achievement as non-infected children.

Limitations

The incompleteness of subjects' health records at certain state health facilities posed a challenge, which resulted in a significant number of candidates being excluded from the study. Pre-existing neurological or neurocognitive disabilities, previous hospitalisation details and the time frame of such were unclear in the documentation. Not all subjects had absolute CD4 counts and CD4 percentage calculations as well as absolute viral load and log unit expressions, which would have made data analysis of these parameters easier and simpler.

All subjects in this study were presumed to have contracted HIV through vertical mother-to-child transmission. Records did not indicate if MTCT was the mode of transmission or if contraction of HIV occurred through different modes beyond the infancy age. However, the mode of transmission of all subjects was accepted to be MTCT during the neonatal age of the subjects for this study. The current caregivers of the subjects were not necessarily the biological mother as most biological mothers were deceased. Accurate and detailed case histories of the subjects were therefore limited.

As this study was a descriptive and not an analytical design, it limited a comparability approach to an HIV-uninfected control group.

There were a limited number of 6-year-old subjects in this study due to poor numeracy skills hence the 6-year-old age category was comparably small to the other age categories.

None of the subjects had any neuropsychological or neurodevelopmental testing done to assess the cognitive state of the subjects prior to this study. This meant that the neurocognitive functioning of the HIV-infected subjects before and after HAART was unknown.

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Research Article

The process of solving skill-based problems about multipliers and multiples by advanced learners in math and gifted students[1]

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Abstract

Globalization has also been reflected in mathematics education, and as a result, international exams, in which Turkey also participate, have become widespread since the 20th century. After participating in international exams in Turkey, it started to make changes in the questions in the exams it held throughout the country. The most striking of these changes is the preparation of skill-based questions that measure metacognitive skills in the High School Entrance System exam. In order to solve such questions effectively, as emphasized in the mathematics curriculum, the problem solving process must be managed well and correctly. In this research, it is aimed to examine the processes of solving skill-based questions about multipliers and multiples. The difficulties experienced by the students in the process of solving skill-based questions and the points they missed were determined. In this study, case study, one of the qualitative research methods, was used. The study group consists of 8 students, 4 of whom are highly successful in mathematics and 4 of whom are gifted, studying in the 8th grade. The Factors and Multiples Achievement Test consisting of 10 open-ended questions was developed in order to measure the students' skills on the subject of multipliers and multiples. While applying the Multipliers and Multiples Achievement Test, we conducted a clinical interview with each student and enabled the students to solve the questions by thinking aloud. We made the descriptive analysis of the obtained data according to the Polya' problem solving steps. While presenting the findings, we made use of the tables and interpreted them according to each question and step. As a result of the research, we determined that the students who successfully realized the step of understanding the problem were able to perform the other steps and solve the questions correctly. We also found that students who are successful in mathematics try to apply Polya's problem solving steps more and are more successful than gifted students. According to these results, we recommend that students use Polya's problem-solving steps effectively while solving problems and that the research results should be investigated in more detail.

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Introduction

Science has existed since the beginning of human history and is in constant development. The basis of all fields of science has modeled the mathematical mindset (Alpaslan, 2011). Mathematics is a science that people have used and

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developed throughout history to explain facts they do not know and to solve the difficulties in their daily lives. Today, there are a large number of people who have difficulty learning mathematical subjects (Altıntas, Ilgun, & Karadag, 2022). It is thought that this situation can be improved by a good mathematics education.

Evaluation of Mathematical Talent at International Level and Turkiye

Mathematics education in Turkey is carried out in a planned manner, based on the NCTM (National Council of Mathematics Teachers) standards, according to the general objectives determined by the Ministry of National Education (Umay, Akkus, & Duatepe-Paksu, 2006). The most striking purpose among the general objectives stated in the mathematics curriculum is the one that focuses on the problem solving process of the student (MoNET, 2018). It is not possible to evaluate the problem solving process, which is one of the high-level skills, with traditional assessment and evaluation approaches (Bal & Doganay, 2010). In order to evaluate the problem solving process, alternative assessment and evaluation approaches including different question types should be applied (Ozturk & Sahin, 2013). In this context, studies such as the International Study of Reading Skills Development (PIRLS), the International Study of Mathematics and Science Trends (TIMSS) and the Program for International Student Assessment (PISA) have emerged to measure high-level skills in the world (Demir, 2010).

Turkiye regularly participates in international measurement and evaluation research. The data obtained from these studies affect the applied central exams (Erden, 2020). This effect has been seen the most in the High School Entrance System (LGS), which has been used to select students for secondary education institutions since 2018 (Kaya, 2019). In LGS, skill-based questions, which are called "new generation questions" among the public, have begun to be asked (Uzun, 2021).

Skill-based questions are questions to measure many high-level skills, especially problem solving (Kablan & Bozkus, 2021). It is observed that students have difficulties because these questions are not compatible with the mathematics curriculum applied in Turkey, they are long and measure high-level skills (Cepni, 2020; Erden, 2020). In addition, although teachers are sensitive to these questions, they experience problems due to their lack of knowledge and mistakes in teaching methods (Kablan & Bozkus, 2021). In order to eliminate these problems, sample skill-based questions about the courses in LGS are published by the General Directorate of Assessment, Evaluation and Examination Services every month. However, it is thought that all of these questions consist of multiple-choice questions and are lacking in developing students' problem-solving skills (Kertil, Gulbagci Dede, & Ulusoy, 2021).

Success in mathematics is directly related to good problem solving. In order to solve the problem, the problem solving process must be managed very well (Altintas, 2009). In the world and in Turkey, the problem solving process of Polya (1957) is generally accepted. According to Polya, the problem solving process should consist of four stages. These stages are understanding the problem, devise a plan (translate), carry out the plan (solve), look back (check and interpret). It is thought that students should manage the problem solving process well in order to be successful in the skill-based questions that they generally have difficulty with. From this point of view, examining the process of solving the skill-based questions of the students emerges as a problem situation.

Mathematical Ability and Problem Solving Skills and Processes

When the studies on the problem solving process are examined, in general, how the participants solve the problems according to different problem solving approaches and the strategies they use are examined. In addition, there are studies in the literature examining the difficulties encountered in the problem solving process. Karatas and Guven (2004) determined that students use variables to define the problem in the stage of understanding the problem, and that students who cannot do this have difficulties in establishing equations and finding solutions. Firat and Kocak (2019) observed that successful students use metacognitive strategies such as underlining and re-reading the problem while reading the problem. Karatas and Guven (2004), Demir (2019), Ahmetoglu (2021), Altintas, Ilgun, and Angay (2022) emphasized in their studies that the most difficult problem solving is in the "understanding step" and mistakes are made. Umurbek (2020) concluded that the students who successfully completed the "understanding the problem phase" were successful in the steps of "making a plan" and "implementing the plan", they used similar solutions while implementing the plan, but did not complete the "control step". In their study, Aydemir and Kubanc (2014)

determined that students who answered the problems correctly performed metacognitive processes such as understanding the problem, solving it in different ways, expressing it in their own sentences and controlling. Yilmaz (2021), in his study with prospective teachers from different branches, observed that most of the pre-service teachers in all branches had difficulties during the evaluation step of the solution. In his study, Sipahi (2021) stated that the group that uses the problem solving stages the most and sequentially is the gifted students. Koç-Koca (2022) found that gifted students are successful in the problem solving process, but they do not control the solutions, they apply the strategies correctly, and they use different solutions by developing more strategies for the problems they have difficulty with.

Considering the studies, there are quite a few studies examining the problem-solving processes of students. However, it has been observed that there are not enough studies examining the solution processes of students' skill-based questions. In addition, it is thought that examining the problem solving processes of students who are successful in mathematics and gifted students among themselves will contribute to the literature and fill an important gap. In this study, skill-based question solving processes of 8th grade students who will be placed in secondary education institutions according to their success status by taking an exam at the end of the academic year, in which skill-based questions are asked, were examined. It is thought that examining the process of solving the skill-based questions of the students is important in terms of determining the points that they have difficulties and lack in this process. Examining the process of solving skill-based questions by successful and gifted students will be very helpful to students and their parents whose aim is to settle in qualified secondary education institutions. In addition, it is thought that it will support the mathematics teachers who prepare students for this exam in terms of seeing and intervening the problems that their students experience while solving skill-based questions. Examining the students' process of solving skill-based questions will increase success in national and international exams by identifying the places where there are problems in problem solving. In this context, it is thought that the research will help institutions and authorities in organizing a mathematics curriculum.

Problem of Study

The aim of this research is to examine in detail the process of solving skill-based questions prepared on the subject of "multipliers and multiples" of students who are advanced learners in math and gifted students according to the Polya' problem solving steps . For this purpose, answers are sought for the following problems and sub-problems.

The problem statement of this research is, "How is the process of solving skill-based questions about multipliers and multiples of students who are advanced learners in math and gifted students?" has been determined. Sub-problems;

- How are students' problem-solving processes according to Polya's problem-solving steps?
- What are the problem solving processes of students who are advanced learners in math and gifted students?

Method

Research Model

The qualitative method, which facilitates comprehension and inference, provides the researcher with the opportunity to research and collect data in detail due to its flexible structure (Karatas, 2015). Qualitative research method was used in order to reveal how the 8th grade students who participated in the research thought, interpreted and solved the questions by making associations while solving the skill-based questions on the subject of "multipliers and multiples". In this research, technically, a case study was used. Case study is a research method that allows the researcher to examine in detail a situation or event that he cannot control. In this research model, answers are sought for "why" and "how" questions. It is generally used when there are multiple data sources and when seeking answers to scientific questions (Yıldırım & Simsek, 2016; Buyukozturk, Cakmak, Akgun, Karadeniz & Demirel, 2018).

Study Group

The study group of the research consists of 8 students, 6 girls and 2 boys, studying in the 8th grade in secondary schools in the central district of Kars in the 2022-2023 academic year. 4 of these students were educated in the field of

general mental ability at the Science and Art Center (SAC), and 4 of them were students with high mathematics achievement who did not go to SAC but studied at the school where the researcher works. While determining the study group, criterion sampling method was used. The main purpose of the criterion sampling method is to work on the criteria that the researcher has previously determined. In this sampling method, the researcher can use a criterion determined by himself or someone else (Yildirim & Simsek, 2016). While choosing the study group, whether the students were selected in the SAC general mental ability field and the success of the mathematics course were determined as criteria. The reason why these students were chosen is because they thought that they would be able to solve skill-based questions in a more organized and understandable way and to convey their thoughts more easily. Students receiving support education at SAC are students who have been identified as gifted students by the Guidance Research Center. On the other hand, the 5th, 6th and 7th grade mathematics grades of the students who did not go to SAC are above 90 points. While selecting the students in SAC, support was received from the director of the institution and the guidance teacher working in SAC. Grade averages of students who did not attend SAC were obtained through the e-school system. In addition, the students from whom data will be collected voluntarily participated in this research and the necessary permissions were obtained from their families. Students were given a code to be used throughout the study, and these codes were used instead of students' names.

Table 1. Structures of participants

No	Talent Status	Grade	Gender	Code
1	Advanced learner in math	8th	F	ALM1
2	Advanced learner in math	8th	M	ALM2
3	Advanced learner in math	8th	F	ALM3
4	Advanced learner in math	8th	F	ALM4
5	Gifted student	8th	M	GS1
6	Gifted student	8th	F	GS2
7	Gifted student	8th	F	GS3
8	Gifted student	8th	F	GS4

Multipliers and Multiples Achievement Testing and Development Process

The data were collected by applying the achievement test developed by the researchers. While the achievement test was being developed, the purpose of the test was determined first. Since the aim of the research was to solve the skill-based questions of the 8th grade students, the first topic of the 8th grade curriculum, "Multipliers and Multiples", was chosen. After determining the subject on which the achievement test will be prepared, the course and test books related to the subject were examined by the researcher. After the examination was completed, 3 outcomes and 16 questions were prepared on the subject of “Multiples and Multiples”. Thus, the draft test was created. A table of specifications has been prepared in order to distribute the questions in a balanced way on the basis of outcomes and to show which outcome they measure. It is very important to ensure the validity of the achievement test while developing it, and it is a frequently preferred method to seek expert opinion (Treagust, 1988; Calik & Ayas, 2003; Buyukozturk, 2020). For this purpose, the draft test prepared by the researcher was evaluated by 2 mathematics teachers, 2 academicians and 1 Turkish teacher who are experts in their fields and have experience in writing questions, in terms of language, scope, appearance, content, etc. analyzed for features. The figures and pictures of the questions were drawn by an expert art teacher in the digital environment in accordance with the level of the students. The draft form was applied to 108 students in the 9th grade of Science High School who volunteered to participate in the study, and item analysis was performed. Reliability analysis was conducted to determine how sensitively the prepared test measures the feature it measures and to what extent the results are free from errors. The KR-20 reliability value of the 16-question draft test was 0.614. After 6 questions were eliminated after item analysis, the KR-20 reliability value was 0.585 for 10 questions in the final test. Since the calculated KR-20 reliability value is greater than 0.5, the test can be said to be a moderately reliable test (Salvucci, Walter, Conley, Fink, & Saba, 1997; Tan, 2009).

Clinical Interview and Think Aloud Technique

The clinical interview is one of the non-traditional methods used to investigate the problem solving process in mathematics education. The problem solving process, which is considered to be a very complex process, and the detailed examination of student behaviors in this process were made with the help of clinical interviews. In the clinical interview, the students were asked "What do you think about the problem?", "How do you intend to solve the problem?", "Are you sure about the result you found?", "Can you explain the procedures you have done?" Information about the problem solving process can be obtained by asking questions such as (Karatas & Guven, 2003).

In the clinical interview, the thinking aloud technique was used to learn all the details of the problem solving process. Thinking aloud technique is an evaluation technique in which the individual conveys everything he thinks and does during the problem solving process. The data obtained in the thinking aloud technique is recorded by a voice recorder or camera. Then this data is dumped. The purpose of applying this technique is to examine the cognitive process of the student in detail during the problem solving process and to minimize data loss (Ozkubat & Ozmen, 2018).

Pilot Scheme

For the pilot scheme, the final test was applied to 5 students, 3 girls and 2 boys, who were successful in the mathematics course, and a clinical interview was conducted. As a result of the pilot scheme, it was seen that 40 minutes was sufficient to conduct clinical interviews with the students. This pilot scheme helped to identify the critical behaviors in the table to be created to examine the data. In addition, in the intervention, it was determined which questions to be asked in order to encourage students to speak and convey their thoughts.

Intervention

While collecting the data, an achievement test was applied to the students participating in the study. While applying the achievement test, a clinical interview was conducted using a voice recorder in order to make in-depth analysis with the students and to minimize data loss. The achievement test application and clinical interview were conducted by determining the appropriate times for the students and the researcher. Gifted students' applications were made at SAC, and advanced learner in math applications were made in their own schools. Thus, the students participating in the research were not adversely affected by the data collection process.

Before starting to collect data, the purpose of the research was explained so that the students could feel comfortable, and an environment was tried to be created that would enable the application to take place in a conversational atmosphere. It was observed that the students were excited during the clinical interview. Therefore, the researcher tried to comfort the participants by making the necessary speeches. The students participating in the research were informed that their names and information would be kept strictly confidential. It is stated that the code will be used instead of their names. In addition, it was emphasized that the audio recording would not be listened to by anyone other than the researcher. It has been specifically stated that the study will not affect the student's school grades and the results will not be shared with other teachers. Thus, the students participating in the study were provided to participate in the clinical interview comfortably.

During the clinical interview, "What does it say about the problem?", "What do you need to do?", "How did you do it?", "Are you sure?" such questions were asked. Thus, the problem solving process was tried to be examined in detail. During the clinical interview, students were asked to think aloud while answering in order to reveal what they were thinking. It has been specifically stated that they can freely say what they think without hesitation. Enough time was given for the students to think and respond where they had difficulty. Clinical interviews lasted an average of 40 minutes. The data collection process was completed in 1 month.

Data Analysis

Polya's (1957) problem solving theory was used to analyze the data obtained in this study in terms of problem solving process. Each problem-solving step in this theory is considered as a step, and the critical behaviors that participants are expected to show in each step are created with the help of Polya (1957) and the data obtained from the pilot

application. In addition, while the questions in the achievement test were analyzed descriptively, the study of Umurbek (2020) was used. The data collected as a result of the clinical interviews with the students were transcribed and coded in accordance with the relevant steps and behaviors in the table.

Findings

The process of solving skill-based questions of the students participating in the research was examined for each question with the help of the data obtained from the interviews. The processes experienced by each student for each problem are shown with the help of tables. While interpreting the skill-based problem solving processes, Polya's (1957) level of realizing the problem solving steps (understanding the problem, devise a plan (translate), carry out the plan (solve), look back (check and interpret) was taken into account.

Findings of the Process of Solving the First Skill-Based Problem

Problem 1.

The divisors of a positive integer are also the factors of that integer. An integer is divided by its factors without a remainder.

After school, Fahrettin goes to help his father's toy shop. In the toy shop there are two boxes with small toys. Each of these boxes contains 50 toys. After selling for a few days, Fahrettin counted the toys in the boxes and reached the following information:

- The number of toys left in box 1 has a prime factor of 2.
- The number of toys remaining in the 2nd box is not a prime number, but has 1 prime factor.
- The numbers of toys remaining in boxes 1 and 2 are co-prime.

What is the maximum number of toys sold in two boxes?

Table 2. Analysis of the first skill-based problem by Polya's problem solving steps

Steps	Behaviours	ALM1	ALM2	ALM3	ALM4	GS1	GS2	GS3	GS4
Understanding the problem	HKP		√	√	√	√		√	√
	DWG	√	√	√	√	√	√		√
	DR			√	√				√
	EPOW		√	√	√	√			√
Devise a plan	CDSP			√					√
	IDSP	√	√		√			√	
	USP					√	√		
	ESP	√	√	√	√			√	
Carry out the plan	CISP	√	√		√			√	√
	IISP			√					
	RPS	√	√	√		√	√		√
Look back	CO	√		√	√				
	RDM								
RFS		F	F	F	F	E	E	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Inorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 2, it is understood that all students, except ALM1 and GS2, emphasized the important points in the *understanding the problem ste*p, and all students, except GS3, determined what was given. However, it was observed that students other than ALM3, ALM4 and GS4 could not determine what was desired, and ALM1, GS2 and GS3 could not express the problem in their own words. It was observed that the students had difficulties in the *devise a plan step* and only ALM3 and GS4 could find a correct solution. In *the carry out the plan step*, it was determined that only GS4 implemented its plan without errors and reached the correct result. In addition, it was observed that all students except ALM4 and GS3 returned to the previous steps. It is also among the findings that ALM1, ALM3 and ALM4 control their operations, although the answers given in *the look back step* are incorrect.

Findings of the Process of Solving the Second Skill-Based Problem

Problem 2.

The divisors of a positive integer are also the factors of that integer. An integer is divided by its factors without a remainder.

Oyku works in a 36-floor workplace. When he went to work in the morning, he took the elevator with a certain number of people on the ground floor (0. floor). The elevator stops at each floor where the positive factors of 36 are, and does not stop at the other floors. If the floor number of the floors where the elevator stops is odd, 2 people got off, and if it is double, 1 person got off. When he came to the last floor and stopped, there was no one left in the elevator after the last descent.

Since there is no elevator except for the ground floor, how many people got on the elevator except Oyku at the beginning?

Table 3. Analysis of the second skill-based problem by Polya's problem solving steps

Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√	√		√	√
	DWG	√	√	√	√	√	√	√	√
	DR	√	√	√	√			√	√
	EPOW		√						√
Devise a plan	CDSP	√	√	√	√	√	√	√	√
	IDSP								
	USP								
	ESP	√	√		√			√	
Carry out the plan	CISP		√	√	√				√
	IISP	√				√	√	√	
	RPS		√		√		√		√
Look back	CO	√			√		√		
	RDM								
RFS		F	T	T	T	F	F	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Inorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 3, it was understood that in the *Understanding the problem* step, all of the students except ALM1 and GS2 emphasized the important points, all of them determined what was given, and all of the students except GS1 and GS2 determined what was desired. In addition, it was determined that none of the students except ALM2 and GS4 could express the problem in their own words. In the *Devise a plan* step, it was observed that all of the students determined the solution path correctly and ALM1, ALM2, ALM4 and GS3 expressed the solution path. In the *Carry out the plan* step, it was understood that successful students, except for ALM1, reached the correct result by solving the question carefully and without making any mistakes. It was determined that gifted students made mistakes in their solutions and found the answer wrong, considering it was due to lack of attention other than GS4. It is also among the findings that the students performed the *Look back* step by checking the solutions made by only ALM1, ALM4 and GS2.

Findings of the Process of Solving the Third Skill-Based Problem

Problem 3.

The divisors of a positive integer are also the factors of that integer. An integer is divided by its factors without a remainder.

Ali and Ahmet, two friends, topped up different amounts of internet packages to their mobile phones. After topping up the internet packages, they learned that the mobile phone company was running a campaign. According to this campaign, internet is given as a gift equal to the sum of the different prime factors of the internet package topped up the mobile phone. After the gifts were added, they saw that the total amount of internet on their line was equal. Since it is known that Ali has topped up 12 GB of internet package, how many GB of internet package could Ahmet have topped up?

A) 6 B) 8 C) 10 D) 15

Table 4. Analysis of the third skill-based problem by Polya's problem solving steps

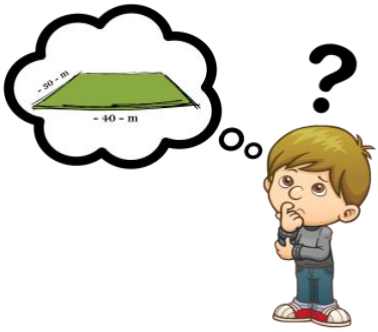
Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√	√	√	√	√
	DWG	√	√	√	√	√	√	√	√
	DR		√	√	√		√	√	√
	EPOW								
Devise a plan	CDSP			√	√		√	√	
	IDSP		√			√			√
	USP	√							
	ESP		√	√				√	√
Carry out the plan	CISP		√	√	√	√	√		√
	IISP							√	
	RPS							√	
Look back	CO				√				
	RDM								
RFS		E	F	T	T	F	T	E	F

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 4, it was understood that in the *understanding the problem* step, all of the students except ALM1 emphasized the important points, all of them determined the given ones, and all of them determined the asked one except ALM1 and GS1. However, it was determined that none of the students could express the problem in their own words. In the *devise a plan* step, it was observed that ALM3, ALM4, GS2 and GS3 of the students determined the right solution, B1 could not determine the solution, and ALM2, GS1 and GS4 chose the wrong solution because of the difficulties they experienced during the understanding of the problem. In the *carry out the plan* step, it was seen that among the students who could determine the solution, only they made a mistake while applying the GS3's plan, and could not give any answer despite returning to the previous steps. It is among the findings that only GS4 of the students tried the other options after answering and performed the *look back* step.

Findings of the Process of Solving the Fourth Skill-Based Question

Problem 4.



Faruk wants to divide his rectangular garden of 40 m in length and 30 m in width into equal squares and plant saplings in the corner of each square. Since each of the saplings Faruk wants to plant is 15 TL, how much should Faruk spend at least for the saplings he will plant?

Table 5. Analysis of the fourth skill-based problem by Polya's problem solving steps

Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√	√			√
	DWG	√	√	√	√	√		√	√
	DR	√	√	√	√	√			√
	EPOW								
Devise a plan	CDSP	√	√	√	√	√			√
	IDSP							√	
	USP						√		
	ESP	√	√	√	√	√		√	√
Carry out the plan	CISP		√	√	√	√			√
	IISP	√						√	
	RPS	√		√					
Look back	CO				√				
	RDM	√							
RFS		F	T	T	T	T	E	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 5, it is understood that in the *understanding the problem* step, all students except ALM1, GS2 and GS3 emphasized important points, all students except GS2 determined what was given, all students except GS2 and GS3 determined what was given, but none of the students could express the problem in their own words. . In the *devise a plan* step, it was observed that the students determined the solution path correctly, except for GS2, which could not determine any solution path, and GS3, which did not determine the solution path incorrectly, and the students who determined the solution path were able to express the solution paths. In the *carry out the plan* step, it was

determined that the students who determined the solution path correctly, except for ALM1 and GS3, implemented their plans correctly and reached the right result. It was seen that ALM1 and ALM3 returned to the previous steps to solve the question. Among the findings obtained from the students, ALM1 solved the question again with a different method and ALM4 performed the *look back* step by checking its operations.

Findings of the Process of Solving the Fifth Skill-Based Question

Problem 5.

Florist Mrs. Serpil has 120 roses and 96 carnations in her shop. Mrs. Serpil wants to create bouquets for Mother's Day, each with a single flower type. How many bouquets can Serpil create, with at least 10 flowers in each bouquet?

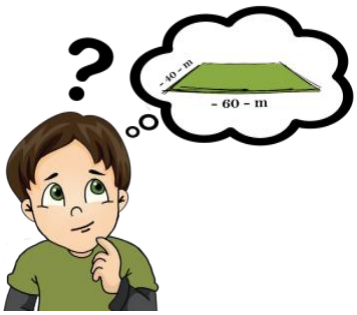
Table 6. Analysis of the fifth skill-based problem by Polya's problem solving steps

Steps	Behaviours	ALM1	ALM2	ALM3	ALM4	GS1	GS2	GS3	GS4
Understanding the problem	HKP		√	√	√				√
	DWG	√	√	√	√	√		√	√
	DR	√	√	√	√				√
	EPOW				√				
Devise a plan	CDSP	√	√		√	√			√
	IDSP							√	
	USP			√			√		
	ESP	√	√		√			√	√
Carry out the plan	CISP	√	√		√			√	√
	IISP					√			
	RPS	√	√	√				√	
Look back	CO		√		√				
	RDM								
RFS		T	T	E	T	F	E	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 6, ALM2, ALM3, ALM4 and GS4 emphasized the important points in the *understanding the problem* step, students other than GS2 determined what was given, students other than GS1, GS2 and GS3 determined what was desired, and only B4 expressed the problem in his own words. understandable. In the *devise a plan* step, it was observed that students other than GS3 who incorrectly determined the solution path and ALM3 and GS2, who could not produce a solution, produced a correct solution. It has been determined that students other than GS1 among the students who produce solutions express the solution path. In the *carry out the plan* step, it was observed that students other than ALM1, among the students who produced a solution, applied their plans correctly. In addition, it was observed that the students ALM1, ALM2, ALM3 and GS3 tried to solve the question by returning to the previous steps. In the *look back* step, it is among the findings that it performs this step by controlling the operations of only ALM2 and ALM4.

Findings of the Process of Solving the Sixth Skill-Based Question
Problem 6.



Mrs. Oğuzhan decided to divide his rectangular field with side lengths of 60 m and 40 m into square pieces and to plant different types of vegetables on each piece. But since Mr. Oğuzhan wants the area of each piece not to exceed 200 square meters, at least how many types of vegetables can he plant in his field?

Table 7. Analysis of the sixth skill-based problem according to Polya's problem solving steps

Steps	Behaviours	ALM1	ALM2	ALM3	ALM4	GS1	GS2	GS3	GS4
Understanding the problem	HKP		√	√	√				√
	DWG	√	√	√	√	√		√	√
	DR	√	√	√	√				√
	EPOW				√				
Devise a plan	CDSP	√	√		√				√
	IDSP			√				√	
	USP					√	√		
	ESP		√		√			√	
Carry out the plan	CISP	√	√		√				√
	IISP			√				√	
	RPS								
Look back	CO				√				
	RDM								
RFS		T	T	F	T	E	E	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 7, ALM2, ALM3, ALM4 and GS4 emphasized important points in the *understanding the problem* step, all students except GS2 determined what was given, students other than GS1, GS2 and GS3 determined what was desired, and only ALM4 explained the problem in their own words. is understood to mean. In the *devise a plan* step, it was observed that students other than ALM3 and GS3, who incorrectly determined the solution path, and GS1 and GS2, who could not determine the solution path, determined a correct solution. It was observed that ALM2, ALM4 and GS3, which determined the solution path, expressed the solution path they found. It was determined that the students who produced the right solution in *the carry out the plan* step applied their plans correctly, while the students who produced the wrong solution made mistakes while applying their plans. In this question, none of the students returned to the previous steps and only checked the operations of ALM4 and performed the *look back* step.

Findings of the Process of Solving the Seventh Skill-Based Question
Problem 7.

Construction master Mr. Deniz wants to lay the square floor bathroom with rectangular tiles with side lengths of 8 cm and 10 cm. When the side lengths of the bathroom floor are not a common multiple of the side lengths of the tile, it is necessary to break and place the necessary tiles in order to completely cover the floor. Since Mr. Deniz did not break any tiles when he finished his work, at least how many tiles did he use to cover the bathroom floor?

Table 8. Analysis of the seventh skill-based problem according to Polya's problem solving steps

Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√			√	√
	DWG	√	√	√	√	√	√	√	√
	DR	√	√	√	√				√
	EPOW		√		√				
Devise a plan	CDSP		√	√		√			√
	IDSP	√			√				
	USP						√	√	
	ESP		√	√					
Carry out the plan	CISP		√	√					√
	IISP	√			√	√			
	RPS		√		√				
Look back	CO	√							√
	RDM		√						
RFS		F	T	T	F	F	E	E	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 8, in the *understanding the problem step*, students other than ALM1, GS1 and GS2 emphasized important points, all students determined what was given, students other than GS1, GS2 and GS3 determined what was desired, and only ALM2 and ALM4 expressed the problem in their own words. understood. In the *devise a plan step*, it was observed that all students, except ALM1 and ALM4, who incorrectly determined the solution path, and GS2 and GS3, who could not determine the solution, all determined the correct solution. It has been determined that ALM2 and ALM3, which determine the solution path, express the solution path they have determined. In the *carry out the plan step*, it was observed that ALM2, ALM3 and GS4 applied the plan they determined correctly, while ALM1, ALM4 and GS1 made mistakes while applying the plan they determined. It was also observed that ALM2 and ALM4 returned to the previous steps in order to solve the problem. It is among the findings obtained that students control the operations of ALM1 and GS4, and ALM2 performs the *look back step* by solving the problem again with a different method.

Findings Regarding the Eighth Skill-Based Question Solving Process
Problem 8.

Mrs. Nilufer, who grows ivy on her balcony, wants to make two supports of equal length for the vines to wrap around. These supports will be formed by bringing equal lengths of 6 cm and 10 cm sticks end to end and gluing them together. Since Mrs. Nilufer has to pay 3 TL to the carpenter for each sticking process, how much should she pay at least for this process?

Table 9. Analysis of the eighth skill-based problem by Polya's problem solving steps

Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√	√	√	√	√
	DWG	√	√	√	√	√	√	√	√
	DR	√	√	√	√	√			√
	EPOW				√				
Devise a plan	CDSP	√	√					√	√
	IDSP			√	√	√	√		
	USP								
	ESP		√		√			√	
Carry out the plan	CISP	√	√						√
	IISP			√	√	√	√	√	
	RPS			√		√			
Look back	CO				√				
	RDM								
RFS		T	T	F	F	F	F	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 9, it was observed that in the understanding the problem step, students other than ALM1 emphasized important points, all students determined what was given, students other than GS2 and GS3 determined what was desired, and only ALM4 expressed the problem in their own words. In the devise a plan step, it is understood that ALM1, ALM2, GS3 and GS4 determine the correct solution path, while ALM3, ALM4, GS1 and GS2 determine the wrong solution path. It has been determined that ALM2, ALM4 and GS3, which determine the solution path, express the solution path they have determined. In the carry out the plan step, it was observed that ALM1, ALM2 and GS4 applied the plan they determined correctly, while the other students made mistakes while applying the plan they determined. In addition, it was determined that ALM3 and GS1 returned to the previous steps in order to solve the problem. It is among the findings that the students performed the look back step by only checking the operations of ALM4.

Findings of the Process of Solving the Ninth Skill-Based Question

Problem 9.

Natural numbers that have no common divisor other than 1 are called prime numbers

Yunus has an old model car. There is a screen on the dashboard of the car that shows the humidity and temperature. However, because the car is old, the ones digit of the two-digit temperature display does not work in some cases. After a certain time, Yunus noticed that the ones digit of the temperature indicator did not work when the humidity and temperature values were prime numbers. Accordingly, if 2_ is written on the temperature indicator when the humidity value is 48, how many different values can the air temperature take?

Table 10. Analysis of the ninth skill-based problem by Polya's problem solving steps

Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√	√	√	√	√
	DWG	√	√	√	√	√	√	√	√
	DR	√	√	√	√		√	√	√
	EPOW		√		√	√			√
Devise a plan	CDSP	√	√	√	√	√	√	√	√
	IDSP								
	USP								
	ESP	√	√	√	√	√		√	√
Carry out the plan	CISP		√	√			√	√	√
	IISP	√			√	√			
	RPS						√		
Look back	CO				√				
	RDM								
RFS		F	T	T	F	F	T	T	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 10, it is understood that in the understanding the problem step, all students except ALM1 emphasized important points, all students determined what was given, all students except GS1 determined what was desired, and ALM2, ALM4, GS1 and GS4 expressed the problem in their own words. In the devise a plan step, it was observed that all students determined the correct solution path and all students, except GS2, expressed the solution they determined. In the carry out the plan step, it was determined that all students except ALM1, ALM4 and GS1 applied the plan correctly and GS2 returned to the previous steps to solve the problem. It is among the findings that the students performed the look back step by only checking the operations of ALM4.

Findings of the Process of Solving the Tenth Skill-Based Question

Problem 10.

Natural numbers that have no common divisor other than 1 are called prime numbers

Meltem and Ipek are two close friends living on the 3rd and 4th floors of the same apartment building, respectively. In this apartment, there are 10 apartments on each floor and the apartment numbers are named with the floor name first. For example, the apartment numbers on the 5th floor are named as 50, 51, 52, ..., 59. Ipek and Meltem's flat numbers have the same unit digit and the flat numbers are prime between them, so how many different values can the flat numbers of these two friends take?

Table 11. Analysis of the tenth skill-based problem by Polya's problem solving steps

Steps	**Behaviours**	**ALM1**	**ALM2**	**ALM3**	**ALM4**	**GS1**	**GS2**	**GS3**	**GS4**
Understanding the problem	HKP		√	√	√	√	√	√	√
	DWG	√	√	√	√	√	√	√	√
	DR	√	√	√	√	√	√	√	√
	EPOW					√			
Devise a plan	CDSP	√	√	√	√	√	√	√	√
	IDSP								
	USP								
	ESP		√			√	√	√	√
Carry out the plan	CISP	√	√	√	√	√			√
	IISP						√	√	
	RPS		√					√	
Look back	CO		√	√	√	√	√		
	RDM								
RFS		T	T	T	T	T	F	F	T

HKP: Highlighting Key Points **DWG**: Determining what's given **DR**: Determining of Requested **EPOW**: Expressing the Problem in Own Words **CDSP**: Correctly Determining the Solution Path **IDSP**: Incorrectly Determining the Solution Path **USP**: Undetermining of Solution Path **ESP**: Expressing the Solution Path **CISP**: Correctly Implementing the Solution Path **IISP**: Incorrectly Implementing the Solution Path **RPS**: Returning the Previous Steps **CO**: Checking the Operations **RDM**: Resolving with a different method **RFS**: Result Found by Student **E**: Empty **T**: True **F**: False **ALM**: Advanced Learner in Math **GS**: Gifted Student

As seen in Table 11, it is understood that in the "Understanding the problem" step, all students except ALM1 emphasized important points, all students determined what was given and what was required, and only GS1 expressed the problem in his own words. In the "Devise a plan" step, it was observed that all students determined the correct solution path and all students, except ALM1, ALM3, and ALM4, expressed the solution they determined. In the "Carry out the plan" step, it was determined that all students, except GS2 and GS3, applied the plan correctly, and ALM1 and GS3 returned to the previous steps in order to solve the problem. It is among the findings that the students performed the k "Look back" step by controlling the operations of ALM2, ALM3, ALM4, GS1 and GS2.

Conclusion and Discussion

In this research, it is concluded that the "Understanding the problem" step is carried out by the students who answered the question correctly. Another result is that the "understanding the problem" step is the step that students have the most difficulty with, and students who cannot successfully perform this step also experience difficulties in the next steps. This result is in line with the results of the studies conducted by Karatas and Guven (2004), Demir (2019),

Ahmetoglu (2021), Altintas, Ilgun and Angay (2022), who emphasized that the most difficulty in problem solving is at the level of understanding and mistakes are made. It is concluded that the students who could not perform the understanding the problem step read the question silently, did not specify the important parts with a pencil or underline the whole question and could not express the problem in their own words. This result is similar to the results of the study by Umurbek (2020). In addition, it was emphasized in the study conducted by Aydemir and Kubanc (2014) that students with high metacognitive skills expressed the problem in their own words and were able to determine what was given and what was desired.

It was concluded that the students who successfully completed the understanding the problem step determined the solution path correctly. It was observed that the students who misidentified the solution or could not determine the solution had difficulty in understanding the problem and expected support from the researcher. It was observed that some of the students expressed the solution way, and some of them tried to solve the question without expressing the solution. These behaviors are similar to the results stated in the study conducted by Umurbek (2020), that some students went to the solution without expressing the plan, and students who could not understand the question expected guidance from the researcher. However, it was determined that the students who went to the solution without expressing the solution way expressed the solution with the intervention of the researcher. Another result reached by the research is that the students generally try to realize the step of creating a plan by using the methods in the questions they have solved before. This result is in parallel with the result of the study by Karatas and Guven (2004) that the students set up equations based on the problems they had previously solved. In addition, it is observed that students try to produce solutions with different strategies when they have difficulties, and this result is similar to the results of the study conducted by Koc Koca (2022).

In this study, it is also concluded that the students who successfully perform the understanding the problem and the devise a plan step also successfully perform the carry out the plan step. This result is similar to the results of the study by Umurbek (2020) in which he emphasized that students who perform critical behaviors in the problem understanding step and choose the appropriate strategy in the devise a plan step are successful in the carry out the plan step.

It was observed that the students did not control the operations they did in general and did not solve the question again with a different method. These results are in line with the results of the studies conducted by Umurbek (2020) with students with different levels of success, by Koc Koca (2022) with gifted students, and by Yilmaz (2021) with pre-service teachers.

Advanced learner in math and gifted students

As a result of the research, advanced learner in math emerges as a result that they try to apply Polya's problem solving steps more than gifted students. This result is in line with the result of Yeşilova (2013)'s study, in which the problem solving behaviors of students with below average and above average mathematics achievement were compared. However, in the study conducted by Sipahi (2021), which examined the problem solving stages of successful and gifted students, Polya's statement that the group that applied the problem solving steps most and sequentially was the gifted students, which contradicts the result.

It was observed that advanced learner in math students made more effort to understand the problem than gifted students. It was determined that advanced learner in math students produced a solution for almost every question, even if they were wrong, and gifted students could not produce a solution for the questions they gave up more easily and had difficulties.

It was determined that advanced learner in math students acted more carefully and made fewer operational errors than gifted students in the carry out the plan step. It is thought that the reason for this situation is that some gifted students try to make operations from their minds.

It was concluded that advanced learner in math students applied the check step more than gifted students. It is thought that the reason for this situation is that gifted students are overconfident in themselves and therefore do not

think that they will make mistakes. This result coincides with the result of Koc Koca (2022) stating that gifted students do not perform the check step in his study.

When the answers to the questions were examined, it was determined that advanced learner in math students were more successful as a group than gifted students, but the gifted GS4 student was more successful than all students. This result contradicts the result emphasized by Koc Koca (2022), stating that gifted students are successful in solving the questions.

Recommendations

According to the results of the study, the following suggestions can be presented to the researchers;

- It is recommended that advanced learner in math students do more detailed research on the reasons why they are more successful in problem solving than gifted students..
- In this research, Polya's problem solving approach was used. It is recommended that advanced learner in math students and gifted students examine problem solving processes with different problem solving process approaches.
- Skill-based questions were used in this research. It is recommended that advanced learner in math students' and gifted students' examine their problem-solving processes with different types of questions.
- This research was conducted with 4 advanced learner in math students and 4 gifted students. The status of these results obtained in qualitative research can also be examined in quantitative research.

According to the results of the study, the following suggestions can be presented to the applicants;

- It is recommended that teachers of advanced learner in math students and gifted students teach problem-solving steps to their students and solve problems using these steps.
- Authorities that shape education policies are recommended to enrich the mathematics curriculum with activities that can improve the problem-solving process of advanced learner in math students and gifted students.
- Teachers teaching at SAC are recommended to carry out studies that will enable gifted students to use the look back step more in the problem solving process.

Limitations of Study

- It is limited to the 2022-2023 academic year.
- Limited to 8 students, 4 advanced learner in math students, 4 gifted students.
- Limited to the 8th grade "Multipliers and Multiples" topic in the mathematics curriculum
- It is limited to the data obtained from the prepared achievement test and the clinical interview.

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Appendix

Appendix 1. Multipliers and Multiples Achievement Test (Turkish)

Soru 1.

Pozitif bir tam sayının bölenleri, aynı zamanda bu tam sayının çarpanlarıdır. Bir tam sayı, çarpanlarına kalansız olarak bölünür.

Fahrettin okuldan sonra babasının oyuncak dükkânına yardıma gitmektedir. Oyuncak dükkânında içinde küçük oyuncakların bulunduğu iki tane kutu vardır. Bu kutuların her birinin içinde 50 adet oyuncak bulunmaktadır. Fahrettin birkaç gün satış yaptıktan sonra kutulardaki oyuncakları saymış ve aşağıdaki bilgilere ulaşmıştır:

- 1. kutuda kalan oyuncakların sayısının 2 tane asal çarpanı vardır.
- 2. kutuda kalan oyuncakların sayısı asal sayı olmayıp 1 tane asal çarpanı vardır.
- 1. ve 2. kutuda kalan oyuncakların sayıları aralarında asaldır.

Buna göre iki kutuda satılan toplam oyuncak sayısı **en çok** kaçtır?

Soru 2.

Pozitif bir tam sayının bölenleri, aynı zamanda bu tam sayının çarpanlarıdır. Bir tam sayı, çarpanlarına kalansız olarak bölünür.

Öykü, 36 katlı bir iş yerinde çalışmaktadır. Sabah işe gittiğinde zemin katta (0. kat) belirli bir sayıda kişiyle asansöre binmiştir. Asansör 36 sayısının pozitif çarpanlarının olduğu her bir katta durmakta bunun dışındaki katlarda durmamaktadır. Asansörün durduğu katların kat numarası tek ise 2 kişi, çift ise 1 kişi inmiştir. Son kata gelip durduğunda son inenlerin ardından asansörde kimse kalmamıştır.

Zemin kat haricinde asansöre binen olmadığına göre başlangıçta Öykü'den **hariç** kaç kişi asansöre binmiştir?

Soru 3.

Pozitif bir tam sayının bölenleri, aynı zamanda bu tam sayının çarpanlarıdır. Bir tam sayı, çarpanlarına kalansız olarak bölünür.

İki arkadaş olan Ali ve Ahmet cep telefonlarına farklı miktarlarda internet paketi yüklemişlerdir. Bu iki arkadaş internet paketlerini yükledikten sonra cep telefonu şirketinin bir kampanya yaptığını öğrenmişlerdir. Bu kampanyaya göre, cep telefonuna yüklenen internet paketi miktarının farklı asal çarpanlarının toplamı kadar internet hediye edilmektedir. Hediyeler eklendikten sonra hatlarındaki toplam internet miktarlarının eşit olduğunu görmüşlerdir. Ali'nin 12 GB internet paketi yüklediği bilindiğine göre, Ahmet kaç GB' lık internet paketi yüklemiş olabilir?

A) 6 B) 8 C) 10 D) 15

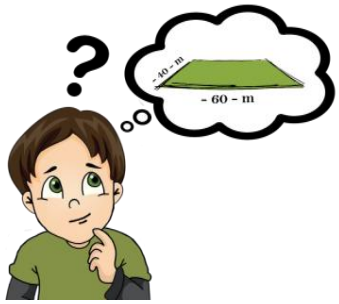
Soru 4.

Faruk, boyu 40 m, eni 30 m olan dikdörtgen şeklindeki bahçesini eş karelere ayırıp, her karenin köşesine fidan dikmek istemektedir. Faruk'un dikmek istediği fidanların tanesi 15 TL olduğuna göre Faruk, dikeceği fidanlar için **en az** kaç TL harcamalıdır?

Soru 5.

Çiçekçi Serpil Hanım'ın dükkânında 120 adet gül ve 96 adet karanfil vardır. Serpil Hanım Anneler günü için her birinde tek çiçek türü olacak şekilde buketler oluşturmak istemektedir. Serpil Hanım her bukette **en az** 10 çiçek olacak şekilde **en fazla** kaç buket oluşturabilir?

Soru 6.



Oğuzhan Bey kenar uzunlukları 60 m ve 40 m olan dikdörtgen biçimindeki tarlasını kare şeklinde parçalara ayırıp, her parçaya farklı türde sebze ekmeye karar vermiştir. Fakat Oğuzhan Bey her bir parçanın alanının 200 metrekareyi geçmemesini istediğine göre tarlasına **en az** kaç çeşit sebze ekebilir?

Soru 7.

İnşaat ustası Deniz Bey zemini kare biçimindeki banyoyu kenar uzunlukları 8 cm ve 10 cm olan dikdörtgen şeklindeki fayanslarla döşemek istemektedir. Banyo zemininin kenar uzunlukları fayansın kenar uzunluklarının ortak bir katı olmadığında, zemininin tamamen kaplanması için gerekli kadar fayans kırıp yerleştirmek gerekmektedir. Deniz Bey işini bitirdiğinde hiç fayans kırmadığına göre banyonun zemini kaplamak için en az kaç adet fayans kullanmıştır?

Soru 8

Balkonuna sarmaşık diken Nilüfer Hanım sarmaşıkların dolanması için eş uzunlukta iki tane destek yapmak istemektedir. Bu destekleri, 6 cm ve 10 cm uzunluğundaki çubuklardan boyları eşit uzunlukta olanları uç uca getirip yapıştırarak yapacaktır. Nilüfer Hanım çubukları her yapıştırma işlemi için marangoza 3 TL ödemesi gerektiğine göre, bu işlem için en az kaç TL ödeme yapması gerekmektedir?

Soru 9.

1'den başka ortak böleni olmayan doğal sayılara aralarında asal sayılar denir.

Yunus'un eski model bir arabası vardır. Arabanın gösterge panelinde nem ve sıcaklığı gösteren bir ekran bulunmaktadır. Fakat araba eski olduğu için iki basamaklı sıcaklık göstergesinin birler basamağı bazı durumlarda çalışmamaktadır. Yunus belli bir zaman sonra nem ile sıcaklık değerinin aralarında asal sayılar olduğu durumlarda sıcaklık göstergesinin birler basamağının çalışmadığını fark etmiştir. Buna göre nem değeri 48 olduğu zaman sıcaklık göstergesinde 2_ yazıyorsa, hava sıcaklığının alabileceği kaç farklı değer vardır?

Soru 10

1'den başka ortak böleni olmayan doğal sayılara aralarında asal sayılar denir.

Meltem ve İpek aynı apartmanın sırasıyla 3. ve 4. katta oturmakta olan iki yakın arkadaştır. Bu apartmanda her katta 10 daire bulunmaktadır ve daire numaraları kat ismi başta olacak şekilde isimlendirilmektedir. Örneğin 5. kattaki daire numaraları 50,51,52,...,59 şeklinde isimlendirilmektedir. İpekle Meltem'in daire numaralarının birler basamağı aynı ve daire numaraları aralarında asal olduğuna göre bu iki arkadaşın daire numaraları kaç farklı değer alabilir?

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Research Article

Visual arts teachers' mental well-being nurturing gifted students

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Abstract

The purpose of this research is to examine the mental well-being of visual arts teachers of nurturing gifted students at Science and Art Center (SAC) that educational institute for supporting gifted in terms of some variables. In this context, mental well-being levels of visual arts teachers were examined in terms of "gender", "seniority", "martial status" and "education level" variables. It is a descriptive study in the survey model, which is one of the quantitative research methods. The population of the research consists of 234 visual art teachers working in SAC in the academic year of 2021-2022. The sample of the research consists of 171 visual arts teachers selected by the easily accessible sampling method in the SACs. The data of the study were collected with the data collection tool "Warwick-Edinburgh Mental Well-Being Scale" developed by Tennant et al. (2007) and adapted into Turkish by Keldal (2015). have become it has emerged. In addition, it was revealed that visual arts teachers' having different gender, age, marital status and education level did not make a significant difference on mental well-being levels.

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Introduction

Teachers have a critical role in the academic success, personalities and moral tendencies of the students who grow up in educational institutions. Teachers' personalities, moral structures and mental well-being are also effective in the development of gifted students like all students (Levent & Bas-Dogan, 2022). It is known that individuals who are creative, change-making, and high-level thinking skills that lead societies in the historical process have superior abilities (Avci and Sakalli Demirok, 2022). In our age, the great need for gifted individuals for humanity requires these individuals to be identified and trained in line with their abilities. For this reason, teachers who will train gifted students should have good mental well-being as well as their personality, morality and education level.

Curren (2017) underlines that gifted students will receive a better education through a qualified education program and teachers who are psychologically and spiritually good. In this sense, it is of great importance that teachers of gifted students, who have a critical importance for societies, have some qualifications. The General Directorate of Special Education and Guidance Services (2018) listed the qualifications that should be possessed by teachers who teach gifted students. These qualifications are listed as having competencies related to the profession, fair, impartial, cooperative, democratic, flexible, humorous, good morals and personality. It is seen that all these features are related to physical, mental and social health, which are included in the scope of mental well-being.

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Gifted Education in Turkiye

The definitions made on gifted individuals are handled in different ways by different researchers. In our country, in the SAC Directive, a definition is introduced on the definition of a gifted individual that everyone will agree on. It is stated that individuals who can learn quickly compared to their peers, are better than their peers in abilities such as creativity, art and leadership, have special academic abilities, can comprehend abstract thoughts, act independently in areas of interest and enjoy it, and perform at a high level compared to their peers can be defined as special talented. (MoNET, 2018).

The training of gifted individuals with the above skills is of strategic importance for countries (Kaynar, 2018; Sahin & Kargin, 2013). In our country, it is known that the education given to gifted individuals has a certain history. The process started with Enderun Schools for the selection, placement and education of specially talented individuals in the Ottoman Empire. With the establishment of the Republic of Turkey, the Law of Unification of Education, the selection of individuals with special talents in education passed to the Village Institutes. With the closure of this institution, institutions such as Teacher High School, Anatolian High School, Science and Social Sciences High Schools received the education of gifted individuals. The buildings established only for gifted individuals and the training programs specially prepared for them started in 1993 (Opengin, 2018). Ankara Yasemin Karakaya SAC started education in 1995, being the first of the public private education institutions that provide education for gifted children and their number reaches 350 throughout Turkey. It is known that the number of gifted individuals and SAC providing education to these individuals is 350 in 81 provinces as of 2022 in our country. SAC is an independent private education institution established by the General Directorate of Special Education Guidance and Counseling Services under the Ministry of National Education, in order to enable gifted individuals studying at pre-school, primary and secondary education levels to realize and develop their own abilities during their out-of-school time without interrupting their education in their own schools (MoNET, 2018).

Gifted Teachers' Psychological Structures

One of the most important factors in identifying gifted students and developing them in line with their abilities is the teachers who will train these individuals. In this context, the physical, physical, spiritual and mental well-being of SAC teachers is critical in raising gifted individuals as successful and healthy individuals.

Teaching is defined as a professional profession in which education and related management duties are undertaken by the state (MoNET, 2017). In addition, teaching is defined as the people who guide students in gaining desired behaviors (Demirel, 2010). When the definitions of the teaching profession are considered, it is seen that the profession has student, parent, individual and professional dimensions. This multidimensional situation brings with it many responsibilities related to the profession and therefore stress factors. It is accepted that the teaching profession is among the professions exposed to stress (Surgevil, 2006). In this sense, the mental well-being of teachers, who are the pioneers of education, is an important factor in the quality of education, which is an important factor in the development of societies (Aslan et al, 2021).

Gifted Teachers are known to have personality traits that respect differences, think critically and are open to criticism, sincere, sincere, creative, energetic, democratic, sympathetic, open to communication, and have feelings of love and compassion towards students (Mertoglu, 2018; Sarar, 2018). Due to all these positive personality and psychological characteristics, it also enables gifted students to be supportive of their psychological state.

Teacher' Well-being

It has been observed that the concept of mental well-being is defined differently by different researchers in the literature. The origin of the concept was put forward by World Health Organization (WHO) in 1948. In the definition made by WHO, mental well-being is defined as being aware of one's abilities, leading a meaningful life, and having the ability to overcome the stress in one's life. Mental well-being is also seen in individuals experiencing inner peace, contentment, happiness and joy, establishing positive relationships with others, feeling in touch and supported, and being self-confident and strong (indomitable). In this context, it is seen that there is more than one element in the definition of the concept. Yavuz (2006) states that these elements are self-esteem, satisfaction, satisfaction with life, and a qualified social

relationship. In this sense, it can be said that mental well-being is a two-dimensional concept. The first of these is subjective well-being, in which there is a high level of positive satisfaction with life (Diener, 1984), while the other is psychological well-being in the sense of self-realization (Waterman, 1993).

Considering that the teaching profession is stressful and the effects of this situation on the performance of teachers, this negative situation needs to be overcome. For this, it is important to determine the mental well-being levels of teachers first. Because individuals with high mental well-being levels struggle more effectively than negative and stressful situations (Danisment, 2012).

When the domestic studies on mental well-being were examined, it was determined that these studies were conducted with university students (Aydinay, 2019; Bahar, 2020; Dogru, 2020; Kilincoglu, 2020; Muraz, 2019; Yilmaz, 2021). In addition, high school students (Bakir, 2017; Koc, 2019; Tosun, 2020), pregnant women (Ozer, 2019), licensed athletes (Pulat, 2021), adults (Bilir, 2017; Ozyildirim, 2021), public employees (Kayalik, 2017), nurses (Dalokay, 2022; Erdogan, 2021) in terms of mental well-being were also encountered.

When the studies conducted abroad on mental well-being were examined, it was determined that the majority of these studies were conducted on students from different grade levels (Bjørnsen, Espnes, Eilertsen, Ringdal & Moksnes, 2019; Hoffman, & Miller, 2020; Morgan, Currie, Due, Gabhain, Rasmussen, Samdal & Smith, 2008; Mackenzie & Williams, 2018; Östberg, 2003; Spratt, Shucksmith, Philip & Watson, 2006; Sun, Liu & Tao, 2015; Walsh, Harel-Fisch & Fogel-Grinvald, 2010). In addition, research on mental well-being was found on teacher children (Danby & Hamilton, 2016). Among these studies, Clarke, Friede, Putz, Ashdown, Martin, Blake, Adi, Parkinson, Flynn, Platt & Stewart-Brown (2011) conducted a study that validated the Warwick-Edinburgh Mental Well-Being Scale.

Visual Arts Teachers for Gifted Student

In the education of the gifted, two definitions are made in Turkey: mental and artistic. These children are selected by scoring their studies, such as getting postgraduate education in the field of education or in the field of education, in the selection of teachers for the SACs where they receive support education. Visual arts teachers take part in the education program of gifted students selected in the field of art, at the stages of adaptation, support, individual talent, special talent development and project. They provide group and individual instruction to students. The emotional state of these teachers is very important, especially at the project stage, as they mentor gifted children in providing individual education. These teachers need to have good mental well-being levels in order to adjust both their psychological state through their creative personalities and their teaching situations.

Problem of Study

When the studies conducted in Turkey and abroad are evaluated, it has been determined that there are no studies on the mental well-being of teachers who teach gifted students. Therefore, in this study, it is aimed to examine whether the mental well-being of Visual Arts Teachers differs significantly in terms of "gender, age, marital status and educational status" variables. For this purpose, answers to the following questions will be sought:

- What is the mental well-being level of visual arts teachers?

Sub-problems are;

- What is the mental well-being levels of visual arts teachers according to gender/marital status/age/graduation?

Method

The method of the research is the quantitative research method. The model of the research is in the scanning model. The research was carried out as a descriptive study (Karasar, 2009). It is a model that handles a situation that exists in scanning models with an objective eye without any interpretation (Karasar, 2009). At the same time, numerical values for a variable were collected in this study. All collected data were subjected to statistical processes to be presented after being described. In this sense, the research is seen as a descriptive statistical model (Buyukozturk, 2014: 6). In this study, the mental well-being level of the visual arts teachers was considered as a dependent variable. In addition, gender, marital status, age and education level of visual arts teachers were considered as independent variables.

Participants

The universe of this research consists of 234 visual art teachers working in SAC. The sample of the research consists of 171 visual arts teachers, who participated in the research voluntarily and determined by simple random-random sampling method, one of the probability sampling methods from SAC in Turkey. Pandemic conditions were taken into account when determining the sample. For this reason, simple random-random sampling method, which is one of the most convenient methods, was preferred. Because in this sampling method, the margin of error can be evaluated statistically when generalizations are made about the universe based on sampling. This sample also provides the researcher with the chance to apply statistics that enable meaning-making (Balci, 2021). This method, each unit in the universe has an equal probability of being selected for sampling. In addition, the rule of neutrality can be applied in this sample. Moreover, no knowledge of the characteristics of the universe and their distribution is required. This method is seen as a shortcut to be carried out in the conditions where the names of the participants in the research universe are included. Sample selection is based on chance. This allows the calculation of the sampling error. In addition, the level of confidence can be determined. Research data were collected by creating a Google Scale Form instead of face-to-face due to the Covid-19 outbreak. 171 visual arts teachers responded to the form. Frequency and percentage distributions of demographic information regarding the research sample are given in the tables below. The distribution of the gender variable of the visual arts teacher in the sample group is given in Table 1.

Table 1. Distribution of the sample group by gender

Gender	**N**	**%**
Female	88	51.5
Male	83	48.5
Total	171	100.0

According to Table 1, 51.5% (n=88) of the sample consists of female visual arts teachers and 48.5% (n=83) male visual arts teachers. The distribution of the marital status variable of the visual arts teachers in the sample group is given in Table 2.

Table 2. Distribution of the sample group by marital status

Marital status	**N**	**%**
Married	107	62.6
Single	64	37.4
Total	171	100.0

When Table 2 is examined, 62.6% (n=107) of the sample consists of married visual arts teachers, while 37.4% (n=64) consists of single visual arts teachers. The distribution of the age variable of the visual arts teachers in the sample group is given in Table 3.

Table 3. Distribution of the sample group by age

Age	**N**	**%**
Ages 30-below	23	13.5
30-39 Age	73	42.7
40-49 Age	33	19.3
Age 50-Over	42	24.6
Total	171	100.0

When Table 3 is examined, 42.7% (n=73) of the sample is 30-39 years old, 24.6% (n= 42) is 50-over age group, 19.3% (n= 33) is 40-49 years old visual arts group form teachers. In addition, 13.5% of the sample (n= 23) consists of visual arts teachers who are under the age of 30. The distribution of the variable of educational status of the visual arts teachers in the sample group is given in Table 4.

Table 4. Distribution of the sample group according to the education level variable

Education	N	%
Undergraduate	80	46.8
Post-graduate	91	53.2
Total	171	100.0

According to Table 4, 53.2% (n= 91) graduate and 46.8% (n= 80) undergraduate visual arts teachers of the sample of the study constitute.

Data Collection Tools

The scale was developed by Tennant et al. (2007). Keldal (2015) adapted this scale into Turkish. The number of items in the scale is fourteen. There is no negative item in the scale. So it's all positive. Likert statements in the scale were determined as "I strongly disagree", "I agree little", "I agree at a moderate level", "I mostly agree", "I completely agree". In this context, the scale has a five-point Likert structure. The highest score a participant can get is 70. The lowest score to be obtained is 14. A high score means high psychological well-being.

The scale score range is between 1.00 and 5.00. In this context, a score approaching 5 means that mental well-being is high. However, if the score approaches 1.00, low mental well-being can be mentioned. The Cronbach Alpha coefficient found by the researcher who adapted the scale is 0.89. This shows that the scale is reliable. As a result of the reliability analysis of the scale in this study, the reliability coefficient was found to be .899. This shows that the scale used in the research is quite reliable.

There is no negative item in the scale. As a result, the scale consists of a total of 14 items in a 5-point Likert type, all of which are positive.

Data Analysis

The data used in the research were collected with the "Mental Well-Being Scale". The collected data were analyzed with the IBM SPSS Statistics 21 package program. The findings obtained from the data were statistically evaluated at the 95% confidence interval ($p<0.05$) at the level of significance. The data collected through the scale were loaded into the SPSS package program. Then, it was analyzed with statistical techniques predicted according to the research problems. First of all, it was checked whether the data were homogeneously distributed across the scale and in terms of all variables. Since the number of research samples was more than 50, Kolmogorov-Smirnov test results were taken into consideration. Since the data were homogeneously distributed, a t-test was used to compare the means of a dependent variable obtained from two independent groups, from parametric tests. In addition, the ANOVA test was also used, which compares the means of a dependent variable obtained from more than two groups. The statistical methods and techniques used according to the statistical data obtained as a result of the research are given below.

- Descriptive statistics were used in the study. By means of this statistic, the distribution of the population and the sample regarding the demographic variables has been discussed.
- In case the distributions of the groups were homogeneous, whether the difference between the mean of the two independent groups was significant or not was examined with the parametric test. In this context, the t-statistic was used. For this reason, the t-test was used because the groups were homogeneously distributed in the variables of gender, marital status and educational status.
- Since the group distributions show normal distribution, whether the difference between the mean scores of three or more groups is significant or not was determined by the ANOVA (F) statistic, which is a one-way analysis of variance. ANOVA (F) statistic, which is one-way analysis of variance, was used in the study because the data related to the age variable showed a homogeneous distribution.

Validity and Reliability

The procedures listed below were carried out for the validity and reliability of the research.

- Necessary permissions were obtained from the researchers who developed the data collection tool for the data collection tool applied in the study via e-mail. The e-mail correspondence regarding the permission to use the Warwick-Edinburgh Mental Well-Being Scale is provided in the Appendix.
- Permission to use the data collection tools used in the study was submitted to the Inonu University Institute of Educational Sciences, Ethics Committee Approval Certificate.
- Data collection with scale was collected by the researcher himself during the application. In this context, it is aimed to prevent any data loss that may occur during the application of the researcher.
- The data of the study were separately entered into the IBM SPSS Statistics 21 package program by an expert together with the researcher. It is aimed to prevent any wrong data entry during the process by comparing the data after the data entry.
- Reliability analysis was performed in the IBM SPSS Statistics 21 package program for the measurement tool. The Cronbach Alpha coefficient, which was found by the researcher who adapted the scale, was found to be 0.89. As a result of the reliability analysis of the scale in this study, the reliability coefficient was found to be .899. This result shows that the scale used in the study is reliable.

Findings

The first sub-problem of the research is "What is the Mental Well-Being Level of Visual Arts Teachers?" has been determined. The measurements of the mental well-being levels of the visual arts teachers included in the research are given in Table 6.

Table 6. Visual arts teachers' mental well-being mean score

Scale	**N**	$\bar{x}$	**ss**	Min.	Max.
Mental Well-Being	171	4.05	0.53	2.36	5.00

According to Table 6, it is seen that the Visual Arts teachers have an average score of Warwick-Edinburgh Mental Well-Being Scale ($\bar{x}$=4.05). The mean scores of the Visual Arts teachers from the scale were calculated as minimum ($\bar{x}$=2.36) and maximum ($\bar{x}$=5.00). It was determined that the Visual Arts teachers' mental well-being levels were at a "high level" with the average score they got from the Warwick-Edinburgh Mental Well-Being Scale ($\bar{x}$=4.05), and they gave a high level of "I mostly agree" response to the scale statements.

When the above findings are examined, it can be said that the Visual Arts teachers of the SAC have a high level of mental well-being.

The second sub-problem of the study is to determine whether the mental well-being levels of Visual Arts Teachers show a significant difference according to gender, age, marital status and educational status. For this reason, the findings regarding whether the mental well-being levels of the visual arts teachers participating in the research differ significantly according to their personal characteristics are given below.

Findings Related to Gender Variable

First of all, the normality of the distributions regarding the gender variable of the Visual Arts Teachers' Mental Well-Being levels was analyzed with the Kolmogorov-Smirnov test and it was determined that the distributions were normal (F-Swomen=0.075 p=0.200; F-Smale=0.092 p=0.082). In addition, the homogeneity of the variances of the measurements was also examined with the Levene test, and it was determined that the condition of homogeneity of the variances was met in general (F=0.295; p=0.588). Accordingly, independent groups t-test, which is a parametric test, was applied. The t-test results regarding the gender variable of the Mental Well-Being Levels of the Visual Arts Teachers participating in the research are given in Table 7.

Table 7. T-test results of visual arts teachers by gender

Scale	Gender	n	x̄	ss	t	sd	p
Mental Well-Being	Female	88	4.03	0.51	-0.417	169	p= 0.677
	Male	83	4.07	0.55			
	Total	171					

p<0.05

According to Table 7, it is seen that the mental well-being levels of Visual Arts Teachers do not show any significant difference in general (t=-0.417; p=0.677) according to the gender variable.

In the light of the above findings, it can be said that the gender of the visual arts teachers does not make any significant difference on their mental well-being. It can be said that the fact that the visual arts teachers participating in the research are male or female does not make any significant difference on their mental well-being levels.

Findings Related to the Marital Status Variable

The normality of the distributions of the Visual Arts Teachers' Mental Well-Being levels related to the marital status variable was analyzed with the Kolmogorov-Smirnov test and it was determined that the distributions were normal (K-Smarried=0.075 p=0.174; K-Ssingle=0.064 p=0.200). In addition, the homogeneity of the variances of the measurements was also examined with the Levene test, and it was determined that the condition of homogeneity of the variances was met in general (F=0.220; p=0.640). Accordingly, independent groups t-test, which is a parametric test, was applied. The t-test results regarding the marital status variable of the mental well-being levels of the Visual Arts Teachers participating in the research are given in Table 8.

Table 8. T-test results of visual arts teachers by marital status

Scale	Marital Status	n	x̄	ss	T	sd	p
Mental Well-Being	Married	107	4.08	0.53	0.957	169	p=0.340
	Single	64	4.00	0.53			
	Total	171					

p<0.05

According to Table 8, it is seen that the mental well-being levels of Visual Arts Teachers do not show any significant difference according to the marital status variable in the scale (t=-0.957; p=0.340).

In the light of the above findings, it can be said that the marital status of visual arts teachers does not make any significant difference on their mental well-being. It can be said that whether the visual arts teachers participating in the research are married or single do not make any significant difference on their mental well-being levels.

Findings Related to Age Variable

The normality of the distributions of the Visual Arts Teachers' Mental Well-Being levels related to the age variable was analyzed with the Kolmogorov-Smirnov test and it was determined that the distributions were normal (F-S30-below age=0.114 p=0.326; F-S30-39 age=0.073 p=0.200; F-S40-49 age=0.108 p=0.219; F-S50-above age=0.093 p=0.363). In addition, the homogeneity of the variances of the measurements was also examined with the Levene test, and it was determined that the homogeneity of the variances in the scale was met (F(3-167)=0.220; p=0.882) According to this, one-way F (variance) analysis ANOVA test was applied for the independent groups since the parametric test assumption was provided. The distribution of the Mental Well-Being Levels of the Visual Arts Teachers participating in the research regarding the age variable is given in Table 9.

Table 9. Distribution of visual arts teachers by age

Scale	Age	N	$\bar{X}$	ss	Homogeneity
Mental Well-Being	30-below age	23	4.1491	.50550	p= 0.200
	30-39 age	73	4.0900	.50198	
	40-49 age	33	4.0628	.57387	
	50-above age	42	3.9218	.55414	
	Total	171	4.0514	.53099	

According to Table 9, it is seen that the mental well-being levels of Visual Arts Teachers are "high" in the scale, according to the age variable (x̄=4.05, sd=0.53). In general, it is seen that the arithmetic mean score (x̄=4.15) with the highest level of mental well-being is among the visual arts teachers who are in the "high" level with the average of 30-under age group. In addition, it is seen that the arithmetic mean (x̄=3.92) with the lowest mental well-being level is between the average and “high” level among the visual arts teachers aged 50 and over.

In order to see whether the difference between the above averages is significant or not, the F (Variance) analysis ANOVA Test was performed. The results of the F (Variance) analysis ANOVA Test regarding the age variable of the mental well-being levels of the visual arts teachers participating in the research are given in Table 10.

Table 10. Visual arts teachers' ANOVA test results by age

Scale		Sum of Squares	Sd	Mean Square	f	p
Mental Well-Being	Between Groups	1.038	3	.346	1.233	p= 0.300
	Within Groups	46.893	167	.281		
	Total	47.931	170			

p<0.05

According to Table 10, it is seen that the mental well-being levels of Visual Arts Teachers' mean scores of mental well-being levels [F(3-167)= 1.233, p= 0.300] in general according to the age variable do not show a significant difference.

In the light of the above findings, it can be said that the age of visual arts teachers does not have any significant difference on their mental well-being. It can be said that the age of the visual arts teachers participating in the research does not make any significant difference on their mental well-being levels.

Findings Related to Educational Status Variable

The normality of the distributions of the Visual Arts Teachers' Mental Well-Being levels related to the educational status variable was analyzed with the Kolmogorov-Smirnov test and it was determined that the distributions were normal (F-Bachelor=0.088 p=0.189; K-S graduate=0.054 p=0.200). In addition, the homogeneity of the variances of the measurements was also examined with the Levene test, and it was determined that the condition of homogeneity of the variances was met in general (F=1.615; p=0.206). Accordingly, independent groups t-test, which is a parametric test, was applied. The t-test results regarding the educational status variable of the mental well-being levels of the Visual Arts Teachers participating in the research are given in Table 11.

Table 11. T-test results according to the education level of visual arts teachers

Scale	Education Level	n	x̄	ss	t	sd	p
Mental Well-Being	Undergraduate	80	4.02	0.56	-0.752	169	p=0.453
	Postgraduate	91	4.08	0.51			
	Total	171					

p<0.05

According to Table 11, it is seen that the mental well-being levels of Visual Arts Teachers do not show any significant difference in the scale (t=-0.752; p=0.453) according to the variable of educational status.

In the light of the above findings, it can be said that the education level of visual arts teachers does not make any significant difference on their mental well-being. It can be said that the fact that the visual arts teachers participating

in the research are at different educational levels does not make any significant difference on their mental well-being levels.

Discussion and Conclusion

The results of this research, which examines whether the variables of gender, marital status, age and educational status of visual arts teachers working in SACs make a significant difference on their mental well-being, are given below.

- It has been determined that visual arts teachers have a high level of mental well-being.
- Visual arts teachers' having different genders did not make a significant difference in their mental well-being.
- There was no significant difference in mental well-being of visual arts teachers being married or single.
- It has been determined that the age differences of visual arts teachers do not have a significant difference on mental well-being levels.
- It has been observed that the differences in the education levels of visual arts teachers do not have a significant difference on their mental well-being levels.

In the study, it was concluded that the mental well-being levels of visual arts teachers were high. It can be said that the work of the visual arts teachers participating in the research at the SAC was effective in the emergence of this result. Because Science and Art SAC Centers offer teachers a more comfortable working environment than other formal education institutions due to their existing artistic environments, painting workshops and necessary physical conditions. In addition, it can be said that the selection of art students by examination in SAC and the low number of them reduce the professional burden and stress on teachers. It can be said that this situation may have positively affected the mental well-being levels of the visual arts teachers in the SAC.

In the study, it was seen that the visual arts teachers' having different genders did not make a significant difference on their mental well-being levels. In the literature, there are studies supporting this result (Bahar, 2020; Demirci, 2021; Duman, Goksu, Koroglu and Talay, 2020; Karacam and Pulur, 2019; Kilincoglu, 2020; Pulat, 2021; Timur, 2008; Tosun, 2020). However, different research results that do not support this result of the research (Cengiz, 2018; Diener & Diener, 1995; Gonener, Ozturk & Yilmaz, 2017; Kayalik, 2017; Saricaoglu, 2011; Oymak, 2017; Gocet & Tekin, 2014; Tunc, 2021) found. Bahar (2020) found that there is no significant difference between the mental well-being of men and women in terms of gender. In addition, Duman, Goksu, Koroglu, and Talay (2020) found in their research that gender differences do not make any significant difference on mental well-being. Cengiz (2018) found in his research that women have higher mental well-being levels than men. However, Oymak (2017) found in his research that men have a higher level of mental well-being than women. Tunc (2021), in his research on teachers' spiritual resources and mental well-being during the Covid-19 pandemic period, found that men have higher mental well-being scores than women. It is stated that women are affected more negatively in terms of psychological health under stress than men (Hafner & Spence, 1988, Whitton & Kuryluk, 2012). In addition, Kayalik (2017) saw the role of women in family life and work-family conflict as the reason why women's mental well-being is lower than men. Pulat (2021) attributed the higher level of mental well-being of women compared to men to women's personal development, being more successful in social relations, and better expressing their feelings and thoughts. When these results in the literature are evaluated, it can be said that there are different results about whether gender creates a significant difference on mental well-being. As a matter of fact, Kilincoglu (2020) states that it is not correct to make a definite judgment between mental well-being and gender, and that the different results between these two variables may be due to the different socio-demographic characteristics of the participants and the inclusion of people with different profiles in the research. Aslan, Erturk, Arutay, Ardic, and Sonkur (2021) argued that men's mental well-being levels are higher than women's, and the reason for this is not only related to women's teaching profession. Because even if female teachers teach at school, being both mothers of children and housewives at home affects their mental well-being.

In the study, it was concluded that the visual arts teachers being married or single did not make a significant difference

on their mental well-being levels. However, there are studies in the literature that do not support this result. Kayalik, (2017) master's thesis study, found that the level of mental well-being differs according to marital status. According to this, it was stated that the mental well-being of the married people was higher than the single ones. It can be said that this result is due to the fact that the life satisfaction of married people is higher than that of singles. Because with the increase in the quality of life with marriage, social relations also increase. It can be said that this situation causes married people to feel better mentally than singles. Marital status is a socio-cultural phenomenon. In this sense, it is related to culture (Yildirim, 1993). In addition, marriage is a concept associated with emotions and behaviors such as love, commitment and trust (Bozgeyikli and Toprak, 2013). In this sense, it is known that married people are better in emotional understanding than singles, their needs such as love and togetherness are met, and because of reasons such as being healthy and having a low age of death, married individuals are in a better state of mind (Tutuncu, 2012). Couples who have a place in society by getting married lead a more productive life in terms of social relations. It can be said that these reasons cause married couples to have mental well-being. This situation is explained by the concept of satisfaction in marriage by Burr (1970). According to him, a subjective situation that occurs when the purpose and desire of the individual is met at a certain level is seen as satisfaction in marriage. According to this concept, they enter into a state of psychological pleasure due to the social and individual duties (making common decisions, sharing professional problems, mutual attitude, love, sexual satisfaction) in marriage (Sokolski & Hendrick, 1999).

Another result of the research was that the visual arts teachers' being at different ages did not make a significant difference in their mental well-being levels. In the literature, there are studies supporting this result (Aslan, Erturk, Arutay, Ardic, & Sonkur, 2021; Demirci, 2021; Kilincoglu, 2020; Ryff, 1989; Sandikci, 2014), as well as research results that do not support this result (Gonener, Ozturk, & Yilmaz, 2017). ; Kayalik, 2017; Ozer, 2019; Tosun, 2020). When the research results in the literature on whether the differences between age groups make a significant difference on mental well-being or not, it can be said that a direct and definite judgment cannot be made between age and mental well-being. Aslan, Erturk, Arutay, Ardic, and Sonkur (2021) concluded in their study that the fact that the participants were at different ages did not make a difference on their mental well-being. However, there are also research results showing that there is a significant relationship between age and mental well-being (Eryilmaz & Ercan, 2011) and that mental well-being increases positively as age progresses (Kermen, 2013). It can be said that as individuals get older, putting their social, professional and family institutions in order meets their psychological expectations, and this situation may make a difference on their mental well-being in later ages. Otherwise, it can be argued that it will make a negative difference on mental well-being. In addition, the lack of a significant difference between mental well-being and age may be due to the fact that the age groups of the participants in the studies were very close to each other.

Another result of the study is that visual arts teachers' having different educational backgrounds does not make any significant difference on their mental well-being. According to this result, although the education level is different, there is no significant difference between the mental well-being levels of visual arts teachers. When the literature is examined, there are studies supporting this result (Camlik, 2013; Demir, 2021; Kayalik, 2017; Pulat, 2021) as well as results that do not support this result (Demir, Namli, Hazar, Turkeli, & Cicioglu, 2018; Diener, 1984). In the study conducted by Demir (2021), it was concluded that there was no significant difference between the educational status of the participants and their mental well-being. It has been observed that the level of mental well-being increases as the education level increases. Demir, Namli, Hazar, Turkeli, and Cicioglu (2018) found the opposite result in their research. In their study, they found that the fact that the participants were at different educational levels made a significant difference on their mental well-being levels. The reason why different research results are found in terms of whether there is a significant difference between educational status and mental well-being in the literature can be shown as the unequal distribution of the variables related to the educational status of the individuals participating in the research. In addition, due to the fact that the process of increasing the level of education is a strenuous, stressful and challenging process, individuals are worn out in terms of mental, physical and mental health, which negatively affects their mental well-being. However, it can be said that mental well-being is positively affected by the increase in educational status, the better living conditions of individuals, and the satisfaction of their needs for knowing, wondering and social status.

Recommendations

Based on the findings obtained in this study, which deals with the mental well-being of visual arts teachers in SAC, the following suggestions are given.

- Due to the understanding of the importance of mental well-being, necessary information can be given to visual arts teachers. Psychological support, information and awareness activities can be given to teachers in order to maintain their health in terms of their mental well-being.
- The mental well-being levels of visual arts teachers in SAC should be followed regularly. In this study, mental well-being is considered alone. Future research can be conducted on the relationship between mental well-being and different variables such as motivation, organizational commitment, and burnout.
- The research was conducted for visual arts teachers in SAC. In future studies, studies that can include larger and different sample groups in different universes can be carried out.
- The research was carried out with a quantitative method in the screening model. In this context, quantitative data were collected. In future research, the research can be carried out in a mixed model in which qualitative data will be collected to support the quantitative findings. In this way, different results can be obtained in the research.
- In the literature, the scarcity of studies on students, teachers and administrators at educational levels has drawn attention. In the context of education on mental well-being, studies can be carried out for students, administrators and teachers.

Limitations of the Study

The limitations of the research are listed below;

- The research is limited to Visual Arts Teachers teaching with gifted in the 2021-2022 academic year.
- The data in the research is limited to the data collection tool applied within the scope of the research.
- The research is limited to the answers given by the Visual Arts Teachers teaching with gifted to the research tool.

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I declare that I have not taken any of the actions stated under the title of "Actions Contrary to Scientific Research and Publication Ethics" in this study. This research was approved by the Inonu Unıversity Social and Human Sciences Ethics Committee with the approval dated 24.09.2021 and numbered E.90674. No project or funding support was received in the research.

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Research Article

Assessment in a health science programme at a South African University: views and experiences of students

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Abstract

The importance of assessments in education cannot be over-emphasised. The reason is that assessments not only promote students' learning but also evaluate students' competencies, particularly in the field of health sciences, such as acupuncture. Therefore, it is crucial for higher education institutions to ensure that assessments in their programmes are valid and reliable. However, there is a distinct lack of research focusing on assessments in acupuncture programmes. This study aimed to explore students' views and experiences of an acupuncture programme at a higher education institution within the South African context. The revised Bloom's Taxonomy was utilised as the theoretical lens to understanding students' views and experiences. A qualitative single case study design was employed in this study. The authors followed a purposive sampling strategy to recruit participants from a public university in South Africa. Ten participants were selected for this study. Thematic analysis was utilised in this study. The results of this study were: Participants stated that it was important to utilise multiple assessment tools for the educational evaluation of the acupuncture program, the frequency and continuity of the assessment motivated learning, each of the assessment tools was valuable and not superior to the other, and the assessment techniques used with the aims of the acupuncture program should be compatible.

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Introduction

Research across the globe has argued the importance of assessment in education. Assessment is an integral part of teaching and learning at higher education institutions. It provides evidence to lecturers on the quality of their teaching and students understanding of the content delivered. Stăncescu and Drăghicescu (2017) emphasise the importance of assessment and agree that it is a fundamental aspect of all teaching and learning globally in all educational institutions. According to the Department of Basic Eeducation [DBE] (2011), assessment is a continuous planned process of identifying, gathering and interpreting information about the performance of students, using various forms of assessment. The information gathered from the assessment is used by academics to assist students with their learning to improve the process of learning and teaching. The value of assessment in the health science education cannot be overemphasised.

Within the field of health science education, assessment promotes students' learning and evaluates their competencies in preparation for the world of work (Stăncescu & Drăghicescu, 2017). Liljedahl (2010) believes that

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assessment also acts as an indicator of the teaching content presented by the lecturers within this field. Through continuous assessment, lecturers can evaluate and reflect upon their teaching strategies. This view is supported by Khan (2012) and Umar (2018) who agree that assessment refers to the activities teachers (lecturers) and students undertake to get information that can be used to improve teaching and learning. In this study, the authors focused on exploring acupuncture students' experiences of assessments in health sciences within the South African context. It is of profound significance since the identified programme at a South African higher education institution (HEI) is a newly developed programme, and it is a unique programme in the African context in the HEI environment.

Khan (2012) acknowledges the importance of assessment in enhancing and promoting students' learning. He further articulates that continuous assessment clarifies the outcomes of the study and report on the progress of students' learning. The authors concur that the ultimate goal of all assessments is improving students' learning and achieving the desired outcomes so that they are competent and confident in the world of work. Furthermore, the authors contend that assessment within the acupuncture programme should be used effectively, so that lecturers can reflect on their teaching to improve learning outcomes. According to Lijedahl (2010), assessment should provide students with an opportunity to self-reflect on their skills and competencies s to meet the required learning outcomes in the acupuncture programmes.

Assessment in Higher Education

Amua-Sekyi (2016) indicates that assessment plays several crucial roles in higher education to promote quality teaching and learning outcomes. Assessment facilitates measuring students' achievement in a programme, which ensures that successful graduates meet specific learning outcomes in a particular programme (Yambi, 2018). Khan (2012) concurs with Black and William (1998) who indicate that assessment is a practical approach to strengthen learning and identifying gaps and challenges in students' understanding and application of the teaching and learning content. According to Liljedahl (2010), assessment in higher education is defined as the process of collecting and analysing data to make inferences about teaching and learning, strengthening and promoting learning outcomes (DBE, 2011) This process is further accepted by Capraro et al. (2012), who articulate that assessment is the action of documenting students' knowledge, skills, value and attitudes through a measurable approach. Umar (2018) explains that assessments are academic activities that aim at strengthening teaching and learning. Khan (2012) agrees with Earl (2006), who acknowledges the importance of assessment in enhancing students' learning.

In this study, assessment refers to an integrated approach to facilitating and evaluating students learning in the acupuncture programme using various types and methods of assessment techniques. Stăncescu and Drăghicescu (2017) state that assessment will clarify the study's goal, report students' learning progress, and reflect the quality of teaching. Amua-Sekyi (2016) further points out that assessment plays numerous important roles in education. For instance, assessment will facilitate measuring students' achievement in a programme, providing authentic feedback to students, validating students responses to test and exam question. For lecturers assessment gives them the opportunity to reflect on their teaching, the implementation of various teaching methodologies and strategies, the depth and scope of their teaching in relation to students levels. According to Department of Higher Education's assessment policy, quality assessment will ensure that successful graduates meet specific learning outcomes in a particular programme in the institution. Although assessment provides information on students' learning achievement, Flórez and Sammons (2013) and Khan (2012) argue that the ultimate target of assessment is improving students' learning and providing lecturers with the opportunity to reflect on their teaching.. The authors believe that assessment is crucial to enhance learning and reflects students' competencies to meet learning outcomes in all educational programmes.

Challenges of Assessment in Health Sciences Programmes

Assessment is vital in higher education institution, since formative and summative play a significant role students completing their studies. In higher education institutions, the most common assessments form is summative (Yambi, 2018). Summative assessment, as defined by Earl (2006) and Yambi (2018), as assessment taking place at the end of an educational activity or programme. The primary purpose of summative assessment is to measure students' overall performance by summarising students' achievements (Umar, 2018). It often takes the form of examinations or tests and

is referred to as the assessment of learning (Amua-Sekyi, 2016). However, Umar (2018) critiques summative assessment and states that it does not offer appropriate and timely feedback to students during the learning process since it only takes place at the end of a module. It fails to identify students' competencies after a period of learning (Yambi, 2018). The authors concur with Umar (2018) that various appropriate assessment approaches should be explored to assess and evaluate students' learning. In the authors' opinion, assessment should be utilised effectively to promote students' learning process and investigate students' achievement. Therefore, it is of profound significance that assessments are valid and reliable (DBE, 2011).

Validity of assessment refers to the degree the test measures what is to measure, while reliability focuses on the consistency with which it measures what is intended to be measured (Tosuncuoglu, 2018). Yambi (2018) agrees with Earl (2006) that a valid and reliable assessment has the following characteristics. Firstly, there must be explicit purposes for assessment, which is an essential requirement to promote effectiveness in the assessment. Secondly, there should be coherence in classroom assessment that meets the purpose of learning goals and criteria. Thirdly, classroom assessment will be in various forms that best suit students' learning goals and needs. These forms include questioning, feedback, self-assessment, and the formative use of summative assessment (Flórez & Sammons, 2013; Umar, 2018). However, most assessment still focus on recall instead of application of knowledge.

Strategies to Improve Assessment

Esomonu and Eleje (2020) are of the view that there are diverse assessment techniques to promote students' learning in the field of health sciences. These approaches include classroom diagnostic assessment, formative assessment, formative use of summative assessment, objective structured clinical examination (OSCE) and portfolio assessment (Jang & Wagner, 2013; Khan et al., 2013; Payne, 2014).

Classroom diagnostic assessment in education focuses on identifying students' strengths and weaknesses for improvement (Jang & Wagner, 2013). Esomonu and Eleje (2020) explain that there are various classroom assessment techniques that contribute to diagnostic assessment, such as quizzes, student interviews, student reflections, and classroom discussions. The authors believe that different types of classroom assessments play a critical role in diagnostic evaluations. They should be an integral part of the daily learning process. This view concurs with Yambi (2018), who agrees that classroom assessment will reflect how students learn, their motivation to learn, and how lecturers teach. Yambi (2018) further explains that classroom assessment will assist lecturers in identifying students' learning process, which promotes teaching and learning. The reason is that lecturers prefer to use the results for the assessment to strengthen teaching since lecturers develop, administer, and analyse the questions in classroom assessment (Khan, 2012).

There has been arguments that time on task and increased time to complete an assessment is beneficial to attain the learning outcomes. Despite the critical role of classroom assessment for diagnostic purposes, Earl (2006) argues that there is no direct evidence that increasing time on assessment will strengthen learning. Therefore, lecturers must determine appropriate assessments to strengthen the educational programme, which requires that assessments to be valid and reliable. Classroom assessment can be utilised to assess students' knowledge in remembering, understanding, applying, analysing and creating (Krathwohl, 2002). The term formative assessment refers to the continuous process of assessing students in a course, which provides feedback to responsible lecturers to enable them to judge how well students are learning (Earl, 2006).

Formative assessment is most appropriate where the results are used internally by those involved in the learning process that is students, lecturers, and curriculum developers. (Yambi, 2018). It also provides information on the effectiveness of the teaching strategies employed , thus assisting lecturers to determine an appropriate remedial action where necessary. For this reason, Amua-Sekyi (2016) states that formative assessment is appropriately referred to as 'assessment for learning.' Yambi (2018) concurs with Amua-Sekyi (2016) that the purpose of formative assessment is to enhance the learning process by providing feedback to students.

Therefore, formative feedback is exploratory, provisional, and aims at prompting further engagement from the students as part of ongoing communications between and amongst students and lecturers (Amua-Sekyi, 2016). This implies that the feedback process in the learning cycle commences with the production and submission of student work,

followed by lecturer assessment and feedback on the task (Yambi, 2018). Earl (2006) points out that students are more likely to be motivated by having their learning progress acknowledged compared to merely the success or failure in summative assessment.

Despite the difference between formative and summative assessment, Payne (2014) is of the view that summative assessment can be used for formative purposes. This is achieved by assessing students periodically throughout module (continuous assessment).. Lecturers need to provide feedback to students for further improvement. The authors agree that purposeful planning and implementation of formative and summative assessment in the classroom will contribute to improvement in student learning outcomes, further promoting their competencies in the world of work. Flórez and Sammons (2013) suggest that integrating summative and formative assessments will promote students' success in education. The reason is that students tend to apply information from the summative assessment to facilitate their learning and measure their achievement at a particular time and level of study.

In the authors' opinion, it is of significance to adopt summative assessment in the acupuncture programme since the students master the acupuncture practice through continues practice and repetition. This view concurs with Amua-Sekyi (2016) and Yambi (2018), who point out that summative assessment provides formal evidence for grading and measuring students' progress; it also confirms students' abilities and competencies to employers of acupuncturist. In the world of work, assessment profile and reports are considered to have a socially high value, indicating to the employer the calibre of employees they are recruiting into the organisation. In the field of health sciences, objective structured clinical examination is an effective method to assess students' clinical competencies. It is practically orientated and allow students to learn from their mistakes (Amua-Sekyi, 2016). OSCE also provides students with multiple opportunities of mastering the assessment activity.

Khan et al. (2013) indicate that OSCE was developed and introduced into the medical field to improve the validity and reliability of assessment and to reveal students' competencies.. Figure 1 show students engaging in OSCE in the acupuncture programme at the higher education institution. According to Khan et al. (2013), OCSE provides for multiple stations in one examination, where each station tests a single focus area or topic within allocated times. Students move from one station to another in a pre-designed order. The purpose of OSCE is to assess students' clinical competency in a simulated environments, where components are presented as broken-down objectives (Ten Cate et al., 2010). These researchers agree that OSCE does not replace the traditional assessment but serve as a supplement for traditional assessment assessment, such as formative and summative assessment.

Figure 1. Participants attending a mock OSCE

Haldane (2014) reports that portfolio assessment is accepted in health sciences education. Portfolio assessment refers to a written collection of students' work, which reflects their efforts, progress, and achievement in the education programme (McDonald, 2012),. These researchers concur that portfolio assessment is more effective in evaluating areas that are difficult to be assessed by traditional methods in a wide range of clinical contexts. These areas include attitudes, personal attributes, reflection, and professionalism (Haldane, 2014; Mokhtaria, 2015). The authors agree that portfolio

assessment effectively measures students' competencies in clinical practice since it allows them to reflect on their learning process. In 2012, a portfolio approach was adopted in the United Kingdom, which required licensed doctors to keep a portfolio of evidence of their practice for evaluation (General Medical Council [GMC], 2012).

Theoretical Framework

The Revised Bloom's Taxonomy developed by Anderson and Krathwohl (2001) was utilised as a theoretical lens in this study to understand participants' views and experiences of assessment in the acupuncture programme. In 2001, Anderson and Krathwohl proposed the revised Bloom's Taxonomy, which was developed from Bloom's Taxonomy (Hu, 2022). Bloom's Taxonomy has been used in education since the 1950s. According to the Revised Bloom's Taxonomy, there are four types of knowledge, namely, e factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge. This knowledge is further categorised into six processes: remembering, understanding, applying, analysing, evaluating and creating [Figure 2] (Barari et al., 2020). The Revised Bloom's Taxonomy is a valuable tool to guide teaching and institutional planning, particularly with regard to assessments. It provides examiners with an opportunity of setting questions at different cognitive levels. It also caters for various categories of students, from below average, average and above average.

The authors believe that the Revised Bloom's Taxonomy provide lecturers with the opportunity to evaluate how well the student can recall and explain content knowledge directly (remembering and understanding), how good the student is at applying this knowledge to a new situation (application), how well a student can differentiate and critique the information of a topic (analysis and evaluation), and how effective students are in extending their learning to new areas (creating). These skills represent different, progressive and cognitive levels of understanding that fall along an abridged hierarchy as outlined in the revised version of Bloom's Taxonomy developed by Anderson and Krathwohl [see Figure 2] (Chandio et al., 2016; Hu, 2022).

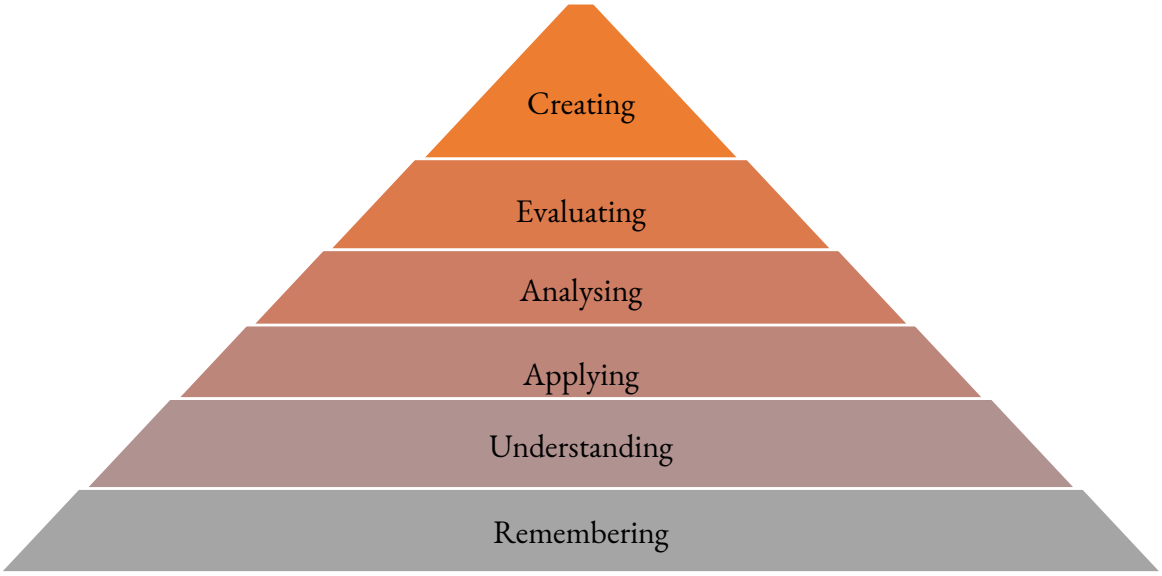

Figure 2. Revised Bloom's Taxonomy (As adapted from Barari et al., 2020)

Research problem statement and research question

Assessment in most higher education institutions in South Africa has adopted summative assessment as its primary form. This form of assessment has given students very limited opportunities for success. There is a lack of multiple opportunities for success in higher education due to the nature of traditional assessment forms. The type of assessment students are exposed to at higher education institution is primarily examination. For this study, the authors asked the questions, "*How do students in the acupuncture programme experience assessment?*" and "*What are the views of students towards the assessment form in the acupuncture programme.*"

Method

Research Design

In this study, the authors employed a qualitative research approach, with an interpretivist paradigm. Since the participants were a specific cohort, the authors opted for a a single case study design.The authors believed that the qualitative approach was suitable for this study since they aimed to explore lived experiences of participants (Hu et al., 2022; Hu & Venketsamy, 2022a). The interpretivist paradigm was adopted in this study which is a subjective epistemology (Creswell, 2014; Venketsamy & Hu, 2022). The acupuncture programme at an identified public university in Gauteng province was selected as the case for this study. The reason was that this was the only HEI that provided an acupuncture programme in SA that the authors had an opportunity to access (Yin, 2018).

Participants

In this study, the authors followed a purposive sampling strategy to recruit participants. Aninvitation to participate was posted on the notice board at the identified campus from March 2022 to April 2022. Participants who met the inclusion criteria were allowed to participate in this study. The inclusion criteria were: (i) they needed to be registered in the second, third or fourth year of study for the Bachelor of Health Sciences in Complementary Medicine; (ii). they must agree to participate in this study voluntarily by signing the research consent form; and (iii). they must be above the age of 18. There were only ten (10) students who responded to the invitation and indicated their willingness to participate in this study. To ensure confidentiality and anonymity, codes were used during the entire process of the research; for instance, the code P1-Y2 referred to Participants 1 in Year 2 of their study. Table 1 presents a summary of the participants' information.

Table 1. Participants' information

Pseudonyms	Gender	Year of study
P1-Y2	Female	2nd year
P2-Y2	Male	
P3-Y2	Male	
P4-Y3	Female	3rd year
P5-Y3	Female	
P6-Y3	Male	
P7-Y4	Female	4th year
P8-Y4	Male	
P9-Y4	Female	
P10-Y4	Female	

Data Collection Tools

The authors used multiple data collection tools; these included text-based interview (see Appendix 1), observation, participants' reflective journals and documentation. The authors concur with Yin (2018) that the use of multiple data collection techniques allows for triangulation which would strengthen the trustworthiness of the study (Hu & Venketsamy, 2022b). A permission letter was obtained from the head of the department before the commencement of this study. The data collection process took place between March to April 2022.

Data Analysis

In this study, the authors opted for the thematic analysis to elicit participants' views and experiences of assessment in the acupuncture programme. During the data analysis, the authors followed the six-step thematic analysis as proposed by Creswell (2014). The six steps include familiar with data, coding, generating themes, reviewing themes, defining themes and writing up (Venketsamy, Smart & Hu, 2021). Qualitative validity criteria, including credibility, transferability, dependability, and confirmability, were ensured in this study by being audited by a second coder.

Ethical Committee Permission

A Research Ethics Committee approved ethical clearance at a public university in Gauteng Province (Reference: EDU137/21).

Results

Findings from this study revealed that all participants acknowledged the importance of assessment in the acupuncture programme. However, they indicated that there was a need for various assessment forms and techniques to accommodate content knowledge and the diverse purposes of assessments. Three major themes emerged from the raw data during the analysis: i) Students' perceptions and experiences of assessment; ii) Need for diverse assessment techniques; and iii) Frequency of assessment .

Theme 1. Students' perceptions and experiences of assessment

Findings revealed that assessment not only evaluated students' knowledge of acupuncture but also enhanced their learning. All participants in this study expressed a shared perception of the importance of assessment in the acupuncture programme. The findings of this study also affirmed participants' shared views on the importance of assessment in facilitating their learning process. Participants agreed that the assessment promoted their study and identified the shortages in their study. They believed assessment was one of the most critical perspectives in their studies since it served various purposes. To this, P1-Y2 wrote: *"It [assessment] helped strengthen my knowledge because it ensured I was constantly revising and learning my work. It also gave me the practice of testing my knowledge and understanding*."
P2-Y2 indicated: "*The assessments were fair and well-structured. However, I found it a bit of 'parrot learning' instead of applying the knowledge. I acknowledge that a lot of theory needs to be memorised and thus taught this way."*

P3-Y2 stated: "*If I struggle to answer a question in an assessment, then I know where I should focus my study more. It helps me see which content I know and lack*."

P5-Y3 added:

> *It has helped me identify areas of the content I do not know as well as I thought I did. I also found I learned clinical knowledge from the assessments as they required the student to apply the content they have learnt so far. I find assessments in this subject very helpful as a growth factor for the student.*

P6-Y3 added: "*We need all the theory that we have been taught in order to apply acupuncture in practice efficiently. The assessment also serves as proof of how far I am with the knowledge of acupuncture*." P7-Y4 stated: "*It [assessment] aided me because it allowed for an opportunity to write a test, which was a true reflection of my knowledge*."

Both P7-Y4 and P9-Y4 concurred that assessment served as an effective way to monitor their progress in learning. P9-Y4 indicated assessment was an effective way to revise the acupuncture content. From the assessment, they believed that lecturers would also be able to identify their competence, which may be used to reflect teaching and learning in the acupuncture programme.

Theme 2. Diverse assessment techniques to improve learning outcomes

The findings of this study highlighted that all participants acknowledged the importance of assessment in the acupuncture programme. However, they indicated that various assessment techniques should be employed to enhance their learning and evaluate students' knowledge effectively. Most participants agreed that various assessment techniques could facilitate their learning and practice, such as diagnostic assessment in the form of various classroom assessments, formative use of summative assessments, and OSCEs. They indicated that various forms of assessment were needed to serve different purposes in their studies. The findings of this study agreed that informal classroom assessment and formative use of summative assessment enhanced students' learning.

P1-Y2 stated: "*The weekly reports [a short essay that students submitted every week] was good in order to keep us studying continuously and to make sure we understood the work*." P1-Y2 further indicated that the formative use of summative assessment "*allows enough time to grasp the content in tolerable segments before getting assessed. It made it easier to focus on certain portions of the contents. Despite a large amount of information to be memorised and understood, the work became bearable*." P2-Y2 mentioned: "*The online mini-assessments were great for achieving study goals and constantly assessing*

progress." P3-Y2 mentioned: "*Personally, if I wanted to gain more knowledge and skills on acupuncture, I would revise my work frequently and quiz myself on it*."

According to the Complementary Medicine Practice 2 Learning Guide (Razlog, 2021), students in the 2nd year were assessed every second week. P5-Y3 indicated that she preferred the formative use of summative assessment in her second year when she was assessed every second week and got timely feedback on her assessment.

P5-Y3 explained:

> *I feel smaller, more regular assessments are much more beneficial to have before the larger summative assessments. Because they can improve students' confidence in tests and assist in identifying areas of the work we don't know very well.*

In her reflective journal, P5-Y3 wrote: "*This [practice in the classroom] could be used as an informal testing system to help the students identify their weak areas*." P5-Y3, P6-Y3, P7-Y4, and P9-Y4 concurred that they would prefer to be assessed more frequently. They believed that frequent assessment in the form of classroom assessment improved their confidence and competence practice. P10-Y4 added:

> *We are assessed via tutorials, quizzes, tests and even through blackboard collaboration. The practical part of it [acupuncture] we do tutorials online as it prepares us for tests and to retain the knowledge. Every week we send in a self-reflection to document our improvement and assess our knowledge and look at what areas to focus on*.

This study revealed that participants agreed that assessment was crucial in the acupuncture programme. They further highlighted their support for adopting various assessment techniques in the programme to assist them in evaluating their competencies. They believed various assessment techniques, such as classroom quizzes and mock assessments, facilitated their learning. In her reflective journal, P4-Y3 wrote: "*I have realised that during the assessment of the mock practical, we are given the freedom to ask anything or say anything, and that is what I liked most about it*."

P9-Y4 answered: "*Doing case studies has helped me to evaluate my knowledge. Questions that are being asked are a good way of assessing us. Also, writing cases as a portfolio will be beneficial because it forces us to study*."

Theme 3. Need for frequent assessment

The findings of this study disagreed with Earl (2006), who reported that increasing time on assessment did not strengthen learning. Participants in this study revealed that increased time in assessment would enhance their learning. Therefore, participants indicated that there was a need to have frequent assessments to improve learning outcomes. To this, P5-Y3 stated: "*I feel smaller, more regular assessments are much more beneficial to have before the larger summative assessments*." When answering the question, 'Explain how you would prefer to be assessed in the acupuncture programme', P6-Y3 indicated: "*Have an assessment for each term and with the normal format that we are used to.*"
P7-Y4 wrote:

> *The OSCEs, however, were very frustrating as I had never done an OSCE before in my whole life, nor had I even done a mock OSCE before the exam. This made me extremely nervous even though I knew and understood the theoretical content quite well. I did very badly in my OSCE for this reason*.

P9-Y4 indicated: "*We should be assessed more frequently during the year so that we can get used to how to answer questions and how are questions asked*." P10-Y4 added: "*Studying for the different assessments helped with my general knowledge as the test helped with showing me what I need to focus on and my strengths and weakness for me to work on*."

P7-Y4, P9-Y4, and P10-Y4 expressed their desire to have more frequent assessments as they believe frequent assessment will not only strengthen their study but also reduce their anxiety during the assessment.

Summarily: Graphically

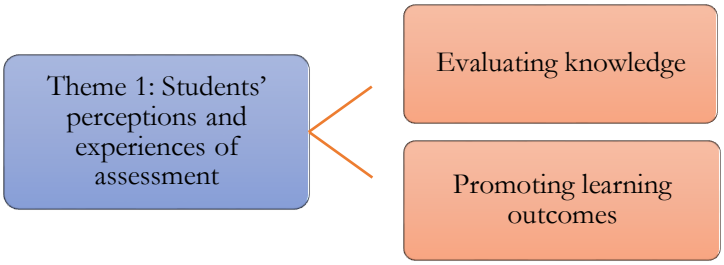

Figure 3. Codes of Theme 1: Students' perceptions and experiences of assessment

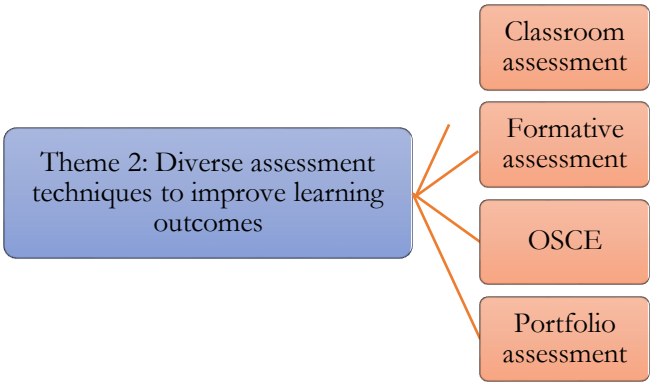

Figure 4. Codes of Theme 2: Diverse assessment techniques to improve learning outcomes

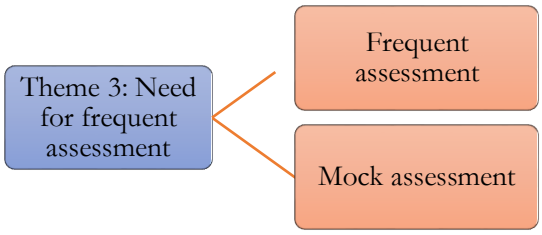

Figure 5. Codes of Theme 3: Need for frequent assessment

Discussion

Significance of assessment in education

According to the Regulations in terms of the Allied Health Professions Act, 1982 (2001) and the CHE (2011), assessment is an effective approach to evaluate the learning outcomes of a programme. Liljedahl (2010) and Stăncescu and Drăghicescu (2017) agree that assessment assists students in identifying learning outcomes and promoting students' learning (Amua-Sekyi, 2016). In the authors' opinion, assessment is of profound significance in investigating students' knowledge and skills and this is evident in P1-Y2 who stated that assessment is important for students learning. Assessment provides students with feedback and guides them in impoving the learning outcome. The authors opine that there should be different levels and forms of assessment, which reflect students' competencies from various perspectives, such as memorising and perception of the CK. These competencies should meet the appropriate levels of the revised Bloom's Taxonomy of learning (Chandio et al., 2016).

This view concurs with Chandio et al. (2016) and Jang and Wagner (2013). They agree that there should be multiple levels and different forms of assessment to measure students' competence. According to the revised Bloom's Taxonomy, Barari et al. (2020) explain that students need to remember and understand content knowledge before applying and analysing using their knowledge. The authors believe that the acupuncture programme requires a solid theoretical foundation in order for students to be able to analyse, evaluate, and create the phenomenon using the knowledge. Subsequently, memorising is emphasised in the assessment of the identified acupuncture programme. According to the revised Bloom's taxonomy, the authors believe that different depths of knowledge should be framed in diagnostic

assessment in the forms of various types of classroom assessment. Apart from classroom diagnostic assessment, formative assessment is another effective approach to promote students' learning.

Flórez and Sammons (2013) and Khan (2012) agree that assessment is an effective technique for promoting students' learning. Umar (2018) and Yambi (2018) are of the view that assessment promotes students' learning and further reflects the quality of teaching. The authors contend that assessment is a useful approach to enhancing students' learning. The reason is that assessment provides an opportunity for students to reflect on the challenges and gaps in their studies. This view agrees with Liljedahl (2010) and Stăncescu and Drăghicescu (2017), who state that assessment effectively assesses students' progress, provided the assessment is valid and reliable (Tosuncuoglu, 2018; Yambi, 2018). According to the Complementary Medicine Practice 2 Learning Guides, students in the second year of study had mini classroom quizzes every second week that was implemented in 2021 (Razlog, 2020; Razlog, 2021). Participants from the 3rd year, who were second-year students in 2021, reported that frequent assessments strengthened their learning and reduced stress in assessment. Therefore, the authors believed that a lack of frequent assessment in the programme resulted in students' anxiety because they were not familiar with the structure of assessment.

Need for differentiated assessment techniques

Esomonu and Eleje (2020), Jang and Wagner (2013), and Payne (2014) point out that there are various assessment methods that can be adopted in teaching and learning. These approaches include classroom assessment, quizzes, formative use of summative assessments, and a portfolio assessment (Flórez & Sammons, 2013; Jang & Wagner, 2013; McDonald, 2012). Khan et al. (2013) further propose OSCEs in evaluating clinical practice. The authors agree that different forms of assessment serve different purposes. Therefore, there is a need to identify the most appropriate forms of assessment for specific purposes. This view concurs with Cakmak (2013) and Goh (2013), who state that lecturers should select the most effective assessment to evaluate students' learning outcomes.

The authors are of the view that various forms of assessment offer an opportunity for students to receive timely feedback, which is crucial to their study. This view is supported by Umar (2018), who argues that delayed feedback from summative assessments is one of the most critical disadvantages in teaching and learning. Since assessment is a crucial element of teaching and learning, the authors concur with Yambi (2018) that various assessment techniques should be adopted to achieve different levels of assessment, such as memorising, understanding, applying, analysing, evaluating, and creating (Barari et al., 2020; Chandio et al., 2016). Therefore, the authors argue that different forms of assessment should be implemented in the acupuncture programme. These approaches include quizzes, tutorials, formative assessment, formative use of summative assessment, self-reflection, portfolio assessment, and debriefing through Socratic questioning (Amua-Sekyi, 2016; Delić & Bećirović, 2016; Payne, 2014; Yambi, 2018).

The authors believe that OSCE is critical in the acupuncture programme since it provides an effective way to assess students' clinical competence, which is a higher level of knowledge according to the revised Bloom's taxonomy. This approach is of particular significance because it takes place in a simulated environment, which ensures the safety of patients and students when assessing clinical skills. In recent years, portfolio assessment has gained increased attention in health sciences. The authors argue that it is necessary to have frequent assessments in the acupuncture programme to monitor students' learning. Students can have different forms of assessment every second week, according to the findings of this study.

Amua-Sekyi (2016) and Khan (2012) articulate the importance of assessment in education. They assert that assessment enhances students' learning by identifying students' weaknesses in their studies (Flórez & Sammons, 2013). Stăncescu and Drăghicescu (2017) agree with CHE (2011) that assessment is an effective approach to evaluating learning outcomes, which further ensures the quality of education. The authors concur with these researchers that assessment plays a critical role in all education programmes, which promotes learning and ensures learning outcomes.

Conclusion

The importance of assessment in health sciences education cannot be overemphasised (. The authors concur with Esomonu and Eleje (2020) who are of the view that there is no specific assessment technique that is more superior to

the other. The selection and implementation of assessment techniques must meet the purposes of the assessment while taking the content knowledge into consideration. This is of particular significance in the field of health sciences education as students should be competent in both the theoretically aspects and practical implementation. The identified HEI provided a newly developed acupuncture programme and from this study it is evident that the assessment needs to be strengthened. This study made contributions to exploring students' experiences of the assessment in the acupuncture programme in the South African context. This was the first study conducted in the South Africa to explore the first cohort of acupuncture students experiences of assessments in the newly developed and implemented acupuncture programme. The findings of this study will make contributions to promoting contextualised quality assessment in health sciences with a particular focus on acupuncture in higher education.

In particular, classroom diagnostic assessment, formative assessment, formative use of summative assessment, OSCE and portfolio assessment are effective approaches to promote students learning in the acupuncture programme and evaluate students' competencies in the world of work (Jang & Wagner, 2013; Khan et al., 2013; Payne, 2014; Yambi, 2018). In the authors' opinion, these assessment approaches can be utilised in other programmes in the field of health sciences. The reason is that these techniques can be used effectively for both theoretical and practical content knowledge and skills which are essential for all health sciences programmes.

Recommendations

Based on the above conclusions, the authors reached the following recommendations:

- It is recommended that various forms of assessment techniques should be applied frequently to the acupuncture programme. These techniques include classroom assessment, quizzes, formative use of summative assessment, portfolio assessment, and OSCEs (Flórez & Sammons, 2013; Jang & Wagner, 2013; Khan et al., 2013; McDonald, 2012).
- It is further recommended that HEIs should provide adequate guidance and training for emerging academics. This will ensure that they use assessment techniques effectively in their daily teaching activities.
- It is recommended that the assessments should be designed appropriately according to the revised Bloom's Taxonomy. This will ensure that assessments meet the specific requirements according to the learning outcomes.

Recommendations for Further Research

The authors are of the view that future studies can be conducted with first year acupuncture students. Furthermore, further research should be done in a 3-year cyclic process. Comparative studies could also be conducted with international partners who present similar course in their higher education institutions.

Limitations of the Study

Since this study was limited to explore students' views and experiences of assessments in the acupuncture programme at one HEI in Gauteng province. The reason was that the identified HEI was the only HEI that provided an acupuncture programme that the authors had the opportunity to access. Although the authors employed multiple techniques to ensure the trustworthiness of this study, the subjective analysis in qualitative study was another limitation of this study.

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Appendix 1. Text-based semi-structured Interview Form

Semi-structured Interview Form

1. Please indicate which year of study you are in. For example, year 2, year 3 or year 4.

   _____

2. Briefly describe your experiences of the acupuncture programme?

   _____

   _____

   _____

3. Describe your experiences in the assessment of the acupuncture programme.

   _____

   _____

   _____

4. Explain how the assessment has helped you to strengthen your knowledge in the acupuncture programme.

   _____

   _____

   _____

5. Explain how you would prefer to be assessed in the acupuncture programme.

   _____

   _____

   _____

6. Describe how technologies have helped to assess your knowledge in the acupuncture programme.

   _____

   _____

   _____

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Research Article

Examination of EPGBU model proposed for academically gifted student with structural equation model[1]

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Abstract

The fact that gifted education programs have certain standards, include evaluation, and are based on theoretical foundations ensure that these programs are real programs. Therefore, it is necessary to test the effectiveness of the programs put forward for gifted education and to determine their social validity. The Education Program for Gifted Bridge with University (EPGBU), developed by Tortop (2013), is a university-based program aimed at raising gifted students in the academic field. This research is in a descriptive survey model, and the characteristics of gifted students studying at the Science and Art Center in Turkey in the components of the EPGBU model were analyzed with the Structural Equation Model (SEM). EPGBU model values; $\chi 2=4.328$, df=5, p=.000; RMSEA, 0.000; $\chi 2/df=,866$; NFI=.951; CFI=.50; GFI=0.983; PCLOSE= .000 was found. Accordingly, it is seen that the EPGBU model is a fit model.

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Introduction

Gifted education has been on the agenda of general education as it has increased rapidly in recent times. In this area, besides student characteristics, teacher characteristics, guidance and psychological counselling and guidance, education programs have also been created on how to train these children. There are many discussions about how these training programs should be, and it is explained that the training program prepared for the gifted should have some features. Real gifted education programs should also have high social validity and studies should be conducted on their effectiveness. In addition, the education model prepared for the gifted should be theoretically testable. Sak (2010) opened up for discussion what the standards of the programs developed for the gifted should be and the characteristics of the real gifted education program. Besides, one of the main problems of gifted education in Turkey is the lack of education program. Education Program for Gifted Bridge with University (EPGBU), developed by Tortop (2013) to fill the gap in this area; With its curriculum components in five different fields and 120 educational achievements, it is a program that can be implemented not only for Turkey but also worldwide.

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EPGBU Model Structure

In developing countries, it is seen that most of the gifted children's potential is directed to academic fields (such as medicine, engineering) in line with both the guidance of the families and the preferences of the children. This situation causes the educational needs of gifted children in the academic field to arise. Turkey is one of the examples of this situation. In the Science and Art Center (SAC) model of the Ministry of National Education of Turkey (MoNET), gifted children are mostly supported in the academic field. EPGBU was put forward with the idea of evaluating the situation of universities having the necessary infrastructure for the education of gifted children. EPGBU is therefore a university-based program.

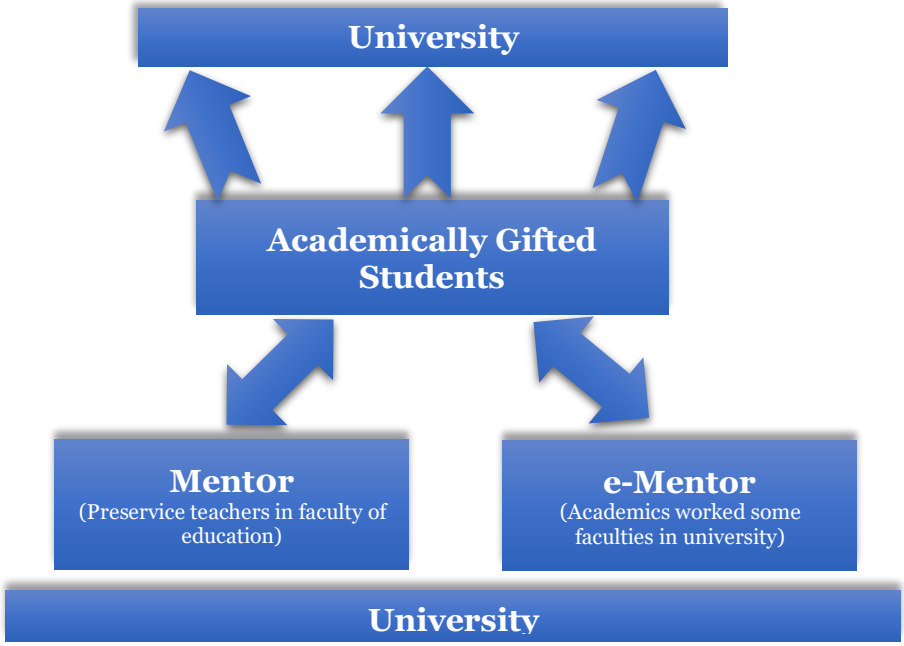

Figure 1. University-based structure of EPGBU Model (Tortop, 2018)

The social validity of the EPGBU training program, which was put forward by Tortop (2013, 2015) for gifted educa on in the academic field, was found to be high. In addition, in the structure of EPGBU consisting of 5 components; Scientific Creativity, Self-Regulation Skills in Learning Science, Thinking Skills, Scientific Research and Process Skills, History and Philosophy of Science.

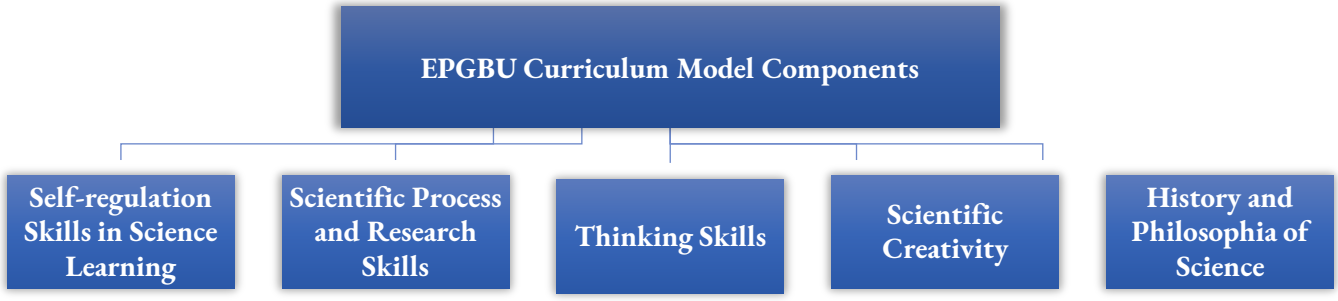

Figure 2. EPGBU curriculum model components (Tortop, 2018)

EPGBU has chosen the educational content necessary for the education of a gifted student in the academic field as gifted young scientists, on the axis of the theories of giftedness. “Self-regulated learning skills” for motivation and commitment to the task in all theories, the skills a scientist uses while carrying out his scientific research, research skills, “creativity” or creative thinking skill in all theories, and “self-regulated learning skills” found in Renzulli and Sternberg's theories. In order to develop the field of wisdom”, it is necessary to determine the educational attainments related to fields such as “history and philosophia of science”.

Problem of Study

Testing the relationships between the structural components of the EPGBU model is very important for the validity of this model. In this research, it is aimed to test whether the EPGBU model is a compatible model with the structural equation model. The problem of the research is

- Is it a model in a structure compatible with all the components of the EPGBU model?

Method

Research Model

In this study, since it was aimed to model the different characteristics of the students studying in Science and Art Centers, the research was descriptive and the survey model was chosen as the design (Buyukozturk et al, 2011). In the study, the model made by showing the interactions of the variables with each other with a diagram is called the path analysis technique. Path analysis can be done in two different types: observed variable and latent (Bryne, 2010). Within the scope of this study, gifted students; Since the variables that determine the features such as self-regulation skills in science learning, scientific research and process skills, knowledge of the history of science and philosophy, thinking skills and scientific creativity are an observable variable, the type of path analysis made with the observed variables was chosen.

Structural Equation Modelling

The definition of Structural Equation Modelling (SEM) can be made as follows. A theoretical model, framed or designed by a researcher, is testing the compatibility of the hypothesis in the light of the obtained data (Schumacker & Lomax, 2010). In fact, it is a hypothesis testing technique, the researcher describes and tests the relationship between the observable and latent variables in the model he developed with the collected data.

Path Analysis Process with SEM

First of all, with any of the statistical package programs for the analysis of the path analysis technique with SEM, which are; Lisrel are programs like AMOS, variables need to be defined. In the path analysis process, it is decided whether the analysis will be done with observed variables or latent variables. After this stage, if the path analysis is to be done with observed variables, the variables should be defined with rectangles, and if it will be done with latent variables, they should be defined in the statistical package program with ellipses or circles. While performing the analysis, data is obtained from the correlation matrix of the variables in the data set if the analysis is to be made over the observable variables, and from the scale items of the latent variables if the analysis is to be made with the latent variables. After that, the probability of the hypothesis model is tested. In the model testing process in path analysis, the primary goal is to examine the fit of the model between the data obtained from the sample, with the criteria described as Goodness Fit Indices and giving an idea about the model fit. While testing the model with the data obtained from the sample, a difference arises and this is expressed as a residual. We can formulate it as follows; "Data = Model + Residual" . Here is the data; scores of observable variables taken from the sample, model; hypothesis about the situation based on the relationships between the variables, the remainder; It is the difference between the model presented as a hypothesis and the fit of the observable variables (Bryne, 2010). The smallness of the remainder indicates the fit between the hypothetical model and the data set. In this respect, the model is interpreted as the better. There are the following stages in the SEM process; Defining the model, Estimating the model, Examining the fit of the model, Correcting the model. Identification of the model; It includes the researcher's tasks such as deciding which of the parameters will be constant or zero. Therefore, the researcher should place the model he considers theoretically and the variables in the model very well. An important issue to be considered at this stage is that the sample or data set is a certain number (Bryne, 2010). Estimation is made with the covariance matrix statistical program of the sample regarding the parameters that are considered as constant or zero in the model. The purpose of this estimation is to test the difference between the population covariance matrix formed by the sample and the population covariance model created with the parameters in the model with the null hypothesis. Likewise, the smaller the difference, the stronger or better the fit between the model and the data set (Bryne, 2010).

Examination of model fit; At this stage, model test statistics are used. Statistical estimations, conceptualized as model test statistics or fit indices, are statistics that allow the interpretation of the fit between the model created by the researcher

and the data obtained by examining them according to certain criteria. There are many compliance statistics within the framework of SEM, some of which are as follows; Chi-square, the main purpose of this fit statistic is to test the fit of the universe covariance matrix and the sample covariance matrix. The number of samples is important for this statistical analysis (Tabachnick & Fidell, 1989).

Standardised Root Mean Square Residual (SRMR) is a criterion for examining the standardized differences between the variance and covariance of the variables measured in the studied model. It is formulated by calculating the square root of the difference between the sample covariance matrix and the hypothesis covariance model. As the SRMR value approaches 0, it indicates good fit (Bryne, 2010; Hooper, Coughlan, & Mullen, 2008).

Root Mean Square Error of Approximation (RMSEA) is a criterion that shows how complex the model is in terms of degrees of freedom. The cut-off point for RMSEA is recommended as .06. Being below this value indicates a good fit in model tests (Bryne, 2010; Distefano & Hess, 2005; Hoyle, 2000). It is expected that the lower limit RMSEA value of the tested model is close to 0, and the upper limit RMSEA value does not exceed 10 (Hooper, Coughlan, & Mullen, 2008). AGFI - GFI (Goodnes of Fit Index) is a substitute for the chi-square test. is the test. It indicates the overall amount of covariance between observed variables calculated in the model under test. If this criterion is over 90, it indicates a good fit of the model (Bryne, 2010; Hoyle, 2000). CFI (Comparative Fit Index) is a criterion based on comparing the covariance matrix estimated by the model under test and the covariance matrix of the model tested with the null hypothesis (Hoyle, 2000). A value above .90 for this criterion indicates a good fit of the model (Bryne, 2010; Hoyle, 2000).

NFI (Normed Fit Index) is a criterion based on the comparison of the chi-square value of the tested model with the chi-square value of the zero model (Hooper, Coughlan, & Mullen, 2008). The NFI value of the tested model indicates acceptable fit for between .80 and .95, and perfect fit for >.95 (Hu & Bentler, 1999). Non-normed Fit Index (NFI); It is a criterion based on comparing the chi-square / degree of freedom ratios of both the observed model and the zero model. A value above .90 indicates a good fit of the model (Bryne, 2010; Hoyle, 2000)]. These fit statistics serve to examine the fit of the tested model with the data set by considering certain aspects. In general, it is necessary to look at all of these statistics, not just one.

Correction of the model; If the estimated covariance matrix in the model does not sufficiently match the sample covariance matrix, this model needs to be revised. In this process, it may be necessary to draw a path in the model or to delete an existing path. In this process, operations are performed on a criterion known as the modification index. Here, the change in the chi-square value of any path added to the model gives clues to the researcher. What needs to be done is to determine the paths that provide the highest decrease in the chi-square value of the model and define them to the model.

Study Group

The study group of the research consisted of a total of 102 gifted and talented 60 girls and 42 boys attending the 6th, 7th and 8th grades who were studying at the Science and Art Center in Manisa and Diyarbakır during the 2016-2017 and 2017-2018 academic years. created a child.

Information of the students in the study group in this study is given in Table 1.

Table 1. Characteristics of the students involved in the study

Demographic variables		f	%
Gender			
	Female	60	58.8
	Male	42	41.2
Age			
	10 years	14	13.7
	11 years	39	38.2
	12 years	18	17.6
	13 years	30	29.4
	14 years	1	1.0
Grade			
	5th	24	23.5
	6th	42	42.5
	7th	36	35.3
Family income			
	0-1250 TL	8	7.8
	1250-3000 TL	55	53.9
	3000-5000 TL	21	20.6
	5000 TL +	18	17.8
Mother Education Status			
	Illiterate	35	34.3
	Primary school	26	25.5
	Secondary school	14	13.7
	High school	14	13.7
	University	13	12.7
Father Education Status			
	Illiterate	8	7.8
	Primary school	23	22.5
	Secondary school	30	29.4
	High school	22	21.6
	University	16	15.7
	Master	3	2.9
Favorite Courses			
	Science	47	46.1
	Mathematic	37	36.3
	Social sciences	12	11.8
	Turksih language	6	5.9
Science achievement grades			
	80-85	5	4.9
	86-90	16	15.7
	91-95	21	20.6
	96-100	60	58.8
	Total	112	100

Data Collection Tools

In the study, "Scientific Creativity Test", "Scientific Epistemological Beliefs Scale", "Problem Solving Inventory for Children", "Scientific Process Skills Test", "Critical Thinking Evaluation Rubric" and "Self-regulation Skills in Learning Science" were used in the process of collecting quantitative data in the study.

Scientific Creativity Test

The "Scientific Creativity Test" developed by Hu and Adey (2002) and adapted into Turkish by Kadayici(2008) was applied to determine the scientific creativity levels of the students. The test, which consists of seven open-ended

questions, measures all sub-dimensions of the process (imagining, thinking), character (fluency, flexibility, originality) and product (technical product, science, science phenomenon, science problem), which are the main dimensions of the Scientific Creativity Construct Model. . Each question in the test measures multiple sub-dimensions. The answers given to the questions are scored in terms of fluency, originality and originality. In order to ensure the construct validity of the test, factor analysis was carried out by Kadayifçı (2008) to ensure the construct validity of the test, and it was determined that the test measures a main factor and the factor load of all questions is more than 0.300. The reliability coefficient of the test developed by Hu and Adey was calculated as 0.89. The reliability coefficient of the test adapted to Turkish by Kadayifçı (2008) was calculated as 0.735.

Scientific Epistemological Beliefs Scale

When we look at the literature, it is seen that the scientific epistemological beliefs scale created by Conley et al., (2004) is mostly used in studies conducted with secondary school students and field-oriented scientific epistemological beliefs in science (Ozkok, 2005). From this point of view, a 26-item five-point Likert-type scientific epistemological beliefs scale, which was originally developed by Conley, et al., (2004) for the primary school group consisting of 5th grade students, and adapted into Turkish by Kurt (2009), was used. In this original scale created by Conley et al., 26 items are included in the four-factor structure. The factors in the scale are named as resource dimension (source), precision dimension (certainly), justification dimension and development dimension. The items in the scale were expressed with a five-point Likert type rating scale, which was stated as strongly disagree (1), disagree (2), undecided (3), agree (4) and strongly disagree (5). As a result of the scale, high scores indicate that students have developed/mature scientific epistemological beliefs, while low scores indicate that students have immature/immature scientific epistemological beliefs. The reliability coefficient of this scale for all items is Cronbach Alpha 0.80.

Problem Solving Inventory for Children

The problem solving inventory for children was developed by Serin, Serin and Saygili (2010) to determine the level of self-perception of secondary school students regarding problem solving skills. The scale consists of 3 sub-dimensions and 24 items. The sub-dimensions of this scale consist of confidence in problem solving skills, self-control and avoidance factors. 12 items of the scale were designed for “Confidence in Problem Solving Skills”, 7 items for “Self-Control” and 5 items for “Avoidance” factor. This scale, developed by Serin, Serin and Saygili (2010), was applied to a total of 568 students in eight primary schools. As a result of the factor analysis, the Cronbach Alpha reliability coefficient of the inventory was determined as 0.80. Each item was categorized as “Never”, “Rarely”, “Sometimes”, “Often” and “Always” in the scale created in a five-point Likert type. Evaluation, “I never act like this (1)”, “I rarely act like this (2)”, “I act like this sometimes (3)”, “I often act like this (4)”, “I always act like this (5) ” was designed and scored. Evaluation of negative items is “I never act like this (5)”, “I rarely act like this (4)”, “I sometimes act like this (3)”, “I often act like this (2)”, “I always act like this (It is rated as “1)”. Serin, Serin, and Saygılı (2010) arranged the items as 32 positive statements and 32 negative statements, a total of 64 statements [25]. As a result of this arrangement, the final version of the scale was developed as 24 items. While the maximum score that the student can get from this scale is 120, the minimum score he can get is 24.

Scientific Process Skills Test

The "Scientific Creativity Test" developed by Enger and Yager (1998) and adapted into Turkish by Koray, Koksal, Ozdemir and Presley (2007) was applied to determine the development of students' scientific process skills. For the reliability study of the scale, it was applied to 300 students with similar characteristics. With the ITEMAN program, 5 items with low reliability were removed from the scale. As a result of this arrangement, the final version of the scale was developed as 31 items. The test consists of scientific process skills, "Observing" (2 questions), "Space/Time relation" (3 questions), "Classification" (3 questions), "Using numbers" (3 questions), "Making measurements" (3 questions). question), “associating” (3 questions), “Prediction” (3 questions), “Controlling Variables” (3 questions), “Interpreting data” (2 questions), “Creating a hypothesis” (3 questions), “Defining”(1 question) and “Experiment” (2 questions). The content validity of the test was provided by taking expert opinions, and the KR-21 reliability coefficient was found to be 0.81. Its validity and reliability were tested and the internal consistency coefficient Cronbach alpha value was found to be 0.77. In the test, 1 point is awarded for each correct answer. Therefore, the highest score that can be obtained from the test is 31.

Critical Thinking Assessment Rubric

In this study, the reading passage (How Will We Choose the Astronaut?) developed by Schreglmann (2016) was applied to determine the development of students' critical thinking skills. This reading passage, which was prepared in accordance with the sixth grade levels of secondary school, was created by Schreglmann (2016) with the help of relevant field experts, and a draft text was created. During the pilot study, 10 sixth grade students were asked to read the reading passage and answer the related questions in 1 class hour. After this process, each student was interviewed individually and they were asked to state their thoughts and suggestions about the reading piece. As a result of the suggestions received from the students, the reading piece was rearranged and took its final form. This reading piece, which took its final form, was taught to students within the scope of the research. Immediately after the reading passage was read, the students answered the above-mentioned six separate questions, after examining 5 different solution proposals related to this passage. The most interesting point here is that students are given multiple solutions ready together. The questions are based on the evaluation of ready-made solutions. These questions consist of open-ended questions. It contains indicators that will enable the evaluation of students' critical thinking skills. When the critical thinking assessment rubric is examined, it is seen that the measurement tool includes important critical thinking elements (defining the problem, making comparisons, suggesting a solution, identifying weaknesses and deficiencies, developing ideas, reflecting).

Scale of Self-regulation Skills in Learning Science

The main purpose of this scale, Self-regulation Skills in Science Learning Scale developed by Tortop (2013, 2015), is to determine students' self-regulation skills in learning science. It is a self-report scale that measures students' self-learning skills. This scale consists of 4 sub-dimensions and a total of 21 items and is a five-point Likert scale. Sub dimensions; These are Metacognitive Skills, Motivation Skills, Cognitive Skills and Management Skills. Cronbach's alpha internal consistency coefficient of the sub-dimensions of the scale, respectively; .87, .85, .87, .87. The Cronbach's alpha coefficient for the overall scale was found to be .94 (Tortop, 2015).

Results and Discussion

In this part of the study, the data collected from the "Scientific Creativity Test", "Scientific Epistemological Beliefs Scale", "Problem Solving Inventory for Children", "Scientific Process Skills Test", "Critical Thinking Evaluation Rubric" and "Self-Regulation Skills in Learning Science" tools The findings obtained as a result of statistical calculations in the SEM process are presented.

Descriptive Statistics for Independent Variables

Table 2. Descriptive statistics of participants' EPGBU model variables scores

	N	Min	Max	$\bar{X}$	Ss
Critical Thinking Score	102	.17	3.50	1.5359	.68963
Epistemological Belief Scale	102	2.77	4.88	3.9540	.46991
Problem Solving Scale for Children	102	2.96	5.00	4.2831	.55319
Self-Regulation Skills in Learning Science Scale	102	3.62	5.00	4.6494	.39828
Scientific Process Skills Test	102	.42	.90	.6584	.09655
Scientific Creativity Scale	102	.71	10.86	5.0812	2.10298

As seen in Table 2, the Critical Thinking Skills Mean Scores of the participants regarding the EPGBU Model components $\bar{X}$= 1.53, the Epistemological Beliefs Scale Mean Scores $\bar{X}$= 3.95, the Children's Problem Solving Scale Mean Scores $\bar{X}$ =4.28, the Self-Regulation Skills in Science Learning Scale Mean Scores $\bar{X}$ = 4.64, Scientific Process Skills Test Mean Scores $\bar{X}$=.65, Scientific Creativity Scale Mean Scores $\bar{X}$= 5.08. In this study, the compatibility of the EPGBU Model proposed by Tortop (2013, 2015) with the Structural Equation Model for the training of gifted students as scientists was investigated.

The number of samples in the model is 110, and the observed variables are Self-regulation skills in learning science (SSLS), Scientific process skills (SPS), Epistemological Belief Scale (EBS), Scientific Creativity Test (SCT), Problem Solving Skills Test (PSST). There are 11 variables, 5 observed and 6 non-observed, 6 echogenic and 5 endogenous

variables in the model.

Two scales were used to obtain data on the "Thinking Skills" dimension related to the model. One of them is the Problem Solving Skills Test and the other is the Critical Thinking Skills Test. It was decided to exclude the Critical Thinking Skills Test (CTSTs) from these tests, since it is a scale that is scored between 1-4 points in testing the model.

Examining Normal Distributions of Data

First of all, it was checked whether the distribution of the data obtained from the scales used to determine the characteristics of the participants was normal. In Table 2, normality values related to the data obtained from the scales are given.

Table 3. Normality values of variables in the model

Variables	Min	Max	skew	c.r.	kurtosis	c.r.
SSLS	71,000	120,000	-,457	-1,956	-,877	-1,878
SCT	9,000	106,000	,533	2,283	-,102	-,217
CTST	72,000	130,000	,099	,426	-,393	-,842
SPS	13,000	28,000	-,328	-1,405	-,113	-,243
SSLS	22,000	117,000	-2,993	-12,813	15,152	32,438
Multivariate					14,126	8,854

SSLS: Self-regulation Skills in Learning Science **SPS** : Scientific Process Skills **EBS**: Epistemological Belief Scale **SCT**: Scientific Creativity Test **PSST**: Problem Solving Skills Test **CTST**: Critical Thinking Skills Test

When Table 3 is examined, it is seen that the variables are at a sufficient level in terms of normality (normal distribution).

Confirmatory Factor Analysis Results of the Model

For the model, the values of fit indices were investigated and interpreted in CFA (Byrne, 2011). Statistical values for Chi-Square Fit Index (χ2), Comparative Fit Index (CFI), Good Fit Index (GFI), Normized Fit Index (NFI), and Root Mean Errors of Approximate (RMSEA) statistical values were determined in the CFA application (Byrne, 2011). The fact that the χ2/df ratio is 3 or less, the GFI, CFI, NFI values are higher than .90, and the RMSEA significance level is less than .06 indicates that the factor structure of the model is compatible (Hoe, 2008; Kline, 1998).). Researchers stated that GFI, AGFI and CFI values of .90 and above are a good fit (Arbuckle, 2012). RMSEA value of .05 is the critical value and values below are preferred (Hoe, 2008). As a result of the analysis in CFA, the first model is as follows.

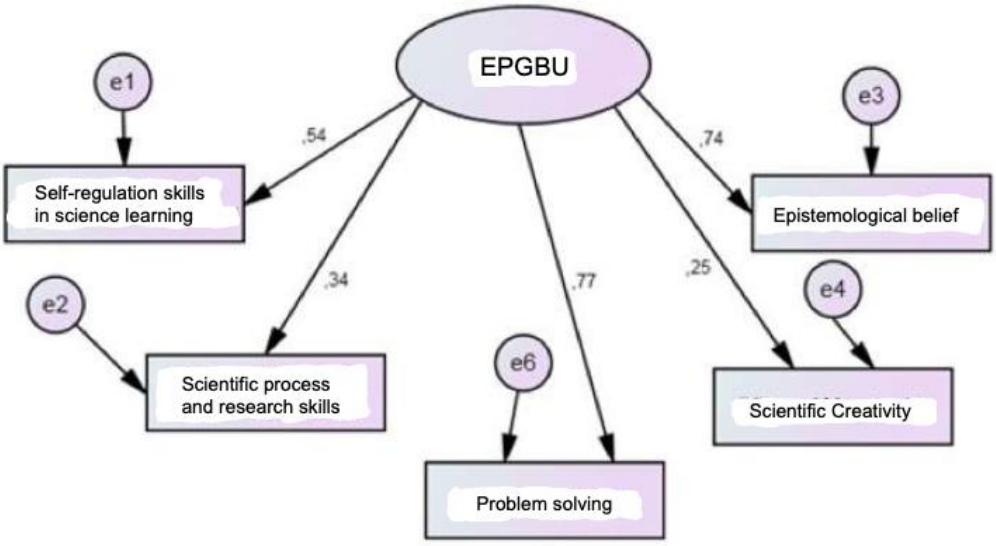

Figure 3. EPGBU Model to Structural Equation Model

χ2=4.328, df=5, p=.000; RMSEA, 0.000; χ2/df=,866; NFI=.951; CFI=.50; GFI=0.983; PCLOSE= .000 was found.

It is seen that the Structural Equation Model and CFA are a compatible model according to the situation stated in the literature (Hoe, 2008; Arbuckle, 2012).

Table 4. Standardized regression loads of variables

			Estimate	S.E.	C.R.	P	Label
SSLS	<---	F1	1,000				
SSLS	<---	F1	,162	,057	2,856	,004	
EBS	<---	F1	1,530	,331	4,626	***	
SCT	<---	F1	,805	,375	2,147	,032	
PSST	<---	F1	1,680	,364	4,610	***	

SSLSs: Self-regulation Skills in Learning Science **SPSs** : Scientific Process Skills **EBSs**: Epistemological Belief Scale **SCTs**: Scientific Creativity Test **PSSTs**: Problem Solving Skills Test

As seen in Table 4, the standardized regression loads of the variables in the model were found to be significant ($p<.05$).

Table 5. Fit Indices for the Model

CMIN Index					
Model	**NPAR**	**CMIN**	**DF**	**P**	**CMIN/DF**
Default model	10	4,328	5	,503	,866
Saturated model	15	,000	0		
RMR, GFI Index					
Model	**RMR**	**GFI**	**AGFI**	**PGFI**	
Default model	6,090	,983	,950	,328	
Saturated model	,000	1,000			
Independence model	39,800	,727	,590	,484	
Comparisons					
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	,951	,902	1,008	1,017	1,000
Saturated model	1,000		1,000		1,000
Independence model	,000	,000	,000	,000	,000
Parsimony-Adjusted Criteria					
Model			PRATIO	PNFI	PCFI
Default model			,500	,475	,500
Saturated model			,000	,000	,000
CMIN Index					
Model	NPAR	CMIN	DF	P	CMIN/DF
Independence model		1,000		,000	,000
CP Index					
Model		NCP	LO 90	HI 90	
Default model		,000	,000	8,346	
Saturated model		,000	,000	,000	
Independence model		78,175	51,820	112,000	
FMIN Index					
Model		FMIN	F0	LO 90	HI 90
Default model		,040	,000	,000	,077
Saturated model		,000	,000	,000	,000
Independence model		,809	,717	,475	1,028
RMSEA Index					
Model		RMSEA	LO 90	HI 90	PCLOSE
Default model		,000	,000	,124	,645
AIC Index					

Model	AIC	BCC	BIC	CAIC
Default model	24,328	25,493	51,333	61,333
Saturated model	30,000	31,748	70,507	85,507
Independence model	98,175	98,757	111,677	116,677
ECVI Index				
Model	ECVI	LO 90	HI 90	MECVI
Default model	,223	,229	,306	,234
Saturated model	,275	,275	,275	,291
Independence model	,901	,659	1,211	,906
HOELTER				
Model			HOELTER.05	HOELTER.01
Default model			279	380
Independence model			23	29

As seen in Table 5, the criteria for testing the Model are CMIN Index, RMR Index, GFI Index, Parsimony-Adjusted Criteria, CP Index, FMIN Index, RMSEA Index, AIC Index, ECVI Index, HOELTER. Fit index findings related to testing the model; $\chi 2$=4.328, df=5, p=.000; RMSEA, 0.000; $\chi 2$/df=,866; NFI=.951; CFI=.50; GFI=0.983; PCLOSE= .000 and CMIN, RMSEA, NFI, CFI, GFI index values were examined.

Conclusion and Recommendations

There are models in our country regarding the education of gifted children. Among them, EPGBU is an example of university-based programs. It is very important to test the theoretical foundations of these programs experimentally. It is seen that scientific knowledge is constantly expanding, technological innovations are progressing rapidly, in today's information and technology age, activities in science are seen clearly in our daily lives, and science education is very important in people's planning for the future (MoNET, 2005).

Science is a discipline in which gifted children can develop advanced cognitive learning situations such as problem solving, analytical, self-regulation, productive, questioning and critical thinking. In this context, the science education of gifted individuals should include interesting and interesting subjects, focus on understanding concepts instead of memorizing, make students feel that they have an active researcher structure, and develop scientific thinking skills by trying to make them love science (Van Tassel-Baska, 1994). One of the most important aims of science education is to discover and support students' interests and abilities in the field of science. Science education has a structure that covers the interest and level of gifted students well.

Gifted students are children who learn faster and in different ways than their peers. In this context, the education to be given to gifted children should be spread over a shorter period of time, the content should be more enriched, and the education/training programs should be differentiated and created with a new model. In this respect, it is important to create models for the training of gifted young scientists. In this study, the EPGBU model was experimentally tested with the structural equation model. There are studies on the social validity of this model. The purpose of examining social validity is to determine the sustainability of the education program (Schwartz & Baer, 1991). By examining the social validity of the program, the values of various features of the program are found in the thoughts of the program participants, and the factors that may cause the students to leave the training program are determined. The social validity of the programs created for the education of gifted students is as important as the effectiveness of the programs. The effectiveness of the program improves the academic success of the student and enables the development of inquiring and creative thinking skills. In this direction, it can be thought that the program is in realizing its scientific goals. As a result, even if the programs with social validity below the normal level are effective, their continuity and widespread effects may be lost for a while (Sak, 2011). When EPGBU is examined in terms of student opinions, it can be said that it is a program with high social validity (Tortop, 2014). In the light of the interviews with the teachers, about the EPGBU model; They stated that the students participating in the EPGBU program had characteristics such as exhibiting positive behaviors, spending their time productively, improving their research and observation skills,

sharing what they learned, regularity, trying to be more successful (Tortop & Ersoy, 2015). These views show that the model is a model with high social validity.

In this study, in the structural equation model study on EPGBU, the values of fit indices in CFA for the Model were investigated and interpreted (Byrne, 2011). Statistical values for Chi-Square Fit Index (χ2), Comparative Fit Index (CFI), Good Fit Index (GFI), Normized Fit Index (NFI), and Root Mean Errors of Approximate (RMSEA) statistical values were determined in the CFA application (Byrne, 2011). The fact that the χ2/df ratio is 3 or less, the GFI, CFI, NFI values are higher than .90, and the RMSEA significance level is less than .06 indicates that the factor structure of the model is compatible (Hoe, 2008; Kline, 1998). Researchers stated that GFI, AGFI and CFI values of .90 and above are a good fit (Arbuckle, 2012). RMSEA value of .05 is the critical value and values below are preferred (Hoe, 2008). When the results of the analysis in CFA were also examined, it was seen that the model was a compatible model. The criteria for testing the model are CMIN Index, RMR Index, GFI Index, Parsimony-Adjusted Criteria, CP Index, FMIN Index, RMSEA Index, AIC Index, ECVI Index, HOELTER. Fit index findings related to testing the model; χ2=4.328, df=5, p=.000; RMSEA, 0.000; χ2/df=,866; NFI=.951; CFI=.50; GFI=0.983; PCLOSE= .000 and CMIN, RMSEA, NFI, CFI, GFI index values were examined.

EPGBU model is a model applied by Tortop (2015) for 3 years at Zonguldak Bulent Ecevit University Special Education Application and Research Center. The fact that the structural equation model related to the model is a compatible model has promising results regarding the applicability of the model in other universities or centers. It is stated that there are many problems in our country regarding the education of gifted children. According to Sak (2010, 13), gifted children experience difficulties in this regard during their school years because they cannot receive the education that will fully meet the individual needs of gifted and talented individuals. Gifted children have problems such as unexpectedly low achievement, lack of attention, adaptive problems, and the desire to stay away from school (Clark, 2013; Ozbay, 2013). In order to provide out-of-school education support to gifted students in Turkey, the Ministry of National Education of Turkey opens Science and Art Centers and increases their number. Science and Art Centers are the most popular institutions in the country where gifted students are educated.

It has been established as institutions that can develop the basic abilities and mental capacities of students. However, the fact that these institutions do not have differentiated programs to meet the interests and needs of students hinders their intended functioning. Şahin (2014) states that there is a need for sustainable education programs at a level that can meet the advanced education needs of gifted and talented individuals, an education staff that can effectively transfer these education programs, and a management staff that can evaluate education programs and teachers (Şahin, 2014). There are a limited number of programs on the education of gifted students in Turkey. It is seen that these are short-term programs. In this respect, quantitative and qualitative inadequacies regarding the education of gifted students stand out (Sak, 2009; Sak, 2010). Tortop (2013) states that the field of gifted education has been neglected for many years in Turkey, except for the limited implementations of only a few program types. He also states that there are two university-based educational program models in Turkey. He stated that one of them was EPGBU. In the creation of EPGBU, it was aimed to create a model suitable for Turkey, its infrastructure and culture by taking into account contemporary models related to gifted education. In EPGBU, it is a comprehensive university-based education program consisting of a unique combination of diagnostics, curriculum components, mentor training and student identification criteria. The EPGBU model is a three-stage education program in the form of academic calendars of 10-12 weeks on the basis of primary, secondary and high school (Tortop, 2013; Tortop and Eker, 2014). It is seen that the education programs applied for gifted students in Turkey are insufficient in the academic field and in raising scientists. The EPGBU model is important in terms of eliminating these inadequacies and giving a different perspective to the education of gifted students. It is thought that the EPGBU model will make an important contribution to the deficiency in the field.

When the problems related to science education in Turkey are examined, it is seen that there are deficiencies in terms of practical orientation and mentoring. The content of Tortop (2015) mentoring concept; a guide showing the way to success for the student, a consultant for the decisions they will make during the development process, a model that they

follow carefully in the field they want to educate themselves, an expert in a certain field, an educator to provide students with knowledge and skills, a friendly and reliable friend who establishes sincere relations with his student. stated that it is like (Tortop, 2015). According to some studies, students who have mentors are more effective at school, are less absent from classes, are more interested in school, have higher self-confidence, and are more likely to enter university than students who do not have mentors. It is seen that mentoring is one of the most productive methods in the education of students with special abilities. Many positive benefits of mentoring in talent training have also been noted in research (Nash, 2001; Siegle, 2005; Torrance, 1984). Giving mentoring practices online over the internet is expressed as e-mentoring. (Nash, 2001). Single and Muller (2001) stated that mentoring is a natural relationship formed by helping a non-experienced person through electronic communication by an experienced person. EPGBU can be an effective program in talent development as it has an approach that includes mentoring and e-mentoring.

One of the studies on the training of gifted young scientists in Turkey is science high schools and social sciences high schools. However, serious criticisms about these high schools are also included in many studies. It does not provide any other education to students selected for science high schools, except for a few additional math and science courses compared to regular high schools. In addition, while it should provide an education that is individualized or differentiated according to the individual speed, interest and learning style of the student and that allows him to explore his creativity, it has become a single-level education in science and mathematics (Akarsu, 2004). In line with the results of the research, the following suggestions can be made.

Recommendations for Further Research

For this research, it can be suggested to re-evaluate the working status of the model by increasing the sample group of 102 people. In addition, it can be done by determining a wider sample for other regions in terms of socio-economic level in the sample of Turkey. In addition, the working status of the model for primary, secondary and high school student groups can also be tried. In our research, the epistemological beliefs scale was used for the history and philosophy of science dimension. Instead, the scale of the history and philosophy of science can be developed and the model can be tried again. The scale of critical thinking skills used is rubric, and the model can be tested by ensuring that it is suitable for a 4-point rating, but using a 5-point Likert-type scale.

Recommendations for Applicants

Experimental studies can be conducted on whether the EPGBU model is an effective model for the education of gifted young scientists. By creating thematic units related to all dimensions of the model with the integration of EPGBU gains within these thematic units, tests can be made with the effectiveness of the model. Sample applications related to the EPGBU model can be turned into projects under the leadership of the university or the Ministry of National Education of Turkey.

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