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An Investigation of Secondary School Students' Cognitive Structures in the Subject of Life Skills

Ortaokul Öğrencilerinin Yaşam Becerilerine Yönelik Bilişsel Yapılarının İncelenmesi

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Abstract: The aim of this research is to reveal the cognitive structures and explanation situations of secondary school students for life skills. The study is a descriptive survey model in quantitative research methods. The sample of the study consisted of 189 secondary school students. The Word Association Test (WAT) was used as the data collection tool. Six keywords (communication, entrepreneurship, teamwork, creativity, analytical thinking, and decision-making) that form life skills were included in order to create the WAT. In the analysis process of WAT, a frequency table has been made to show which words or concepts are repeated for which keyword. According to the frequency table, a conceptual relational network that revealed the cognitive structures of secondary school students was drawn. It was determined that secondary school students could not produce enough words regarding life skills concepts. The number of students who gave answers especially about creative thinking and decision-making concepts was quite limited. Based on the results of the research, it is recommended to develop the diversity of concepts in students' cognitive structures for life skills concepts and their conceptual knowledge of life skills with applied activities in different courses.

Keywords: Cognitive structures, secondary school students, cognitive structure, life skills

Öz: Bu çalışmada ortaokul öğrencilerinin yaşam becerilerine yönelik bilişsel yapılarının ve bilgi durumlarının ortaya çıkarılması amaçlanmıştır. Nicel araştırma yöntemlerinden betimsel tarama modeli kullanılmıştır. Çalışmanın örneklemini 189 ortaokul öğrencisi oluşturmuştur. Araştırmada veri toplama aracı olarak Kelime İlişkilendirme Testi (KİT) kullanılmıştır. Testi oluşturmak amacıyla yaşam becerilerini oluşturan altı anahtar kavrama (iletişim, takım çalışması, girişimcilik, yaratıcılık, karar verme, analitik düşünme) yer verilmiştir. KİT'in analiz sürecinde, her bir anahtar kelime için ilişkilendirilen kelimelerin ya da kavramların tekrar sayısını gösteren bir frekans tablosu oluşturulmuştur. Oluşturulan frekans tablosu baz alınarak ortaokul öğrencilerinin bilişsel yapılarını ortaya koyan kavram ağları çizilmiştir. Bu araştırma sonucunda, ortaokul öğrencilerinin yaşam becerilerine ilişkin kavramlar hakkında yeterince kelime üretemedikleri tespit edilmiştir. Özellikle yaratıcı düşünme ve karar verme kavramlarıyla ilgili cevap veren öğrenci sayısının oldukça sınırlı olduğu ortaya çıkmıştır. Öğrencilerin yaşam becerileri kavramlarına yönelik bilişsel yapılarındaki kavram çeşitliliğinin ve yaşam becerilerine ilişkin kavramsal bilgilerinin farklı derslerde uygulamalı etkinliklerle geliştirilmesi önerilmektedir.

Anahtar kelimeler: Bilişsel yapı, ortaokul öğrencileri, yaşam becerileri

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Introduction

Individual differences stand out with the advances in science and technology. In this process where individual differences stand out, individuals must have different life skills (Cansoy, 2018; Kenan, 2005; Sayın & Seferoğlu, 2016). In terms of skill development, schools benefit learners in many ways. Sreekumar (2016) expresses skill development in education as "the facilitating key in the process of transforming knowledge into a healthy behavior". Education of life skills is being considered more in the process of organizing education systems all over the world (World Health Organization [WHO], 1999). Life skills are defined as "adaptive and positive behavioral abilities that enable individuals to effectively cope with the demands and challenges of daily life" (WHO, 2009). According to Gazda and Brooks (1985), life skills are defined as the skills required for behavior-based learning that helps individuals to solve the problems they encounter at all ages. In another definition, life skills are the psychological skills required to cope with the challenges and demands of daily life (Papacharisis et al., 2005). With the studies carried out for life skills education, it is aimed to develop individuals in "personal, social, academic, professional and moral" terms (Kolburan & Tosun, 2011, WHO, 2009). Life skills are quite functional in terms of individuals' adaptation to society (Alaca et al., 2020).

With life skills, it is aimed to enable the individual to use the acquisitions aimed in the education process by associating them with daily life problems (Kirman Bilgin, 2019). In this way, the lives of individuals can be facilitated (Erbil et al., 2004). Relevant skills are given implicitly within the acquisitions in the science curriculum in Turkey. There is a relationship between the acquisition of life skills and the learning of the science course (Ayvacı et al., 2020). It can be said that basic science concepts need to be learned in order to acquire and develop entrepreneurship, creative thinking, analytical thinking and decision-making skills which are among the life skills included in the skill learning area of the science curriculum in Turkey. Because the student may need to think creatively or analytically to decide the best solution from different solutions while looking for answers to daily

life problems. Studies show that students cannot directly use science concepts by relating them to their daily life experiences (Er-Nas et al., 2016; Lubben et al., 1999; Özmen, 2003; Smith & Siegel, 2004; Stolk et al., 2009). Also, it is quite difficult for an individual who cannot learn basic science concepts to produce solutions to daily life problems he/she encounters. Besides, it is observed that these individuals have difficulties in establishing relationships between concepts and developing different solutions (Crespo & Pozo, 2004; Gilbert, 2006). In other words, in order for students to solve a problem they encounter in their daily life, they must first be able to determine the relationship between this problem and science concepts. After that, students need to use life skills to solve the problem. It can be said that students' internalization of life skills will indirectly contribute to the development and continuity of the society. This situation also coincides with the goals specified in the science curriculum in Turkey (MoNE, 2018a).

Life skills have an important role in the adaptation process of students to society. Considering the positive relationship between life skills and class participation level, classroom behavior and academic achievement, the role of life skills education in school curricula becomes important (UNICEF, 2018). Life skills are also included in the curriculum of social studies and life science courses at primary school level (MoNE, 2018a, MoNE, 2018b). However, there is a clear emphasis on life skills in the science curriculum. Life skills have been included in the science curriculum in 2013 in Turkey. Life skills are stated as "basic skills in reaching scientific knowledge and using scientific knowledge" in the curriculum (MoNE, 2018a). Considering the goals of the curriculum, it is seen that it is aimed for students to take responsibility for solving daily life problems and to use life skills in this process (MoNE, 2013; 2018a). It can be said that the inclusion of life skills in the science curriculum is an important development in directing students' daily lives.

Cognitive structures are theoretical structures that represent conceptual relationships in students' long-term memories (Shavelson, 1974). Cognitive structure is all kinds of descriptions created by the concepts in the mind (Balbağ, 2018). Determining the cognitive structures of students in the teaching process will contribute to the learning outcomes and will be effective in the development of teaching strategies (Tsai & Huang, 2002). Additionally, determining the cognitive structure helps improve learning processes (Jonassen, 1987). In this process, the word association test (WAT) can be used. It is a technique that reveals the cognitive structure of the students, the relationships between the concepts in this structure, and helps us determine whether the relationships between the concepts are sufficient (Bahar et al., 2006; Ercan et al., 2010). If the cognitive structures of the students are known, appropriate teaching can be done. In fact, if the cognitive structures of the students are revealed, the life skills education can be shaped in that direction. Therefore, it is thought that revealing the cognitive structures of the students will contribute to the science teachers or researchers in shaping the science course content related to life skills.

In order for students to solve a problem they encounter in their daily life, they must first solve their relationship with science concepts and then determine which life skill to use to reach a solution. Studies show that students cannot associate science concepts with their daily life experiences (Burbules & Linn, 1991; Stolk et al., 2009; 2012). Therefore, daily life experiences should not be considered independent of science and life skills. There are very few studies in the relevant literature on the awareness and use of secondary school students' life skills (Kirman Bilgin, 2019). Science teachers, while teaching science concepts to their students, should also ensure the development of students' life skills. It is important for secondary school students, who will become individuals of the future, to acquire life skills. In order to ensure that students acquire these skills at the desired level, it is necessary to reveal the secondary school students' cognitive structures and conceptual knowledge situations for life skills. Therefore, the aim of this research is to reveal the cognitive structures and explanation situations of secondary school students for life skills.

The following research questions guided the current study:

- What are the cognitive structures of secondary school students on life skills according to the word association test?
- What is the secondary school students' explanation situations about life skills?

Method

The study is a descriptive survey model in the quantitative research methods. Descriptive research tries to describe the existing situation. The main purpose of descriptive studies is to explain the situation investigated. The description method, questions such as "What is the current situation?", "Where are we?" and "Where should we go?" are investigated (Kaptan, 1998). Survey studies aim to determine the current situation (Çepni, 2010).

Sample

Convenience sampling method was used in the study. The convenience sampling method is the sampling method in which the participants from whom the data can be obtained in the easiest way are selected (Yıldırım & Şimşek, 2013). Therefore, the convenience sampling method is relatively less costly and may be perceived as practical and easy for some researchers. The sample of the study consisted of 189 secondary school students studying in Trabzon, Turkey. 50 of these students are fifth grade, 53 of them sixth grade, 47 of them seventh grade and 39 of them eighth grade students.

Simple random sampling method was used while determining the study group. Simple random sampling method was found to be appropriate in this study since it is a sampling method in which the rule of neutrality can be applied, each unit in the universe has an equal and independent chance of being included in the sample (Balcı, 2009). Participants took part in the research voluntarily. The frequency and percentage distributions of the participants' gender, average age and grade levels are shown in Table 1.

Table 1. Frequency distributions of the participants' gender, average age and grade levels

Grade Level	The Average Age	f_{female}	f_{male}
5	10-11	28	22
6	11-12	23	30
7	12-13	26	21
8	13-14	19	20
Total		**96**	**93**

Word Association Test (WAT)

The WAT was prepared by researchers considering the life skills in the current science curriculum in Turkey. The pilot application of WAT with six key concepts was carried out with 17 students. In the WAT application, an explanation was given to the students about the application. The test format was prepared by repeating each key concept in the WAT, and each key concept was placed on different pages to avoid the risk of chain responses (Bahar & Özatlı, 2003). The key concept on each page was repeated ten times for each other, and blank spaces were created for students to write the next concept on each line. In the second stage, the student was expected to write a sentence about the key concept within a given minute. The answer (sentence) associated with the key concept can be anything that is not significantly related to the key concept at the recall level only. Within the scope of the validity study of the developed WAT questions, the opinions of two science education experts were received. As a result of the pilot and validity study, it was decided to change the one-and-a-half-minute time given for each key concept in the WAT to one minute. During the pilot study, students' interests and focus were not scattered. The data were examined after the pilot study by researchers, and it was seen that six key concepts (communication, creativity, analytical thinking, decision-making teamwork, and entrepreneurship) could be answered by secondary school students.

The data collection tool in the research was the WAT. The WAT consists of six key concepts (communication, creativity, analytical thinking, decision-making teamwork, and entrepreneurship) that constitute life skills in the science curriculum in Turkey (MoNE, 2018a). Each concept is placed on a page. On WAT sheets, each concept has been prepared to come on one page. Below is an example page layout:

Please write down what the "teamwork" word reminds you.

Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
Teamwork…….
An example sentence related to teamwork.....

Figure 1. A WAT page layout

Data Collection

The data were collected in the fall semester of the 2019-2020 academic year. The research is limited to 189 students in a secondary school affiliated to the Ministry of National Education in Trabzon, Turkey. Only secondary school students (5th, 6th, 7th, and 8th grade) were included. The research was limited to the key concepts of life skills in the science curriculum in Turkey. Before the implementation of WAT, explanations were given to the student about how to apply the test and examples of application related to different areas were stated. One of the researchers actively participated in the data collection process. Before the data collection, the science teacher was informed about the process. The teacher and the researcher made explanations to the students and the researcher made a short sample practice for a different concept with the students. The time control was done by the researcher. At the end of the time, the teacher warned the students to switch to the other key concept. One minute was given for each key concept. The time was found to be varied according to the grade level in different studies in the literature. It was decided to be one minute based on the class levels to be studied and the sample studies in the literature (Ercan et al., 2010; İnel et al., 2016; Kaya & Taşdere, 2016) so that the duration did not show an element of variability. During this period, the students wrote the answer words they thought related to the key concept. Each keyword was written one after the other on a single page in the prepared WAT. If not, it is possible that the secondary school student may give the previous words as an answer. This will undermine the purpose and reliability of the test (Bahar & Özatlı, 2003). In order to provide that the students allocate equal time to each keyword, another keyword was switched after the time given for each word expired. All procedures in this research were made in accordance with the approval decision of Trabzon University Social and Human Sciences Scientific Research and Ethics Committee (02.06.2021, E-81614018-000-527).

Data Analysis

The words obtained related to the concepts in the study were examined in detail by the researchers. Then, a table was created showing the frequency of repetition of these words. In the process of analyzing the data, the number of answer words produced by the students was used and was done by two researchers to ensure the consistency of the data. Analyses that were carried out independently were examined and brought together by two different researchers. In the analyzed data, the prominent and important issues were determined. Then, the answer words, which were produced separately, were compared, and clarified by both researchers. For evaluating the results, the answers were examined in detail for each keyword. In this context, coding reliability was calculated to determine how the researchers' response words were consistent. Coding reliability was calculated using the answer word agreement ratio index. The agreement ratio is an index found by calculating the coding where consensus was reached and could not be reached. By using the agreement ratio calculated in this way, the consistency value between the researchers was found as 0.90. The answers that were not agreed upon were resolved by negotiation. The agreement ratio used to determine the reliability between researchers is expected to be higher than 0.70 (Tavşancıl & Aslan, 2001).

A frequency table was created showing the repetitions of associated words or concepts for each keyword. Because the understanding of a keyword depends on words' quality and word number associated with that keyword (Bahar et al., 2006). A conceptual relational network was drawn based on the frequency table which demonstrated the cognitive structures of the students. The frequency table created is presented in Appendix 1. While the conceptual relational network was created, the cut-off technique was applied (Bahar et al., 2006). Word answer to any keyword in the frequency table 3-5 below was used as the breakpoint unit. The concepts and answer words above this frequency were plotted in interconnection lines and stated as the first part of the conceptual relational network. Then, the cut-off point was taken down at certain intervals. Associations carried on until answer words and all keywords were determined (Ercan et al., 2010). For example, because the word "computer" produced under the communication concept is repeated 83 times, it is located at the cut-off point of 75 and above. The number of words that emerged in the process of determining the cognitive structure, the number of associations in the conceptual relational networks, the related words' suitability and quality to the subject content were considered. Moreover, the sentences formed by the participants were analyzed in the light of their content meanings and qualifications, by classifying "directly related statements", "partially related statements", "sentences with misconception" and "intentionally left blank" classifications. If the sentences were scientifically correct and related to the concept, they were discussed under the title of "directly related statements"; content sentences that are not scientifically correct and used in daily life, reflecting only their feelings and thoughts, and interpreted with their past experiences and traditions were discussed under the title of "partially related statements". Sentences that were concepts used with "different and wrong meaning concepts or expressions and containing expressions mixed with each other" were discussed under the title of "sentences with misconception". Since there were no expressions containing misconceptions in the sentences formed by the secondary school students, this category was not included in the tables. Life skills indicators were considered while making classifications during the analysis of the related sentences (Kirman-Bilgin, 2019). For research ethics, participants were coded. For instance, the 26th secondary school student going to the eighth grade was coded as 8S-26.

Findings

In the research, words with 15 or more frequencies according to the cut-off points are presented with figures. The words under the concepts are stated with the figures below according to their "cut-off points". The conceptual relational network generated for the cut-off point 90 and above is shown in Figure 2.

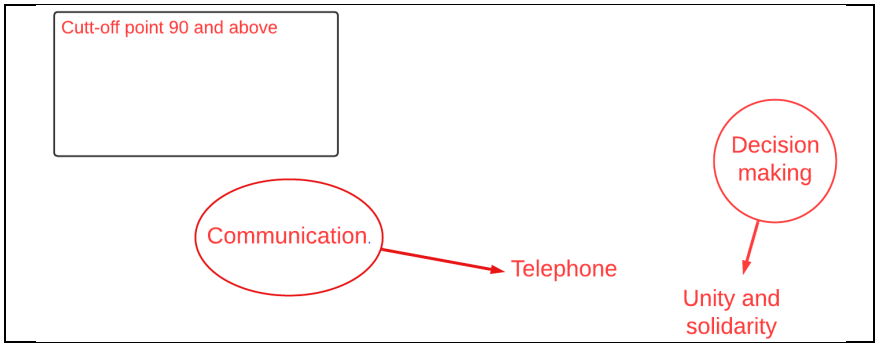

Figure 2. The conceptual relational network for cut-off points 90 and above

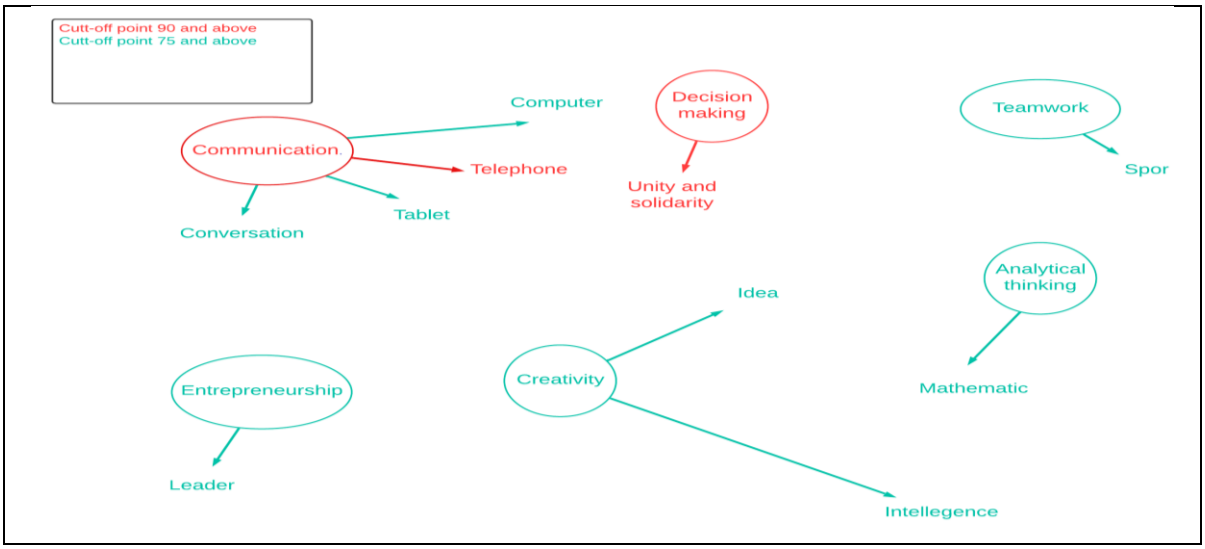

Figure 3. The conceptual relational network for cut-off points 75 and 89 range

Cut-off point 90 and above: According to the cut-off point indicated in Figure 2, secondary school students produced the "telephone" for the concept of communication and the "unity" for concept of decision-making according to the cut-off point. No words for other concepts were produced.

Cut-off point 75 and 89: According to the cut-off point indicated in Figure 3, communication was associated with the "tablet", "computer" and "speaking" by secondary school students. In addition, the teamwork concept was associated with "sport", the entrepreneurship concept was associated with "leader", the creativity concept was related to "idea" and "intelligence", and the analytical thinking concept was related to "mathematic".

Cut-off point 60 and 74: According to the cut-off point indicated in Figure 4, communication concept was also associated with the "letter" by secondary school students.

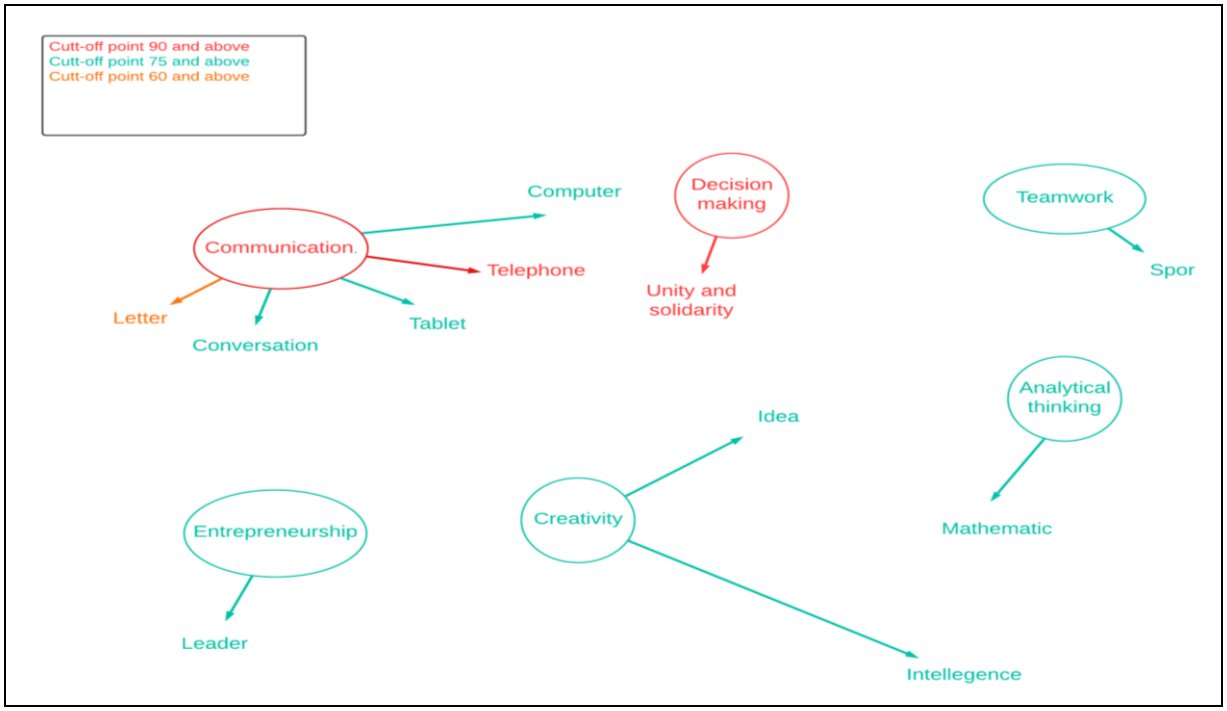

Figure 4. The conceptual relational network for cut-off points 60 and 74 range

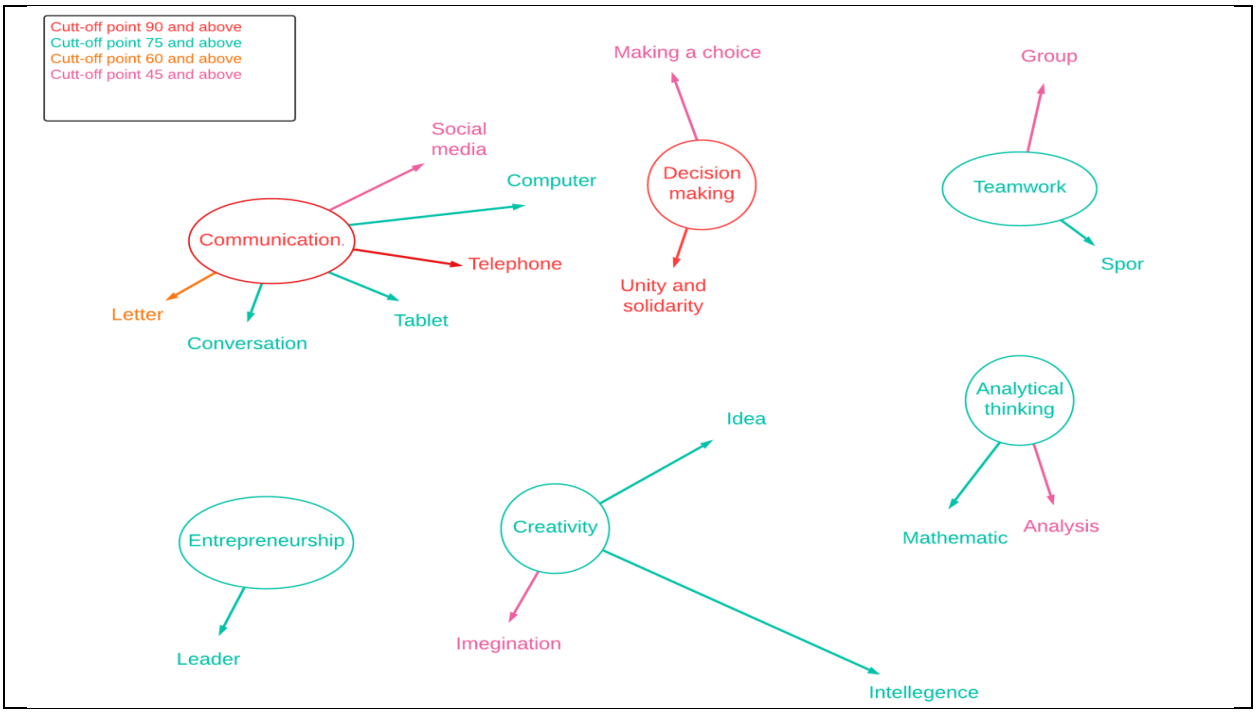

Figure 5. The conceptual relational network for cut-off points 45 and 59 range

Cut-off point 45 and 59: According to the cut-off point indicated in Figure 5, different from the previous cut-off point, communication was associated with the "social media" by secondary school students. In addition, the teamwork concept was associated with "group", the creativity concept was associated with "imagination", the decision-making concept was associated with "making a choice", and the analytical thinking concept was associated with "analysis".

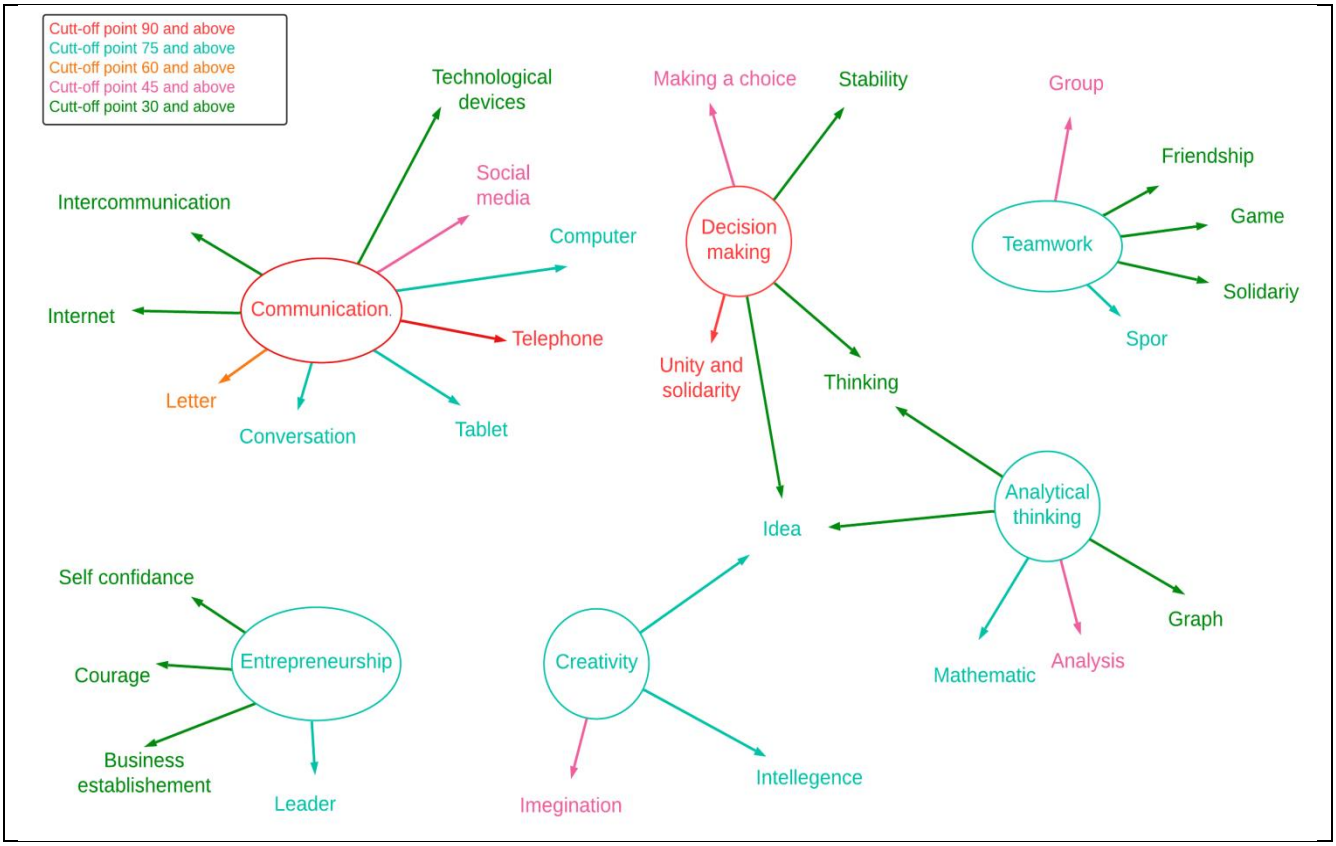

Figure 6. The conceptual relational network for cut-off points 30 and 44 range

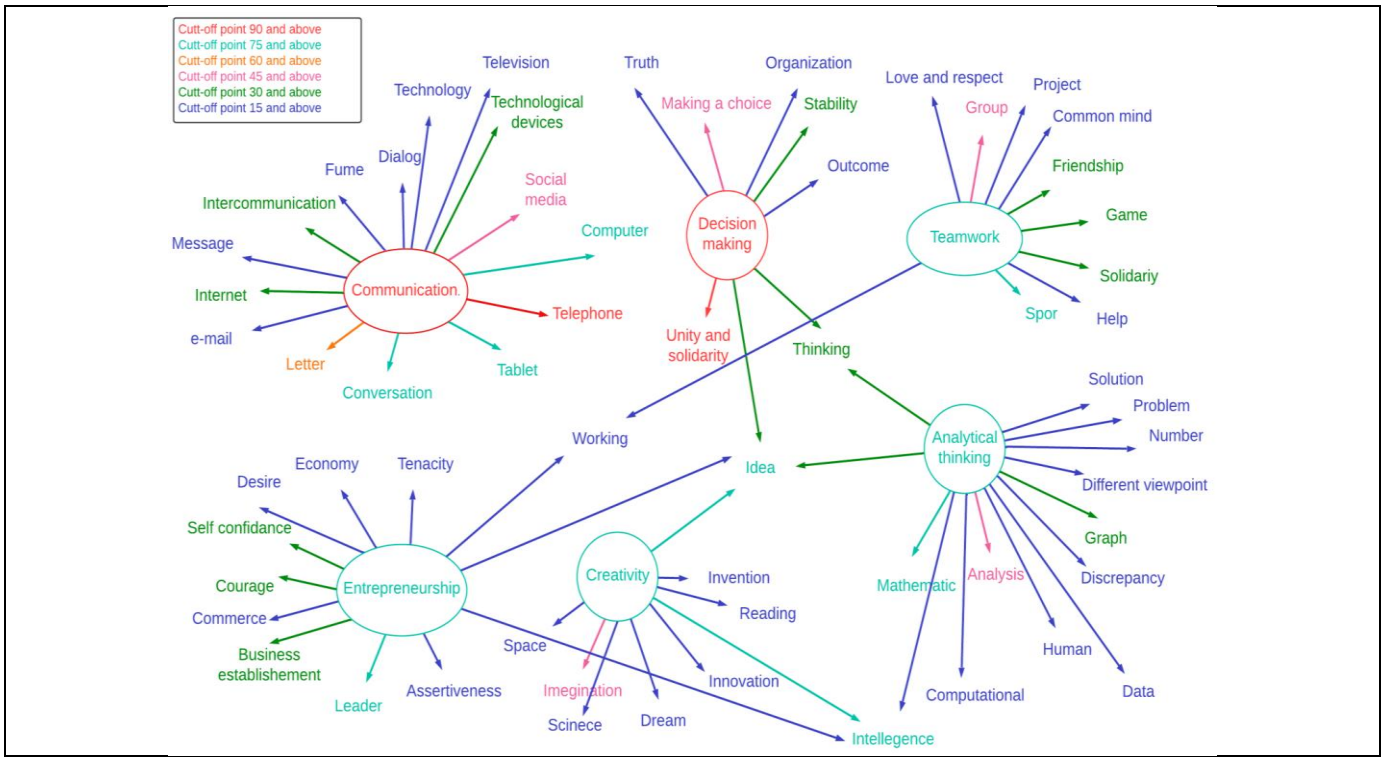

Figure 7. The conceptual relational network for cut-off points 15 and 29 range

Cut-off point 30 and 44: According to the cut-off point indicated in Figure 6, different from the previous cut-off point, communication was related to "intercommunication", "internet" and "technological devices", the entrepreneurship concept was associated with "self-confidence", "business establishment" and "courage" and the teamwork concept was related to the "game", "friendship" and "solidarity". In addition, the decision-making concept was associated with "stability" and the analytical thinking concept was related to "graph". Moreover, the "idea" was associated with entrepreneurship concept, creativity, decision-making and analytical thinking, conversely, the "thinking" was related to the decision-making and analytical thinking concepts.

Cut-off point 15 and 29: According to the cut-off point indicated in Figure 7, the whole conceptual networks the words they produce about six concepts has emerged. Different from the previous cut-off point, communication was related to the words "e-mail", "message", "dialog", "television", "technology" and "fume", the teamwork was associated with the words "project", "help", "common mind", "love and respect" and entrepreneurship concept was related to the words "desire", "assertiveness", "economy", "tenacity" and "commerce". The "working" word was associated with both teamwork and entrepreneurship by secondary school teachers. Also, it was seen that the creativity concept was related to "dream", "reading, space", "invention", "science", "innovation" words and the analytical thinking concept was related to "solution", "number", "different viewpoint", "problem", "data, human", "computational" and "discrepancy". In addition, "intelligence" was related to creativity, entrepreneurship and analytical thinking.

The findings obtained from the "related sentence" part of WAT are as follows. Sample sentences and frequencies of the sentences are presented in Table 2.

Table 2. Sentences produced about concepts and their frequencies

Life Skills	Directly related statements	Partially related statements	Intentionally left blank
Communication	40 (%21,16)	117 (61, 91)	32 (%16, 93)
Creativity	19 (%10,05)	95 (%50, 27)	75 (%39, 68)
Entrepreneurship	17 (%8,99)	102 (%53,97)	70 (%37,03)
Teamwork	34 (%17,99)	126 (%66, 67)	29 (15, 34)
Decision-making	17 (%8,99)	125 (%66,14)	47 (%24,87)
Analytical thinking	15 (%7, 94)	89 (%47,09)	85 (%44,97)
Total	142	654	338

* C: Communication, Cr: Creativity, E: Entrepreneurship, T: Teamwork, D: Decision-making, A: Analytical thinking

The frequencies (f=40, f=19, f=17, f=34, f=17, f=15) of directly related statements in relation to the six concepts are presented in Table 2. It is understood from the table that the most scientific sentence about the concept of communication has been created. Sample sentences are presented below:

C: We must respect the other person to establish good communication (8S-26).

Cr: Ideas of creative thinkers are interesting and innovative (5S-41).

E: Entrepreneurship is a feature that requires self-confidence (8S-20).

T: Teamwork requires order and responsibility (7S-34).

D: It is necessary to be able to distinguish and choose right and wrong directions (5S-26).

A: Interpretation is important for analytical thinking (5S-48).

The frequencies of the six concepts with partially related statements (f=117, f=95, f=102, f=126, f=125, f=89) are presented in Table 2. It is understood that students write sentences that are not scientifically correct and contain superficial information for the teamwork concept the most and analytical thinking concepts the least. Sample sentences of the related concepts are presented below:

C: The phone makes it easy to communicate (5S-19).

Cr: When I dream, I think logically and come up with original ideas (7S-9).

E: As an entrepreneur, I must develop new ideas (5S-35).

T: Teamwork makes it easy for us (6S-46).

D: We should decide something calmly, without hurrying (8S-26).

A: Elif compared values while solving a problem (7S-14).

It was determined that there were no misconceptions related to all six concepts from the findings obtained from the research.

Discussion and Conclusion

In the current study, it was aimed to reveal the cognitive structures and explanation situations of secondary school students for life skills. The students mostly associated the concept of communication with the "telephone". This could be because the telephone is one of the tools of communication. Their association mostly with the concept of communications tools is an indication that their cognitive structures are shaped according to their daily needs and uses (Eren et al., 2014). Also, it might be a striking result that the students did not associate the concept of communication with other life skills concepts although communication skill is one of the components of other life skills (Er-Nas & Alaca, 2019; Oskay, 2001; Ören & Biçkes, 2011; Wrahatnolo, 2018; Yüksel et al., 2015; Zhao & Gearin, 2016). These results show that they mostly associated communication with technological communication tools. The high rate of repetition of the word "conversation", which is a scientific concept, can be interpreted as a positive situation. The most important element in communication is bidirectional information transfer (Er-Nas & Alaca, 2019; Mclean, 2005). In this respect, the inclusion of the word "dialog" in students' cognitive structures is interpreted as associating communication with its correct meaning. The fact that this word is produced by a few numbers of students can be explained as those students may not know the concept of communication adequately.

It was determined that students most frequently associated the teamwork with the sport and then with the group. The teamwork was associated with the words "help", "love and respect", "common mind" and "working" by a few students. It can be mentioned that the answer words were match up with the literature (Şenel-Çoruhlu & Pehlevan, 2019; Yapar, 2009). However, both the insufficient answer words and the association of these words by a few students may indicate that the students did not perform enough activities for this skill in classes. As the shaping of an individual's cognitive structure towards a concept is directly related to the experience of that concept (Matthews, 2002; Ünal, 1999). The diversity of words in students 'cognitive structures and the few repetitive words may be due to the low number of teamwork objectives in the curriculum (Deveci et al., 2018) and teachers' performing poor teamwork activities in the classroom (Ayanoğlu & Hamedoğlu, 2013).

Regarding the concept of entrepreneurship, the word "leader" was produced the most, and no words were produced at three cut-off points. Students' associating the concept of entrepreneurship with the "leader" may be due to their handling of the characteristics of entrepreneurial individuals. Also, the concept of entrepreneurship was related to the words "self-confidence", "business establishment" and "courage", it has also been associated with the words "desire", "assertiveness", "economy", "working, tenacity", "intelligence" and "commerce". Considering the definitions made for the concept of entrepreneurship, it can be said that all the words used by students are scientifically correct and that the word diversity is sufficient in terms of relation to the key concept. Because the students both touched on various competencies such as "tenacity", "courage", "assertiveness", "self-confidence" that an entrepreneurial individual should have, and related entrepreneurship with the words "business establishment", "economy" and "trade" by considering it economically. As a matter of fact, Deveci (2018) examined the entrepreneurship tendencies of secondary school students and reached that the entrepreneurial tendencies of the students are high. Besides, they produced answer words about entrepreneurship with four other concepts apart from the concept of communication. This situation shows that students associate the entrepreneurship with other life skills in their minds. Students' associating the concept of

entrepreneurship with other life skills is also in line with the relevant literature (Deveci, 2018; İnaltekin, 2019).

The findings about creativity show that the answer words were repeated by a small number of students. This situation may indicate that secondary school students do not have sufficient comprehensive knowledge of the concept of creativity. The most frequently repeated word was "intelligence", and the next one was "imagination". In the literature, creativity is accepted as a feature of the mind, and it is mentioned that creativity is not a special ability. However, it is stated that studies on creativity are generally carried out with gifted students (Beghetto, 2010). To develop creativity, educational opportunities should be offered not only to certain groups but also to all individuals. Therefore, the fact that most students' association with the concept of creativity with intelligence can be interpreted as they think that creativity skill belongs to a certain group, such as the gifted people. For this reason, it is important to make the necessary corrections in the cognitive structures of the students. In the educational science literature, creativity generally means that the student imagines various ways in the process of solving a problem and reveals a new combination of existing knowledge (Hu & Adey, 2002). It can be said that the students' use of the imagination is parallel with the definitions in the literature (Baer & Kaufman, 2012). The words "dream", "reading", "space, invention", "science" and "innovation" are words in students' minds. Students being in environments that develop creative thinking can not only improve their cognitive structures and creative thinking skills but also produce innovative and creative products for this concept. (Baer & Kaufman, 2012). The fact that the total number of words produced related to creativity skills is less than other skills also support this situation.

The decision-making was most related to the words "unity" and "solidarity" and then "making a choice". The use of the unity and solidarity as the answer word may indicate that students do not tend to make decisions on their own. In other words, there may be environmental factors (parental attitudes, peer influence, socio-cultural environment etc.) or individual factors (self-concept, self-esteem, autonomy, problem solving skills, perception, metacognition, etc.) that may affect students' decision-making process (Yıldırım-Kocakaya, 2017). Although co-decisions procedure is important, it is also important for students to develop their own decision-making skills at an early age to be more determined individuals in their future lives. Considering the literature, decision-making is generally expressed as the process of choosing the one that suits our opinion among the options (Adair, 2007; Khishfe, 2012). In this context, the association of students with "making a choice" is similar to the definitions of decision-making in the literature. Considering the definitions and features of the decision-making skill in the literature, it can be said that the words in the cognitive structures of the students might be enough.

Regarding the analytical thinking concept, it was related to the words "mathematics", "intelligence", "idea" and later with the "analysis". Fewer students produced "graph" and "thinking", and at least the words "solution", "number", "different viewpoint", "problem", "data", "human", "computational" and "discrepancy" were produced. Analyzing is the basis of analytical thinking skills. In addition, analytical thinking skill is expressed as the most effective thinking skill. Therefore, the inclusion of these all concepts in the cognitive structures of the students is associated with the correct meaning and is compatible with the literature (Behn & Vaupel, 1976; Stenberg, 2006). Considering the definitions and stages made for analytical thinking skill, it can be said that the words in the students' cognitive structures are correct. However, at this point, it might be striking that students concentrate more on specific areas such as mathematics, number, problem, numeracy, and graphics. Students may think that analytical thinking skills are mostly used in numerical lessons and that numbers or graphs are often used.

The second sub-problem of the study is to determine the explanation situations of secondary school students regarding life skills. For this reason, they were asked to make sentences about the concepts of entrepreneurship, communication, teamwork, creativity, analytical thinking and decision-making life skills. Thereby, the formations of the links among concepts or the misconceptions that limit the bonds were determined. It is seen that students mostly produce scientific and correct sentences related to communication skills. At this point, it is noteworthy that although students do not make any associations with the concept of communication, the concept in which the correct sentence in scientific quality is most established is communication. Contrary to this result, although analytical thinking is associated with the entrepreneurship, creativity, and decision-making, it is remarkable that the concept in which the scientifically correct sentence is least established is analytical thinking. In addition, analytical thinking was the concept that was mostly left blank by the students in the related sentence part despite the high number of words produced. It is notable that there are few sentences that express the relevant concepts scientifically correct. In this context the table of related sentences was evaluated as a whole, it was determined that secondary school students made sentences that were mostly non-scientific or containing superficial information, then left the sentences blank regarding the concepts and formed the least number of scientifically correct sentences. In addition, the number of sentences left blank, especially regarding the concepts of creativity, entrepreneurship and analytical thinking stands out. According to Ercan and Taşdere (2010), students' inability to form a meaningful sentence containing

key concepts and leaving it blank may represent students do not have conceptual knowledge about these concepts. For the sentences left blank, it can be said that the conceptual knowledge of secondary school students regarding life skills is quite limited.

Recommendations

Based on the results of the research, it is recommended to reinforce the conceptual knowledge of the students with the activities applied in different lessons and develop the cognitive structures of the students towards the concepts of life skills in order to provide concept diversity. More applied studies on life skills can be included in all lessons, and their impact on the student can be assessed.

Author Contribution Rates

All authors equally took part in all processes of the article. All authors have read and approved the final version of the study.

Ethical Declaration

The purposes and procedure of the current study were granted approval from the ethical committee of the Trabzon University (Ethics Committee's Decision Date: 02.06.2021, Ethics Committee Approval Issue Numbers: E-81614018-000-527).

Conflict of Interest Statement

The authors declare that there is no conflict of interest with any institution or person within the scope of the study.

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Appendix I. Frequency table of key concepts and answer words

Answer Words	Key Concepts					
	Communication	Entrepreneurship	Creativity	Decision-making	Teamwork	Analytical thinking
Analysis						51
Assertiveness		20				
Business establishment		30				
Commerce		20				
Common mind					16	
Computational						21
Computer	85					
Conversation	88					
Courage		44				
Data						27
Desire		19				
Dialog	16					
Different viewpoint						22
Discrepancy						22
Dream			15			
Economy		17				
E-mail	15					
Friendship					39	
Fume	17					
Game					37	
Graph						30
Group					59	
Help					15	
Human						27
Idea		20	75	42		35
Imagination			50			
Innovation			18			
Intelligence		20	83			28
Internet	31					
Invention			27			
Leader		77				
Love and respect					27	
Making a choice				54		
Mathematic						81
Message	23					
Number						29
Organization				16		
Outcome				27		
Problem						15
Project					29	
Reading			22			
Science			18			
Self-confidence		33				
Social media	52					
Solidarity					40	
Solution						18
Space			21			
Sport					80	
Stability				44		
Tablet	87					
Technologic device	37					
Technology	24					
Telephone	151					
Television	24					
Tenacity		17				
Thinking				30		32
Truth				17		
Unity and solidarity				108		
Working		21			17	