



Educational Policy Analysis and Strategic Research

1949 - 4289

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EPASAD

Educational Policy Analysis and Strategic Research

Volume 19 Issue 1 March, 2024



A Journal Sponsored by International Association of Educators (INASED)

EDUCATIONAL POLICY ANALYSIS AND STRATEGIC RESEARCH

Indexing/Abstracting:

- 1- ERIC: <http://www.eric.ed.gov/>
- 2- ERIH PLUS: <https://dbh.nsd.uib.no/publiseringskanaler/erihplus/>
- 3- EBSCO Publication: <http://www.ebsco.com>
- 4- Cabell's Directory of Publishing: <http://www.cabells.com>
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Development of a Scoring Key to Evaluate the Creative Story Writing Levels of Secondary School Seventh Grade Students¹

Ebru ÖZTÜRK²

Usak University

Erol DURAN³

Usak University

Abstract

In this study, it was aimed to develop a rubric to evaluate the creative story writing skill levels of seventh grade secondary school students. The research was designed in quantitative research method and survey model. In the research, convenience sampling technique was used and 270 students studying at the seventh grade level of secondary school were studied. In the process of creating the item pool of the research, 11 academicians, 8 teachers and 7 graduate students were consulted. In order to create an item pool, firstly, a literature review was conducted. The prepared item pool was presented to the field experts and the draft scale was applied to the sample group. As a result of the findings obtained, it was concluded that there was a high level of consistency between the evaluations made by different raters. The validity studies of the scale were conducted and it was determined that the content and criterion validity were appropriate. In order to determine the reliability of the scale items, Cronbach's Alpha value was determined. It was determined that the Cronbach's Alpha value of the scale with all sub-dimensions was above 0.7. Cohen's Kappa statistic (κ) was used to ensure internal consistency between raters ($p < .05$). As a result of the analyses, it was determined that there was almost perfect agreement in the items in the scale. Finally, Cohen's Kappa coefficient was determined to determine whether there was agreement between the raters, and a significant level of agreement was found between the raters of the scale. In addition, as a result of the results obtained from the expert opinions, it was decided that the rubric should consist of 6 dimensions and 24 items in total, namely "imagination", "originality", "different perspective", "content", "language and expression", "form", and five levels, namely "strongly agree", "agree", "partially agree", "disagree" and "strongly disagree".

Keywords: Writing, creative writing, rubric

DOI: 10.29329/epasr.2024.655.1

Submitted: 27 December 2023

Accepted: 26 February 2024

Published: 31 March 2024

¹ It was produced from the doctoral dissertation titled "The Use of Orff-Schulwerk Approach in Developing Creative Story Writing Skills of Seventh Grade Secondary School Students".

² PhD Student, Institute of Graduate Studies, ebruozturk43@gmail.com, ORCID ID: 0000-0002-4995-9496

³ Prof. Dr., Uşak University Faculty of Education, erol.duran@usak.edu.tr, ORCID ID: 0000-0001-7581-3821

Introduction

Today, the most problematic situation in interpersonal social relations, in the daily routines of family members, and in educational activities carried out with students in educational environments is the desire of individuals to achieve success without being productive, without labouring, without spending time and effort. Technological developments and rapid change in the information world feed this desire. Individuals can now access the information they want with a single "click" and solve many problems in seconds without spending time. This situation pushes individuals towards simplicity and makes information worthless.

The fact that today's children, who are moulded with ready-made knowledge and quickly get bored with actions that require a long process, have this point of view will cause them to be defined as "unqualified". In order for children to become individuals in accordance with the requirements of the age and to carry the qualities of the changing world on them, creative and productive thinking skills of individuals should be developed and it should be ensured that they use these skills effectively in the widest area.

Changes in every field have changed the meanings attributed to skill areas. The information about 21st century skills can be determined by taking into consideration the criteria of the personnel sought by the authorities in the employer sector or the success ranking of the countries in the internationally recognised exams at the PISA level. In the 21st century, individuals are expected to be individuals who have problem-solving skills, can cooperate, can use technological resources to access information, are open to new views and ideas, have high communication skills, can take responsibility, have self-confidence and self-control, have developed themselves in socio-cultural terms, have strong leadership skills, are productive, harmonious, and can think critically and creatively (Eryılmaz & Uluyol, 2015).

Creativity skill, which is in a very important position among these skill areas, which is the source of creating new inventions, enabling to perceive and make sense of life differently, is a skill that is accepted to be innate in every individual, but this skill area needs to be developed in order to be used in an integrated manner in all areas. Therefore, the biggest task in developing the creativity skills of students who spend most of their time at school falls on education programmes in general and language education programmes in particular.

In the literature, creative thinking skill has been attributed different meanings. Field experts define creative thinking as;

- ✓ A skill that varies from person to person and develops depending on the process,
- ✓ Being open to change and going beyond the current situation,
- ✓ It is a lifelong process,

- ✓ To be able to produce different solutions to existing problems,
- ✓ Making new connections between events,
- ✓ The ability to produce new products based on experience and experiences (Runco, 1996, Rıza, 2000, Craft, 2003, Senemoğlu, 2005, Özözer, 2008, Yenilmez & Yolcu, 2007).

Language education consists of listening, speaking, reading and writing skills known as comprehension and expression skills. Writing skill is the last and most difficult skill among these skill areas. Writing activities, which have both mental and physiological dimensions, are the types of activities that students resist the most. The reason for this is the dominant understanding of writing activities. Until recently, in writing activities, students were given a concept or a maxim and expected to produce a text on this concept, the teacher evaluated the resulting product and mostly did not give feedback to the student (Akkaya, 2011). In contrast to this situation, it is known that fun and creative writing activities that appeal to multiple sensory areas of students and stimulate their feelings of excitement break the existing prejudices against writing skills (Essex, 1996).

Creative writing activities are based on the principle that students use all their sensory organs in the writing process. The more actively an individual participates in writing activities, the more dominant he/she is in every stage of the writing activity, the more he/she can look at events or facts from different points of view while writing a text, the more creative he/she is considered to be.

It can be said that creative writing studies emerged in the late 19th and early 20th centuries. The first examples of these studies can be found in writing studies at Harvard University (Myers, 1993; Bishop, 1994). Creative thinking individuals are expected to produce original ideas in creative writing studies, to include unusual fictions, to use imagination effectively, and to produce different solutions to problems by establishing different intellectual connections.

In creative writing, individuals express their feelings and thoughts through various types of writing (stories, tales, poems, posters, etc.) (Kaya, 2013). According to Demir (2013), creative writing is the free transfer of all existing auditory, visual, verbal, symbolic stimuli through writing by reconstructing and creating new meaning relations between these stimuli. The act of writing alone contains creativity skills, but the creation of genres such as stories, tales and poems based on creative writing is considered as creative writing.

When it comes to creative writing products, the first thing that comes to mind is story texts. Because stories, being event-based texts and allowing for fictions that can be encountered in daily life, provide individuals with a wide range of movement. In history, stories have been the most frequently used texts in the education process (Becit & Coşkunserçe, 2023). Because story texts have a structure that educates the individual as well as providing a pleasant time and makes the individual think while entertaining. Stories are competent sources that are used both in developing listening skills, contributing

to writing skills and expanding the vocabulary of individuals. At the same time, the skill area that individuals use most actively in activating their imagination and creating creative story texts is writing skill (Güvey Aktay, 2020).

Creative writing studies are studies with a predominant intellectual aspect. Because creativity skill first develops in the mind and then turns into action. For this reason, there was a need for criteria regarding the characteristics of a creative writing to be accepted as creative. When the literature was analysed, no rubric for evaluating creative writing studies was found. In order to contribute to researchers working on this field, a rubric was developed to determine the level of creative story writing skills of seventh grade secondary school students.

Method

Research Model

In this study, the survey model, one of the quantitative research methods, was preferred. The survey model is a research model that aims to explain an existing situation as it is and to reveal the current situation within its own conditions (Karasar, 2009).

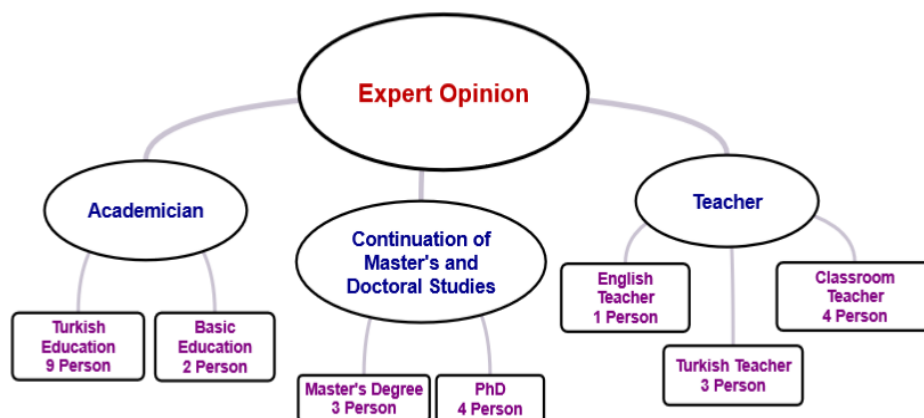
Working Group

In this study, convenience sampling technique was preferred. The study group of the research consists of 270 students (139 female, 131 male) studying at the seventh grade level of secondary school.

Data Collection Process and Development of Data Collection Tools

In the study, an evaluation scale consisting of 6 dimensions, 24 items and 5 levels was developed in order to evaluate creative story writing skills by using the opinions of field experts. The qualifications of the experts whose opinions were consulted during the scale development phase are given in Table 1.

Table 1. Qualifications of the Experts Consulted



While developing the rubric developed in line with the opinions received from the experts, the following steps in the literature were followed (Karakoç, Dönmez; 2014):

- ✓ Needs Analysis,
- ✓ Literature Review,
- ✓ Creating a Pool of Substances,
- ✓ Submission of the Article Pool to Expert Opinion,
- ✓ Application of the Scale Shaped by Expert Opinion to the Draft Sample Group,
- ✓ Validity and Reliability Analyses and Finalisation of the Scale.

Needs Analysis

Although it is known that creativity skill is basically an innate skill, it is a fact accepted by experts that it is a developable skill area. Every individual is born with a certain level of creativity skills. The conditions, the quality of the education received and the interpersonal relations in the social environment of the person can improve this creativity skill or cause a decrease in this skill. In today's conditions, the changes in the field of technology, which have a dizzying speed, have also affected the education sector. Children raised with this education seek the same speed in all fields. For this reason, they tend to stay away from actions where the ability to think is utilised for a long time. However, the basis of the existential process of the individual is based on productivity skills. Individuals maintain their place on the stage of existence to the extent that they can produce new products, knowledge, skills or ideas.

The researcher has completed his master's degree in the field of Turkish education and continues his doctoral education in the same field. She is currently actively working as a Turkish teacher and is in her seventh year in her profession. As an extension of the national exams being implemented in the country, she has observed that students tend to solve multiple-choice questions, and she has found that they are very reluctant in writing studies. Especially in their answers to the questions based on generating new and original ideas, she found that they either did not express any opinions or preferred expressions that were repetitive of each other's opinions. This situation reduces the quality of the results obtained from international exams.

Writing skill is the most effective way of expressing thoughts and making them permanent. Creative writing skill, which is based on putting forward and concretising an original and new thought, should be one of the most basic activities of language education and Turkish language teaching. For this purpose, the researcher has searched for methods on how children can acquire creative thinking and creative writing skills. The researcher has started an intellectual process about which dimensions

creative writing skills should have and which characteristics of a writing can be accepted as creative writing.

Literature Review

A literature review on creative writing was conducted by the researcher. As a result of the review, national and international publications were analysed. As a result of this review:

- ✓ National and international articles on creativity skills,
- ✓ At national level; 1926, 1930, 1936, 1936, 1948, 1968, 1981, 2015 and 2018 teaching programmes,
- ✓ Papers published at national level, including creativity skills,
- ✓ Books on creativity skills published at national and international level,
- ✓ Master's and doctoral theses on creativity and creative writing were analysed.

Creating an Article Pool

As a result of the literature review, item pools related to the subject, creativity and creative writing skills were created. The statements in the item pool were classified by two researchers who are experts in their fields as 8 dimensions and 21 items in 5-point Likert type. Care was taken to ensure that the dimensions and items were simple and comprehensible and that a statement contained a single judgement.

Submission of the Article Pool to Expert Opinion

After the preparation of the draft scale, the scale was submitted to expert opinion. The experts commented on the necessity of the items, whether they clearly explain what is intended to be explained, and the originality of the expressions. As a result of the opinions received from the experts, some of the items were removed, some items were merged, new items were added and 6 dimensions, 30 items, 5-point Likert type were prepared to be applied to the draft sample group. Thus, the content and face validity of the scale was ensured with the expert opinions.

There are 6 dimensions in the scale: imagination (18), originality (22), different perspective (18), content (21), language and expression (13) and form (8). The maximum score that the student can get from these dimensions is 100 points and the minimum score is 20 points. Even a student who gets the lowest score from the items in all dimensions does not get 0 points.

In determining the levels in the scoring key, 2 academicians who are experts in the field of measurement were consulted and the levels were determined as strongly agree (5), agree (4), partially agree (3), disagree (2), strongly disagree (1).

Application of the Scale Shaped by Expert Opinion to the Draft Sample Group

In line with the expert opinion, an application was made to determine the validity and reliability level of the evaluation scale, which was finalised to be applied to the draft sample group.

The students in the study group were asked to write a free themed story text. While creating the story texts, no subject limitation was imposed on the students, and they were asked to complete the story texts under the control of the teacher during 2 lesson hours (40+40 minutes). The story texts obtained from the students were scored with the scoring key developed by the researcher.

Validity and Reliability Analyses and Finalisation of the Scale

The steps followed to ensure the validity and reliability of the scale are as follows:

Validation Process:

Content Validity

Determining whether the quality to be measured by the evaluation scale is measured exactly or not is very important in terms of content validity. The evaluation scale is considered qualified to the extent that it serves the purpose. In particular, field experts who have studies on creative writing, academicians who have a career in the field of Turkish and classroom education, researchers who continue their master's and doctoral studies in the field of Turkish and classroom education, Turkish and classroom teachers have presented opinions that the scale serves the purpose. In this way, the content validity of the scale was found to be high.

Criterion Validity (Conformity and Prediction)

The views on the qualities that a creative writer should have in previous studies on creative writing (Torrance, 1962; Kale, 1994; Karakuş, 2001; Brookes & Marshall, 2004; Temizkan, 2010; Demir, 2011; Kırmızı, 2011; Orhon, 2014; Susar Kırmızı, 2015; Saluk & Pilav, 2018) support the dimensions and items in the scale. It was determined that the items in the scale have high convergent validity due to the similarity with previous studies.

The items in the scale were applied to the draft sample group and the story texts obtained from the students were scored by different raters. The fact that the scores given by the raters to the activity sheets were similar reveals that the scale can accurately measure the quality to be measured in the future. Thus, the predictive validity of the scale was found to be high.

The Reliability Process:

- Care was taken to ensure that the items included in the draft scale and submitted to expert opinion were clear and understandable. In line with the opinions received from the experts, the items that were not clear enough were corrected, the items that were found to measure more than one skill

were divided into two separate items, and the reliability level of the scale was increased by removing the items that were not thought to fully measure the skill to be measured.

- The fact that the items in the scale were formed in line with the expert opinion at all levels from basic education level to graduate education level increased the reliability of the scale.

- The fact that the evaluation level of the items in the scale was determined as 5 levels increased the sensitivity of the scale, thus contributing to the reliability of the scale.

- In order for the statistical procedures to be performed on the measurement tool to be carried out with parametric measurements, the data obtained from both raters must show a normal distribution. The kurtosis and skewness coefficients of the researcher scores were determined based on the normality test results on SPSS. According to Tabachnick and Fidell (2013), data with skewness and kurtosis values between +1.5 and -1.5, and according to George and Mallery (2010), data with skewness and kurtosis values between +2.0 and -2.0 show normal distribution. In the study, it was determined that the data obtained from both researchers (skewness= -.059 kurtosis= -1,282) showed normal distribution.

- In order to determine the reliability of the scale items, Cronbach's Alpha value was determined. According to Büyüköztürk (2011), if the Cronbach's Alpha value of the scale items is above 0.7, the scale is considered reliable. The Cronbach's Alpha value of the scale with all its sub-dimensions (.968) imagination (.953), originality (.884), different point of view (.863), content (.934), language and expression (.911), form (.727) was found to be above 0.7. Thus, it was determined that the scale was reliable.

- Cohen's Kappa statistic (κ) was used to ensure internal consistency between raters ($p < .05$). The results of this statistic are given in Table 2.

Table 2. Inter-rater Agreement

Categories	Kappa Statistic Value (κ)	P
Stimulating the imagination	,73	,000
Fantastic elements	,73	,000
Example out of daily life	,79	,000
World of emotion and thought	,78	,000
The element of curiosity	,77	,000
Element of humour	,70	,000
Original ideas	,81	,000
Divergent thinking	,70	,000
Alternative solutions	,70	,000
Consistent writing	,83	,000
Impressive connections	,78	,000
The sequence-node-solution plan	,84	,000
Effective end	,87	,000
Original characters	,82	,000
Effective spaces	,79	,000
Fluent narration	,76	,000
Clear and understandable expression	,88	,000
Simple and sincere style	,78	,000

Images	,86	,000
Symbols	,81	,000
Effective use of language	,81	,000
Page layout	,77	,000
Punctuation	,82	,000
Spelling	,81	,000

According to Landis and Koch (1977), it is considered that there is a significant level of agreement between raters with kapa values of .70 and above. As a result of the analyses, it was found that there was a significant level of agreement in the items of stimulating the imagination, fantastic elements, examples out of daily life, world of emotion and thought, element of curiosity, element of humour, divergent thinking, alternative solutions, impressive connections, effective places, fluent expression, simple and sincere style, page layout; almost perfect harmony in the items of original ideas, coherent writing, series-node-solution plan, effective ending, original characters, clear and comprehensible expression, images, symbols, effective use of language, punctuation and spelling.

As a result of all these statistical data and expert opinions, it can be said that the scale prepared is a valid and reliable scale.

Analysing the Data

In order to determine the validity and reliability of the scale items determined as a result of expert opinion, literature data and needs analysis, story texts were written by seventh grade secondary school students and these story texts were scored by different raters through the scale. In order to perform statistical operations on the scores, kurtosis and skewness coefficients of the data were determined. When it was determined that the data were normally distributed, Cronbach's Alpha coefficient was calculated to determine whether the scale items were consistent within themselves and whether they measured the feature to be measured.

Finally, Cohen's Kappa coefficient was determined to determine whether there was agreement between the raters, and a significant level of agreement was found between the scale raters.

Conclusion, Discussion and Suggestions

In this study, an evaluation scale was developed to measure the creative story writing skills of seventh grade secondary school students. Many variables have an effect on the data obtained in education, especially in the field of social sciences. Naturally, this situation makes it difficult to measure the studies from an objective point of view. However, it should not be forgotten that in order to bring about a behavioural change in education, to carry the existing competence to a higher level, and to eliminate the existing missing learning, a measurement-evaluation process is mandatory.

Measurement in education is the process of determining the current situation through various scales. In other words, measurement is the variables obtained as a result of observation (Güler, 2011). Evaluation is the process of reaching a conclusion as a result of the measurement. Without measurement

and evaluation steps, educational activity turns into a vicious circle. Because the practices in education and the measurement tools developed should be subjected to measurement and evaluation so that incomplete or incorrect learning can be prevented (Özçelik, 2010). At the same time, evaluation is the element that shows continuity and improves educational activities (Yılmaz, 2009). For this reason, measurement and evaluation process is vital in educational activities.

Writing is the most recently developed and the most difficult skill area to acquire. For this reason, it is an area where students have many prejudices. It is interpreted as a very complicated skill area by students and adults for reasons such as requiring coordination of body and mind, employing creativity skills in producing original products, and prioritising both speed and quality. This situation makes the studies on writing skills even more valuable.

When the literature is examined, scale development studies on how to evaluate a creative writing (Cheung, Tse, & Tsang, 2001), evaluation factor on writing skill and creative writing skill (Coleman, 1981; Vaezi & Rezaei; 2019) or evaluation of another factor (Taylor & Hoedt, 1966; Beydermir, 2010; Maden & Durukan, 2010; Temizkan, 2011; Kırmızı & Beydemir, 2012; Demir, 2013; Sever, 2013 Kasap, 2019; Akbaba, 2020), and the basic qualities of creativity and creative writing skills (Bishop & Starkey, 2006).

In the measurement tool developed within the scope of the research, there are six dimensions in total: "imagination", "originality", "different perspective", "content", "language and expression" and "form". Thirty items were included depending on these dimensions. The scale was finalised as a total of twenty-four items by removing the items that were not functional from the scale. While determining these dimensions and sub-items that are thought to be present in a creative story, previous creative writing scale studies, master's and doctoral theses written in this field, book studies on creative writing, expert academics and teachers' opinions actively working in the field were taken into consideration. As a result of all these justifications, the reasons for the inclusion of these dimensions will be detailed.

In order to talk about a creative story, it is undoubtedly necessary to produce a product in which imagination is used effectively. In the literature, there are numerous examples of writing that address an existing situation (Simpson, 1922; Rugg, 1963; Çankaya, Yeşilyurt, Yörük, Şanlı, 2012; Küçükali & Akbaş, 2017; Liao & Gendler, 2019; Ünveren, 2020). However, producing a new and unprecedented product is an extension of being able to use imagination actively. The boundaries of the world of imagination are quite wide. Blending the elements of this unlimited world in a story text will make that text distinctive from other genres.

The concept of "originality" is defined in the dictionary as "originality, which is distinguished from similar ones in terms of its qualities, has its own unique qualities, original" (Ayverdi & Topaloğlu, 2007:835). In later studies in different fields, it was used with expressions such as innovation, creativity and similarity (Demirtaş, Gedik, Gedik, & Avdan, 2023). In today's world where every product is

obtained with a single button and even this single button brings along information theft, producing products free from copies is characterised by originality skill. Because the concept of originality basically means "not being found in others, being original". Originality also requires the individual to bear the consequences of his/her own actions. An individual is authentic to the extent that he/she can bear the consequences of his/her actions (Sheldon et al., 1997). For this reason, when talking about a creative story, the concept of originality should be mentioned immediately afterwards. Otherwise, all of the products put forward will be considered as copies of one another.

Interpreting the world differently, handling events from a different perspective is the basis of all inventions. Individuals with a different perspective start life one step earlier. Undoubtedly, this also applies to a creative story. Individuals who have some ability in writing can produce quality story products. However, in order to talk about a creative story, a different perspective is needed.

The recorded form of communication or the subject of all kinds of written and verbal elements can be described as "content" (Gül & Nizam, 2021). In creative story texts, content is as important as thought structure. Because the content element is the main criterion that reveals whether a text is a story or not. In a creative story, unusual content elements and the way these elements are interpreted are very important. The author who creates a creative story conveys his/her observations, thoughts and emotional movements through the filter of his/her original fictional world. For this reason, content is an indispensable element in a creative story as in every story.

The writer who wants to create a creative story should use the language effectively in order to convey what he wants to tell to the reader. Otherwise, what he/she designs in his/her thought world will remain an empty endeavour. In the dictionary, style means "the way followed, the style adopted". In language and literature, style is the way of expressing one's own feelings, thoughts and excitement, the way of using language. In this respect, the field of interest of stylistics is to examine the formal-individual characteristics of the author in the use of grammar and syntax rules while using language material (Durmuş, 2012). Literary texts reflect the literary features of the language in which they are written (Karabulut, 2012). Although it does not play as effective a role in a creative story as other dimensions and sub-items, the ability to use language is one of the most basic qualities that a creative story writer should carry.

According to some researchers, the element of "form" is one of the main obstacles to creativity. There are two main views on this issue. Researchers who adopt the first view argue that formal elements restrict the author in creative products, while researchers who adopt the second view argue that formal elements should not be neglected even if a creative product is produced. As a matter of fact, Attila İlhan refused to use punctuation marks in his poems on the grounds that they overshadowed his creativity, and he wrote and published his poems without using punctuation marks. Although it cannot be the basic principle in creative story writing skills, it is considered important to write the story legibly and in

accordance with the rules of the language in order to arouse desire in the reader. For this reason, the element of "form" is accepted as one of the qualities of the creative story.

The definitions of creativity, which is an abstract concept, started to be given historically with Guilford's studies (Guilford, 1956). According to Torrance, creativity consists of processes such as the capacity to find gaps in thoughts or processes, to produce various solutions to problems, to develop new ideas and to make new connections between ideas (Torrance, 1966). Creativity skill, whose different aspect is discovered with each new study, is a skill area that needs to be carefully emphasised.

Academics, teachers, doctorate and master's degree researchers, who are experts in their fields, expressed their opinions on the study. As a result of these opinions, they stated that the scale items serve the purpose and that the items are presented in a clear and understandable manner. They also stated that each item measures a single characteristic.

When the previous studies on creative writing were analysed, it was revealed that the items of the scale were similar to the qualities in these studies. Likewise, the fact that two raters gave similar scores to the group to which the scale was applied reveals that the scale is valid.

Policy Implications

In the field of social sciences, especially in creative writing studies where the world of thought is brought to the forefront, evaluation criteria are a big problem. Because there is no consensus on which aspect of the products put forward by individuals will be considered creative or qualified. With this study, it is aimed to provide unity in evaluating the creative story texts created by the students. Similarly, criteria to be used in the evaluation of other text types can be determined by considering the criteria in this study.

This study was limited to the seventh grade level. Similar criterion development studies can be conducted at other grade levels in order to evaluate the texts created by students. Creative story writing skill has an important place especially in the field of language education. For this reason, similar scale development studies should be carried out in other fields.

The study was designed by considering all details in order to guide other researchers in the field of scale development. This study is expected to guide researchers in scale development studies to be conducted in other fields.

Conflict of Interest

Disclosure statement: The authors whose names are listed below declared the following details of affiliation or involvement in an organization or entity with a financial or non-financial interest in the subject matter or materials discussed in this manuscript.

"No potential conflict of interest was declared by the authors".

Funding Details

There is no funding for this study.

Ethical Statement

This study was conducted in accordance with ethical principles. In case of any plagiarism, the authors take responsibility for the necessary sanctions.

Credit Author Statement

Author 1: Conceptualization and Methodology, Validation, Supervision . *Author 2:* Writing- Original draft preparation, Visualization, Investigation, Writing- Reviewing and Editing.

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Relation between Resilience and Enneagram Personality Types

M. Hülya ÜNAL-KARAGÜVEN¹

Marmara University

Abstract

The purpose of this research is to examine the psychological resilience levels of adult individuals in terms of demographic characteristics and enneagram personality types. The findings may help experts working in the field and contribute to the literature. The study is an original study that has not been researched before. Participants consisted of parents of students attending a pre-school education center. Data was collected from 252 people, 182 women and 70 men. In order to collect data a "Questionnaire", "Brief Resilience Scale" and "Enneagram Personality Scale" were used to collect data. T-test and analysis of variance techniques were used to evaluate the changes in the level of the resilience with demographic variables. Correlation analysis was conducted to determine the relationship between resilience and enneagram personality types. Results of the statistical analysis has been determined that resilience levels are higher in men, older individuals, married people, and those with high education and income levels. Additionally, levels of resilience were found to be positively related to enneagram personality types. This relationship was found statistically significant in a total of six personality types: achiever, original, observer, adventurer, leader, and accommodator. This work contributes to the study of resilience and related factors. Similar studies were proposed for the future to bolster the results.

Keywords: Resilience, Enneagram, Personality

DOI: 10.29329/epasr.2024.655.2

Submitted: 04 January 2024

Accepted: 11 February 2024

Published: 31 March 2024

¹Assoc. Prof. Dr. Atatürk Faculty of Education, Marmara University, Istanbul, Turkey, ORCID: 0000-0002-6375-8930
Email: mhulya@marmara.edu.tr, mhkhulya@gmail.com

Introduction

Individuals are confronted with traumatic events or circumstances that are inevitable throughout their lives. Resilience becomes significant as it enables individuals to lead a healthy life by mitigating the adverse impacts of those traumatic experiences. When faced with stressful life situations, resilience may help people restore, enhance, and maintain their psychological health (Farber and Rosendahl, 2020; Ungar and Theron, 2019). Resilience also called psychological resilience (<https://dictionary.apa.org/resilience>). Resilience is the process and result of effectively adjusting to tough or challenging life experiences, particularly through mental, behavioral, and emotional flexibility and adaptation to both internal and external demands (<https://dictionary.apa.org/resilience>). While providing the dictionary definition of resilience, which means "durability" or "robustness" in English and succinctly describes an individual's capacity to effectively adjust to stress and adversities, it is worth noting that originates from the Latin word "resilire." It refers to "the elasticity of a substance and its ability to easily return to its previous state" (Greene, 2012). The Oxford English Dictionary (1978) defines it as "to recover quickly when crushed and return to its former condition and form." It is defined as "adapting quickly to change and negativities and recovering quickly" according to Merriam-Webster Dictionary (1987). Rutter (2006) describes resilience as having the ability to overcome all of life's stresses and obstacles, adapt, and produce positive outcomes after being exposed to difficulties, difficulties, and unfavourable experiences. In dictionaries, it is expressed as "psychological resilience" in the field of "Resilience" (<https://tureng.com/tr/turkce-ingilizce>). Nevertheless, Turkish literature also employs the term "psychological endurance" to refer to resilience (Eminağaoğlu, 2006; Kılıç, 2014; Uçar, 2014; Sönmezer, 2015; Yaşayanlar, 2018). The term "resilience" was used throughout this research.

Newman (2003) posits that resilience is not an inherent quality however a capacity that can be learned and improved by any individual. Stout and Kipling (2003) claim that the presence of any risk factor is a prerequisite for developing resilience. Risk is defined as the existence of one or more consequences that elevate the probability of an adverse occurrence or circumstance taking place (Stout & Kipling, 2003). Protective factors hold equivalent significance to risk factors with regard to resilience. Ramirez (2007) defined protective factors as those that mitigate or eradicate the potential consequences of risky conditions or occurrences. The most important of these factors that contribute to people's resilience are an individual's perspective and manner of interacting with the world, the availability and caliber of social support systems, and coping mechanisms (APA, 2017). Fraser and Jenson (2008) and Vance and Sanchez (1998) examined protective and risk factors under three distinct headings in their respective studies. These categories are classified as environmental, familial, and individual.

Socioeconomic position, peer connections with problematic dynamics, social violence, and child neglect are a few examples of environmental risk factors. Environmental protective factors that

can shield a person from risk factors include examples like positive interactions with peers, positive role models, positive relationships with relatives, and supportive school environments (Fraser & Jenson, 2008; Vance & Sanchez, 1998).

Having a crowded family, problems with harmony in family relationships, being a child of a divorced family or living separately from parents for any reason, having substance use or various addictions in the family, and having individuals with any pathology in the family are all examples of family-based risk factors. A healthy relationship between parents, paying attention to rules and boundaries at home, being sensitive to personal differences, having a well-educated parent, and positive future designs in the family are examples of familial factors that can protect the individual against these risk situations (Fraser & Jenson, 2008; Vance & Sanchez, 1998).

An individual's personality traits, diseases, low IQ, substance use, ethnic background, and academic performance are all examples of individual risk factors. Intellectual or emotional intelligence, a positive outlook, academic competence, high self-esteem, a sense of humour, and developed problem-solving abilities are all examples of individual protective factors (Fraser & Jenson, 2008; Vance & Sanchez, 1998). This demonstrates the significance of an individual's personality traits concerning resilience. Furthermore, it is thought that individual factors are the most significant differentiating factor among individuals who exhibit distinct psychological and behavioural response patterns despite sharing identical familial and environmental factors. For instance, siblings who attend the same school and reside in the same family may experience the same risk factors at varying degrees of severity. The degree of resilience an individual possesses may vary. Here, it is the unique attributes of each individual that distinguish them. Personality traits have been stated by Fraser and Jenson (2008) and Vance and Sanchez (1998) as prominent individual risk factors. As a result, when it comes to individual variances in resilience, personality qualities may be one of the most important underlying differences. In this situation, an examination of the personality issue is necessary.

As of the present, the concept of personality, which distinguishes an individual from others, has been the subject of numerous classifications and definitions, as well as the development of many different theories (Adler, 1964; Ericsson, 1963; Freud, 1923). Presently, the concept of personality can be succinctly summarised in a definition authored by Gökkaya (2020). Personality encompasses, as per this definition, every behavioural pattern that makes individuals' feelings, thoughts, and behaviours unique and that they cultivate to accommodate their surroundings. Aside from creating the notion of personality that distinguishes people from one another, different classifications have been made and measurement tools aimed at measuring these personality types have been developed (Cattell, 1949; Eysenck, 1947; Jung, 1925). One of them is the enneagram personality types.

Like others, the enneagram defines and classifies personality types (Riso & Hudson, 1996; 1999). The term "enneagram," derived from the Greek words "gramos" and "ennea," denotes nine

distinct personality styles (Naranjo, 1994). There are various opinions regarding its emergence. Today, however, it is known that Ichazo was the first to say it in the West (Randall, 1979). Ichazo has stated that the enneagram was imparted to him by Sufi teachers in Afghanistan. The theory acknowledges the existence of three centers and considers the entirety of the human being. It is suggested that each center generates three distinct personality types, for a grand total of nine fundamental personality types. Consequently, one of the nine potential categories of personality types that each individual possesses is more dominant than the others, according to this theory (Palmer, 2010; Riso and Hudson, 2003). The domestic style is more dominant of the nine styles, according to Wagner (1988), because it provides insight into how an individual will act in stressful times. Again, as stated by Wagner (1988) each style explains the individuals' choices, worldview, motivation sources, and values, as well as their responses to stress, individuals, and situations. Riso (2003) indicated, in describing that the numbers represent personality types and not any value. Likewise, it makes no difference what order these numbers are in or whether they are large or small. The enneagram typology does not incorporate the notions of good or bad, which precludes any form of comparison among personality types.

The personality categories comprising the enneagram typology can be briefly outlined as follows: Type 1 Perfectionist: They are perfectionists and reformers who are continually striving for the ideal and are difficult to please (Acarkan, 2016). Individuals with a reformist attitude, according to Palmer (2010), always tend to push their living conditions to the next level, they have a leadership style, and they might get lost in details. Type 2 Helper: Individuals of this type, according to Riso and Hudson (1996), always demand love and affection from their surroundings. They are also predisposed to somatization, eating problems, and sexual disorders. They have a robust and effective structure that takes into account the demands of their environment. Type 3 Achiever: People with this personality type have a strong inclination to be workaholics and are continually striving for achievement in their lives (Palmer, 2010). Their actions are devoid of emotion. They excel at persuading, organizing, and mobilizing others (Acarkan, 2016). According to Riso and Hudson (1999), people with these personality qualities are more likely to have narcissistic personality disorder, hypertension, depression, anger, arrogance, and psychopathic behaviour patterns. Type 4. Original: Palmer (2010) remarked that these people are continuously looking for originality and aspire to be unique. If these people are unable to cope with emotions of lack and inadequacy in their lives, they may become melancholic and withdrawn, according to Riso and Hudson (1999). Type 5 Observer: People with the observer personality want to be competent and capable. These people have developed observation abilities and are continually alert to life (Riso & Hudson, 1999). According to Palmer (2010), these people are concerned about the privacy of their personal lives and so do not wish to be in the public glare. Being overly distant in interpersonal relations, introversion, arrogance, and a lack of empathy are among the unhealthy personality traits of observant persons, according to Acarkan (2016). Type 6. Loyalists: Individuals belonging to this category, as defined by Riso and Hudson (1999), desire stability and security in their

lives. In addition to avoiding risky and dangerous situations, they frequently exhibit anxiety, suspicion, and indecision (Riso & Hudson, 1999). Type 7 Adventurer: According to Riso and Hudson (1999), people in this group are very productive and their thoughts are usually busy with something. The disadvantage of adventurous people is that they make decisions without thinking. According to Riso and Hudson (1999), people with this personality tend to abuse substances. Type 8. Leader: According to Palmer (2010), persons with a strong sense of justice demonstrate their love for others by protecting them. They can push themselves and their emotions to the limit. Their characteristics include the ability to confront challenging problems bravely and to lead others. According to Matise (2007), while members of this group are strong and autonomous, they may also be conflicting and domineering. They are afraid of appearing weak and being injured if they do not exert control. According to Riso and Hudson (1999), people with this personality type may continually endeavour to gain control, even at the expense of others. Type 9 Accommodator: According to Riso and Hudson (1999), these people who dislike conflict are tranquil, conciliatory, and harmonic, and are sometimes referred to as mediators. Riso & Hudson (1999) pointed out that these people may be vulnerable to some pathologies such as depression and severe depersonalization.

The assumptions posited within the enneagram model have been put forward with the aim of enhancing our comprehension of the intricacies of human nature and to date, various scales have been devised to assess these personality characteristics (Hudson, 2015; Randall, 1979; Riso and Tastan, 2019; Wagner and Walker, 1983; Yılmaz et al., 2014). The scale used in this research was the Enneagram Personality Scale developed in Turkish by Subaş and Çetin (2017).

There are studies in the literature on how various risk factors and protective factors affect resilience. Family, environment, friends, school variables, and personality characteristics of the individual have been mentioned particularly in studies conducted on teenagers and young adults (Ayar, 2018; Eley, Cloninger, Walters and al., 2013; Eminağaoğlu, 2006; Gizir, 2007; Nieto, Visier, Silvestre, et al., 2023; Oshio, Taku, Hirano, et al., 2018; Özcan, 2005; Özer, 2013). The research indicates that resilience is positively influenced when personal, environmental, and familial factors are positive (Hetherington & Stanley-Hagan, 1999). It appears crucial to consider individual factors such as demographic characteristics and personality traits in this situation. Nonetheless, a study utilizing the enneagram personality type classification, to assess the relationships with resilience, has yet to be found in the literature.

The Importance of the Study

The significance of resilience in relation to an individual's mental health is widely acknowledged. The correlation between personality traits and individual resilience renders the study of resilience and personality traits a significant and worthwhile subject for research. The experts in the field may be able to improve the psychological health of the individuals who comprise society with the

aid of these results. The results can contribute to the literature and can serve as models for future research.

Aim of the Study

The purpose of this research is to analyse the resilience levels of adult individuals according to their demographic characteristics and enneagram personality types.

Research Questions

1. Does the level of resilience differ according to demographic variables?
2. Is there a relationship between the level of resilience and enneagram personality types?

Method

This section contains information regarding the study's research model, population and sample, and data-collecting tools. Furthermore, the results of data collecting and statistical analysis are explained. Later, the findings were interpreted in light of past research results.

Model of the Study

This study is a descriptive and quantitative study. The descriptive survey comprises the researches, carried out in large groups, to receive opinions, and observe attitudes of the individuals in such group concerning a fact or an event, as well as describing these facts and events. Scientific studies examine events or situations in light of specific variables, to discern any significant relationships that may exist among them (Karasar, 2011). Since the resilience levels are analyzed in terms of several variables in this research, the descriptive survey model was used.

Participants

Data was gathered from 252 parents of preschool students between March and April 2023. The population of the research is the European side of Istanbul. Participants were determined by a convenient sampling method. Convenient sampling is a type of non-random sampling in which Participants who meet criteria such as easy accessibility, geographical proximity, and willingness to participate are included in the study (Dörnyei, 2007). Parents of students enrolled in a pre-school education center as determined by the accessibility approach comprised the study group. Since adult individuals may have children, the study group was formed of school parents. Necessary permissions were obtained from the school administration and explanations were provided prior to the commencement of the study. Initially 255 people agreed to participate; later 252 parents comprised the study group; 72% of the sample was women and 28% was men. Applications were processed one-on-one through face-to-face settings. The research topic, scales, and application method were disclosed to participants before the application. The participants' demographic information is given in Table 1 below.

Table 1. Frequency distribution of the participants by demographic variables

	Frequency (<i>f</i>)	Percent (%)
Gender		
Women	182	72
Men	70	28
Marital status		
Married	168	67
Single	84	33
Age		
18-25	60	24
26-35	92	38
36-45	81	32
46 and above	19	6
Education Level		
Primary and Secondary School	21	8
High School	42	17
University Associate (First two years of univ.)	35	14
University	154	61
Income Level		
Low	28	11
Middle	176	70
High	48	19
Total	252	100,0

As seen in Table 1, 182 (72%) of the participants were women; 70 of them (28%) were men. 168 (67%) were married and 84 (33%) were single. 60 people (24%) were 18-25 years old, 92 people (39%) were 26-35 years old, 81 people (32%) were 36-45 years old, and 19 people (6%) were 46 years old and over. 21 people (8%) were primary and secondary school graduates, 42 people (17%) were high school graduates, 35 people (14%) were associate degree graduates and 154 people (61%) were undergraduate and graduate graduates. When looking at the income level distribution, 28 people (11%) stated that they were in the low income group, 176 people (70%) stated that they were in the middle income group and 48 people (19%) stated that they were in the high income group.

Measures

A nine-item questionnaire was used to gather demographic data. In addition to questionnaire Turkish form of the “Brief Resilience Scale-BRS” and Turkish “Enneagram Personality Scale-EPS”. Totally, test sets consisted of two scales and one questionnaire.

Questionnaire

The researcher designed a five-item questionnaire to collect demographic data from the participants. The survey comprises questions designed to determine information pertaining to

independent variables, including the age, gender, marital status, level of education, and income of the participant.

Brief Resilience Scale (BRS)

Turkish form of “The Brief Resilience Scale” (Smith et. al., 2008) was used to measure resilience levels of individuals. It was adapted into Turkish by Doğan (2015). BRS is a tool for self-reporting measurements. It is composed of six items. Items were scored on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). High scores indicated high resilience level. Alpha for this sample: .91 (N = 252, n = 6).

Enneagram Personality Scale (EPS)

It is a self-report scale developed as Turkish by Subaş and Çetin (2017). The scale consists of 27 items and 9 subscales in total. Items were scored on a 4-point Likert scale ranging from 0 to 3. 0: "Doesn't" describe me at all, 1: "Part of" describes me, 2: "Generally" describes me, and 3: "Totally" describes me. The sub-dimensions of EPS were named as the following personality types; Type 1 perfectionist, Type 2 helper, Type 3 achiever, Type 4 original, Type 5 observer, Type 6 questioner, Type 7 adventurer, Type 8 leader and Type 9 accommodator. In this study, internal reliability of each subscales were found to vary between .80 and .91 (N = 252, n = 27).

Data Analysis

To perform statistical analysis a statistical programme was used on the research data. The normality test of the BRS scores was performed, and the Skewness and Kurtosis values were within the range of ± 1.5 . As a result, it was accepted that the resulting scores had a normal distribution. T-test and One-Way Analysis of Variance (ANOVA) techniques were used to test the statistical significant differences of the mean scores (Karasar, 2005). Additionally, the Pearson Product Moment Correlation coefficient was calculated to explain the relationship between BRS and EPS scores as well.

Results

This section comprises the results derived from the application of statistical analysis. The first finding is the descriptive statistical analysis results of the scores obtained from the BRS. The findings are presented in Table 2 below.

Table 2. Descriptive statistics of scores obtained from the BRS

	\bar{X}	Standard Deviation	Minimum	Maximum
BRS	19.05	4.86	6.00	30.00

BRS= Brief Resilience Scale

As seen in Table 2, the arithmetic mean of the BRS scores was calculated as 19.05 and the standard deviation was 4.86. The findings regarding the difference in the mean scores obtained as a

result of the application of the BRS according to the independent variables are given. The findings are presented in Table 3 and Table 4 below.

Table 3. T-Test results of BRS scores

		N	$\bar{X} \pm S$	sd	t	p
Gender	Women	182	18.56±4.77	250	2.60**	.01
	Men	70	20.32±4.91			
Marital status	Married	168	19.83±4.66	250	3.67***	.000
	Single	84	17.50±4.90			

*p ≤ .05, **p ≤ .01, ***p ≤ .001, N=252, BRS=Brief Resilience Scale

BRS scores of the participants show significant differences according to gender. [t(250)=2.60 p<.05]. Resilience levels of men ($\bar{X} = 20.32$) are higher than women ($\bar{X}=18.56$). Resilience scores of the participants also show significant differences according to marital status [t(250)=3.67 p<.05]. Resilience levels of married individuals ($\bar{X} = 19.83$) are higher than single individuals ($\bar{X} = 17.50$).

Table 4. ANOVA results of BRS scores

		N	$\bar{X} \pm S$	Sum of Squares	Sd.	Mean Squares.	F	p
Age	15-25	60	17,43±4.83	241,066	3	80,355	3,496*	,016
	26-35	92	19.84±4.90	5700,156	248	22,984		
	36-45	81	19.08±4.42	5941,222	251			
	46-Above	19	20.21±5.62					
Education Level	Pri. Sc.	21	18.28±5.58	235,886	3	78,629	3,418*	,018
	High Sc.	42	17.40±4.96	5705,336	248	23,005		
	Un. Associate	35	18.22±4.05	5941,222	251			
	University	154	19.79±4.78					
Income Level	Low	28	17.67±4.52	294,371	2	147,185	6,490**	,002
	Middle	176	18.69±4.73	5646,851	249	22,678		
	High	48	21.18±4.99	5941,222	251			

*p ≤ .05, **p ≤ .01, ***p ≤ .001, N=252, BRS=Brief Resilience Scale

Significant differences were discovered as a result of the analyses of variance (ANOVA) carried out to test if the level of BRS scores changes significantly by age [f (3-248) =3.49, p<.05]. The Scheffe test was used to determine which groups had significant differences in BRS scores. The BRS scores of individuals aged 46 and over ($\bar{X} = 20.21$) were significantly higher than those of the 15-25 age ($\bar{X} = 17.43$), 26-35 age ($\bar{X} = 19.84$) and 36-45 age ($\bar{X} = 19.08$) groups.

Significant differences were discovered as a result of the analyses of variance (ANOVA) carried out to evaluate whether the individuals' BRS levels differed significantly according to their education level [f (3-248) =3.41, p<.05]. The Scheffe test was used to determine which groups had significant differences in BRS scores. The BRS scores of individuals with a bachelor's degree or higher education

level ($\bar{X}=19.79$) are significantly higher than the primary education ($\bar{X}=18.28$), high school ($\bar{X}=17.40$) and associate degree ($\bar{X}=18.22$) education groups.

Significant differences were discovered as a result of the analyses of variance (ANOVA) carried out to evaluate whether the individuals' BRS levels differed significantly according to their economic level $f(2-249)=6.49, p<.05$]. The Scheffe test was performed to reveal the groups in which the BRS scores created a significant difference, and the BRS scores of individuals with high income levels ($\bar{X}=21.18$) were significantly higher than those of low ($\bar{X}=17.67$) and medium ($\bar{X}=18.69$) income groups.

Correlation analysis is used to assess whether a linear relationship exists between two numerical measurements (Büyüköztürk, 2011). Pearson bivariate correlation analysis was used to test the relationship between the BRS and EPS scores. Findings are presented in Table 5 below.

Table 5. Pearson bivariate correlation values between BRS and EPS

EPS	BRS
	r
Type 3. Achiever	0.27**
Tip 4. Original	0.16**
Tip 5. Observer	0.14*
Tip 7. Adventurer	0.26**
Tip 8. Leader	0, 23**
Tip 9. Accommodator	0, 25**

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$, N=252

As seen in Table 5, six of the nine enneagram personality types were found to have a significant relationship with resilience. These are; type 3. Achiever ($r=0.27, p < .01$), type 4. Original ($r=0.16, p < .01$), type 5. Observer ($r=0.14, p < .05$), type 7. Adventurer ($r=0.26, p < .01$), type 8. Leader ($r=0.23, p < .01$) and type 9. Accommodator ($r=0.25, p < .01$).

Discussion, Conclusion and Recommendations

The purpose of this study was to examine whether the level of resilience changed according to demographic variables. The relationship between resilience and enneagram personality types was also investigated. The study yielded the responses to the sub-objectives. First, resilience differed according to demographic variables. Secondly, there is a strong and positive relationship between resilience and enneagram personality types.

The findings of the T-test and ANOVA statistical analyses, which were performed by the study's first sub-objective, indicated that there were significant differences in the resilience levels of the participants based on gender. The resilience levels of men are higher than that of women. An examination of the relevant literature reveals that there are results that corroborate this conclusion. Research conducted among students has consistently found that male students exhibit higher levels of resilience than women students (Bahadır, 2009; Acıkgöz, 2016; Sezgin, 2016). There are also studies

showing that averages change according to the gender factor in adults (Doğan, Yavuz, 2020). Nevertheless, different results have been observed in research pertaining to the gender variable. Additionally, there exists research indicating that women exhibit higher levels of resilience. The research conducted by Kılıc (2014) revealed that women students exhibited greater levels of resilience in comparison to men students. A similar outcome was observed in the research undertaken by Oktan, Odacı, and Berber-Çelik (2014). On the other hand, there are studies in the literature demonstrate that the level of resilience does not differ based on gender (Ayar & Egemberdiyeva, 2018; Aydın, 2010; Aydoğdu, 2013; Bolat, 2013; Özer, 2013;). An apparent discrepancy arises in the results concerning the gender variable. If the level of resilience varies according to the gender factor, it can be concluded that there is no consistency. This could potentially be attributed to the influence of numerous uncontrollable factors on resilience.

There are also significant differences in the resilience scores of the participants based on their marital status. The resilience of married individuals is higher than that of single individuals. There are studies that substantiate this conclusion in the literature. Ucar (2014) discovered in a study of teachers that married teachers possessed higher resilience than their unmarried counterparts. Dane (2015) reached the conclusion in his research that married people possess significantly higher levels of resilience in comparison to single individuals. In the study conducted by Yaşayanlar (2018), it was concluded that married individuals have high resilience levels. This condition can be attributed to a variety of variables, including marital support, the ability to share bitter or joyful moments with the spouse, overcoming issues together with the spouse, and building problem-solving skills together. Conversely, some research indicates that resilience does not change according to the marital status variable (Sezgin, 2012; Sonmezer, 2015). Thus, it can be argued that further research is warranted regarding the subject of marital status.

According to research data, Resilience scores show significant differences according to age. Resilience was found to be higher among those aged 46 and older compared to other age categories. This result is consistent with those of previously conducted studies (Gooding, Hurst, Johnson, & Tarrier, 2012; Varicier, 2019). Individuals aged 65 and up were shown to be three times more resilient than those aged 18-24 in a study conducted by Bonanno et al. (2006). Gooding, Hurst, Johnson, and Tarrier (2012) investigated the levels of resilience in adult groups under the age of 26 and over the age of 64, and discovered that older adults were more resilient than young adults. This can be interpreted as elderly people becoming psychologically stronger than younger people as a result of having faced challenging living conditions numerous times during their lives.

It was observed that individuals with a bachelor's degree and above have higher resilience, according to the research results. Individuals with higher education levels have significantly higher resilience levels. An examination of the literature reveals that there is no common result with regard to

educational level. Research involving university students revealed no significant difference (Varicier, 2019). Thus, it can be asserted that further research involving participants with varying levels of education is required.

When examining the relationship between income level and resilience, it is observed that individuals with higher income levels exhibit a significantly higher level of resilience than those with medium and low-income levels. This result is in line with the findings of prior research. This result, for instance, provides support for the research conducted by Gizir (2007), who concurs that a high-income level is a protective factor for the resilience of the individual. According to the findings of a study involving adult participants conducted by Bektaş and Ozben (2016), resilience differs significantly in magnitude in accordance with the perceived economic situation. Individuals' resilience increases when their assessments of their economic condition improve. This has been interpreted as favourable economic circumstances that psychologically strengthen the individual.

Regarding the second research question, a correlation analysis was performed to examine the relationship between resilience and enneagram personality types. The results indicated that resilience was positively correlated with all enneagram personality types. In other words, an increase in resilience corresponds to an augmentation in personality type characteristics. Nevertheless, an analysis of resilience did not reveal a significant relationship with the following three personality types: Type 1 Perfectionist, Type 2 Helper, and Type 6 Loyalist. Six of the nine personality categories in which significant relationships were determined can be seen in the table below. These are; Type 3. Achiever, Type 4. Original, Type 5. Observer, Type 7. Adventurer, Type 8. Chief (leader) and Type 9. Accommodator. This general result is similar to previous studies. The results of a recent study by Nieto et al. (2023) also showed that there is a positive relationship between resilience and personality traits.

Resilience was found to be significantly and positively correlated with the Type 3, Achiever personality type. These traits are associated with an increase in resilience in individuals with the achiever personality type, and conversely, a reduction in these traits is correlated with a decline in resilience. According to Palmer (2010), people with this personality type do not act on their feelings, are success-oriented, and can be workaholics. They are adept at persuasion, organisation, and mobilisation (Acarkan, 2016). According to the findings of this study, it can be interpreted that the high resilience levels of people with a high level of education and a good economic condition are compatible with the fact that the achiever personality types and resilience are associated.

Positive and significant relationships were discovered between type 4, original personality type, and resilience. In individuals with an original personality type, resilience increases with these characteristics, or as these characteristics decrease, resilience also decreases. According to Palmer (2010), people with this personality type are continually looking for originality and wants to be unique.

Its association with resilience may be attributed to their ability to observe the fine details in life and their efforts to take a unique stand in the face of life's many difficulties and responsibilities.

The observer personality type, type 5, was discovered to be positively and significantly related to resilience. In individuals with an observer personality type, resilience increases with these characteristics, or as these characteristics decrease, resilience also decreases. People with the observer personality desire to be capable and competent, and they are continually alert to life (Riso & Hudson, 1999). As a result, it can be concluded that the resilience of people who are always sensitive to life and wish to be sufficient improves.

Type 7, Adventurer, was discovered to be favourably and strongly connected to resilience. Resilience increases with these attributes in individuals with the adventurer personality type, and decreases with these characteristics. When we look at adventurous people, we see that they are always productive in life and have a strong imagination. They are not afraid to seek adventure and to take risks in their lives. It can be suggested that this circumstance aids in the development of their resilience.

Type 8, leader personality type was found to be positively and significantly related to resilience. In individuals with the leader personality type, resilience increases with these characteristics, or as these characteristics decrease, resilience also decreases. As stated by Matise (2007), members of this group are strong and autonomous yet they fear damage; therefore, it is possible to conclude that this trait is associated with resilience. Facing difficult situations fearlessly and leading people can enhance the resilience of those involved.

Type 9, accommodator personality type was found to be positively and significantly related to resilience. In individuals with the agreeable personality type, resilience increases with these characteristics, or as these characteristics decrease, resilience also decreases. Riso and Hudson (1999) posit that individuals who dislike conflict are peaceful, conciliatory and harmonious; they are also referred to as mediators. There is evidence to suggest that individuals who possess the ability to resolve conflicts amicably and composedly are, generally, more resilient from a resilient. Being peaceful can be interpreted as being related to resilience.

When considering the findings of the research as a whole, it is possible to conclude that individuals who are success-oriented, value uniqueness, exhibit alertness and competence in life, are willing to take risks, demonstrate strength, possess problem-solving abilities, establish strong interpersonal relationships, maintain composure in crisis situations, and exhibit peacefulness are also resilient.

As a result, the study achieved its goal, and the sub-objectives were addressed. The level of resilience was found to vary according to demographic factors. Specifically, men, older individuals, married individuals, those with higher levels of education, and individuals with higher incomes

demonstrated higher levels of resilience. Additionally, positive relationships were observed between resilience and Enneagram personality types. This study contributed to the examination of factors related to resilience by seeking to understand the roles of demographic factors and Enneagram personality types.

The study contains some advantages and limitations that have been observed in prior similar investigations. One strength is the utilization of standardized scales and methods. Another strength is the sample size. The vast majority of scales utilized enable individuals' objective self-evaluation and possess satisfactory validity and reliability. However, the subjectivity of a portion of the scale items is one of its limitations. A further limitation is that the research can only be conducted with the parents of a particular institution. To enhance the generalizability of findings, it is advisable that forthcoming studies incorporate distinct and larger groups.

Policy Implications

This study examined the psychological resilience levels of adult individuals in terms of demographic characteristics and enneagram personality types among a group of parents of students. The results obtained from this study show that resilience was related to personality types, and the level of resilience varies according to demographic factors. This work contributes to the study of resilience and related factors, which may assist experts working in the field and contribute to the literature. The study is original and has not been researched before.

The purpose of education is to cultivate individuals who can think critically, express their thoughts, conduct research, read, interpret, and transfer knowledge to others in the information age. Moreover, the primary goal of education is to ensure the continuity of society by fostering psychological strength in its members. Psychological resilience may serve as a solution for a society comprised of psychologically robust individuals. In this regard, it is essential to integrate this issue into educational plans and programs so that students can develop strong psychological foundations. This approach may pave the way for creating a psychologically resilient society for the future.

Conflict of Interest

Author declares no conflicts of interest.

Funding Details

This article has not been funded by any institution.

Ethical Statement

Participation was arranged voluntarily, with informed consent obtained from all participants. Necessary permissions were obtained for the scales used in the study. Ethical approvals were obtained before conducting the present study. Participants were informed about the confidentiality of their

responses through a consent form before filling in the questionnaire. They provided informed consent by choosing “I agree to participate” and signing consent statements.

Credit Author Statement

Author have contributed in multiple roles.

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STEM-Engineering Education with a Disadvantaged Student Group

Ganime AYDIN¹

Çanakkale Onsekiz Mart University

Mehpare SAKA²

Trakya University

Jale ÇAKIROĞLU³

Middle East Technical University

Abstract

The aims of this research were to examine the changes in the students' perceptions of engineers, engineering as a profession, learning of engineering design processes (EDP), awareness of engineering branches, and their future career choices through Engineering Design Process activities with the 5E learning model. Sixty disadvantaged students between 4th grade to 8th grades comprised the sample group. Engineering activities were held over 8 weekend days outside of school with engineers and science educators. The study was a single group pre-test and post-test weak experimental design using qualitative data sources. Draw an Engineer Test (DAET) along with written descriptions were used as a pre-test and post-test to examine students' perceptions of engineers and engineering before and after the intervention and the career choice test (CCT) was used to compare their future career choices and awareness of engineering branches. Based on the results, their perceptions about engineering changed by using the words design, produce, invention, and production, which were included in EDP. Their career choice of being an engineer or learning engineering branches changed with the aim of improving their standard of living.

Keywords: Engineering education, STEM, Engineering Design Process, Disadvantaged students

DOI: 10.29329/epasr.2024.655.3

Submitted: 27 November 2023

Accepted: 11 February 2024

Published: 31 March 2024

¹Associate Professor, Education Faculty, Çanakkale Onsekiz Mart University, Çanakkale, Turkey, ORCID: 0000-0001-6112-5243

Correspondence: ganime31@gmail.com

² Associate Professor, Education Faculty, Trakya University, Edirne, Turkey, ORCID: 0000-0001-9730-8607

Email: mehpiresaka@gmail.com,

³ Professor, Education Faculty, Middle East Technical University, Ankara, Turkey, ORCID: 0000-0002-1014-7650

Email: jaleus@metu.edu.tr

Introduction

There is a worldwide requirement for graduate students with 21st-century skills and enriched scientific knowledge because of the changing global need for innovation. Many countries added STEM education programs to formal education and informal education under the guidance of the National Science Board (2010) and the National Research Council [NRC] (2012). The next generation of science standards ([NGSS], 2013) includes the goal of science within the framework of K-12 education as “ensuring that by the end of 12th grade, all students will have some appreciation of the beauty and wonder of science, possess sufficient knowledge of science and engineering to engage in public discussions on related issues, be careful consumers of scientific and technological information related to their everyday lives, be able to continue to learn about science outside school, and will have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology” (p. 14). The NCR noted the sustainability of STEM education from pre-school to the end of university, but there are some restrictions on STEM applications for all students in a society, for instance, families, schools, and teachers. The social status of the family is the most important factor in the success of students and their choice of career (Bourdeu, 1990). Weininger and Lareau (2003) stated that other than the social background of students, the education system also sets up individuals in different classes. Xie, Fang, and Shauman (2015) asserted that learning science requires education, and science offers the opportunity to attain a high-status occupation with relatively high income and social prestige. They emphasized that STEM education is required for science or engineering employment and suggested which social determinants (family, individual factors like cognitive level of student, teacher, racial and ethnic differences, schools) influence the attainment of STEM education by all students. Lowrie, Downes, and Leonard (2018) explained the requirement of STEM education for disadvantaged groups, indicating the presence of barriers such as school factors, personal factors, and home factors. They also explained ways of overcoming these barriers by implementing STEM activities during holiday periods, in out-of-school programs, and requirements for STEM integration into the school curriculum. Altan and Koroglu (2019) studied STEM activities with disadvantaged students in a school program, and they found improvements in student perceptions and career awareness regarding STEM fields. In a similar vein, the participants of the present study were sixty students residing in children’s houses/orphanages under the protection of the Ministry of Family and Social Services.

When we look at the evaluations of STEM applications in which the engineering design section stands out, we see in the NRC (2012) report that engineering courses applied at the K-12 level increase students' success and motivation, improve conceptual learning, higher-order thinking skills and engineering design skills (Fan & Yu, 2017) were observed. The engineering education in this study, which was related to the current science curriculum, was provided in a rich learning environment including university laboratories, a factory, an orchard, an art gallery, and two historical places in Turkey like Troy and Edirne, one of the capital cities of the Ottoman Empire. Therefore, the main aim of this

study was to examine the changes in the students' perceptions of engineers, engineering as a profession, learning of engineering design processes, awareness about engineering branches, and their future career choices through engineering design process activities with the 5E learning model.

Engineering, Engineering Education and Engineering Design Process

Today engineering goes beyond the theoretical knowledge of science, mathematics, design, and engineering; it includes many competencies that require working as a team, effective transferring of ideas, understanding different cultures, and understanding the impact of technology on individuals and societies; in short, it is the design of today's technology (NRC, 2014). Engineering was also defined in the Ministry of National Education (MoNE) science curriculum as follows; "engineering includes objects that meet the requirements of people and practices which are systematic and open to improvement by planning processes and design" (MoNE, 2018, p. 10). Engineering education that advances student motivation, problem-solving skills, and critical thinking abilities supports learning of mathematics and science as well as linking engineering with science (Brown and Borrego, 2013; Katehi, Pearson and Feder, 2009). In evaluations about STEM practices where engineering design is prominent, NRC (2012) reported that engineering courses applied at the K-12 level increase the students' academic achievements and motivation. In this teaching model, discussions included topics like a number of integrated disciplines, which discipline should be the main discipline connecting with others, the role of technology, and whether it is a product or tool during implementations. Moore, Glancy, Tank, Kersten, Smith and Stohlmann (2014), while describing engineering as the natural integrator of STEM teaching, emphasized that engineering should include science and mathematics for technological advances. NRC (2012) also stated that engineering is the basic mechanism for meaningful learning of science concepts in STEM applications. Therefore, the framework of STEM applications is to implement practices that will connect the concepts of science and mathematics at the center of the engineering discipline. The STEM education model based on engineering design processes (EDP) aims to educate students and produce successful individuals who think systematically, are creative, have ethical values, can solve problems with proper solutions, are scientifically literate, open to communication, and complete engineering design projects integrating different disciplines as an engineer (Guzey, Thank, Wang, Roehrig, & Moore, 2014; Mann, Mann, Strutz, Duncan, & Yoon, 2011; Rogers & Porstmore, 2004). In each stage of engineering design processes, students improve and learn what engineers work on, transfer scientific and mathematical knowledge within their solutions, generate different solutions, and gain critical skills (Lotteroperdue, Bolotin, Benyameen, and Metzger, 2015). Engineering allows students to design creative and innovative solutions as a problem-solving context linking science and mathematics knowledge (English & Hudson, 2013). In addition to this, EDP not only involves the processes to produce a product, it also requires complex decision-making and problem-solving skills (Cunningham & Lachapelle, 2014; Fan, Yu, & Lou, 2017). In addition to the effectiveness of EDP in various ways, recommendations were developed during implementation. Schnittka and Bell (2011) indicated that

engineering design alone was not enough to promote a conceptual understanding of science. In their research, they investigated how an engineering design intervention that addresses alternative conceptions is more successful in helping students learn science content at a deep conceptual level. In the present study, engineering education was structured through inquiry-based learning within the 5E learning model to teach science concepts, and EDP was given in the elaboration stage of the 5E learning model. Also, when different kinds of engineering branches were examined, EDP was used to change perceptions about engineering, to understand how engineers work, and to enhance the self-efficacy of students about STEM-related careers.

Engineering as a career choice

Firstly, for young people to choose careers in the STEM fields, it is important they have academically successful experiences in science and mathematics to ensure STEM integration and the necessary competencies in these areas (Blotnicky, Franz-Odendaal, French & Joy, 2018, Heilbronner, 2009; Kelly, Dampier & Carr, 2013;). Even though very clear changes are observed in the beliefs related to competency and expectations of success among students from the primary school years to middle school years, the rate of this variation was identified to reduce from the 9th grade to the 11th grade during the high school years (Mangu, Lee, Middleton, & Nelson, 2015). The causes of this variation in self-efficacy beliefs of students were stated to include the gender variable, e.g., the belief that girls have higher competency for verbal lessons, while boys have higher mathematic competency and this being supported by academic success outcomes, along with ethnic, socioeconomic, and sociocultural differences and peer groups (Wigfield & Eccles, 2002). Timur, Timur and Çetin (2019) pointed out another factor related with gender difference that teachers play vital role in determining students' interest in subjects and they effect on students' future career due to their role model function.

During the high school years, the most important factor affecting choices in the STEM field is self-efficacy, as explained by Heilbronner (2009) and Kelly, Dampier, and Carr (2013). Another topic affecting career choices in STEM fields is the degree to which students have knowledge of engineering (Compeau 2016; Karatas, Micklos, & Bodner, 2011). Inclusion in STEM activities was stated to be another factor affecting student choice of careers in STEM areas (Franz-Odendaal, Blotnicky, French, & Joy, 2016). In the present study, when performing activities in many engineering branches with EDP, the first author explained what engineering is at the beginning of implementations.

STEM with disadvantaged students

We aim to identify disadvantaged students who face specific barriers compared to their peers. These barriers can be categorized into three groups within the light of literature (Banerjee, 2016; Fan, Yu, & Lou, 2017; Henley & Roberts, 2016). The first group includes disabilities, encompassing mental, physical, or chronic illnesses. The second group consists of sociocultural barriers, such as gender, race, ethnicity, beliefs, sexual orientation, immigration status, refugee status, residing in rural areas, and the

educational level of their families. The third category of barriers can be described as socioeconomic, which is directly linked to sociocultural factors, including low family income, the quality of schools and teachers' experience, academic qualifications of teachers (master's or doctorate), school learning environments (availability of laboratories, digital tools, etc.), and peer-related factors (cognitive and cultural diversity of peers in the same schools, class size, etc.). All three categories are interconnected and impact students' academic achievements and career choices.

Considering these factors, STEM programs for students facing these barriers offer an opportunity to change their destiny. According to existing literature, these barriers have a direct influence on students' goals and their interest in career choices (Brown & Lent, 1996; McWhirter, 1997; Lent, Brown, & Hackett, 2000; Fouad & Byars-Winston, 2005). Henley and Roberts (2016) addressed various barriers that students face, including economic, geographic, social, and educational obstacles. These include a lack of family support, mentoring, and career guidance, as well as insufficient access to advanced high school courses and funds for postsecondary preparation activities. Students also lack confidence in securing local employment. STEM education for disadvantaged students contributes to social justice (Ebenezer, 2013) and reduces school dropout rates (Ball et al., 2019; Chachashvili-Bolotin et al., 2016; Flynn, 2016). Socioeconomic status, gender, ethnicity, racial minority status, and learning gaps/disabilities all influence the STEM career choices of disadvantaged students (Uluduz & Calik, 2022).

Hlosta, Herodotou, Bayer, and Fernandez (2021) conducted a study involving 1500 students, including those from Black, Asian, and Minority Ethnicity (BAME) backgrounds and students from economically deprived areas. They implemented three STEM courses and found that students in the experimental group had a 7% higher chance of passing the courses compared to the control group. Wilson, Iyengar, Pang, Warner, and Luces (2012) developed a mentoring program called S-STEM (Scholarships for Science, Technology, Engineering, and Mathematics) for college students from diverse ethnic backgrounds, leading to increased graduation rates and improved student performance (GPA). The latest report on science education in England in 2022 focused on STEM education for disadvantaged groups, specifically addressing gender and ethnicity (source: <https://www.stem.org.uk>).

In summary, there is limited research on STEM education for students facing barriers. Existing research has primarily focused on racial and ethnic groups, as well as women in STEM education (Xie, Fang, & Shauman, 2015). Therefore, this study is distinctive as it examines disadvantaged students between the ages of 10-15 who are under the government's protection.

The research questions that guide this study are as follows:

After participating in out-of-school engineering design process activities,

1. Is there any change in the disadvantaged students' future career choices?

2. Is there any change in the awareness of disadvantaged students about engineering branches?
3. Are there any changes in the disadvantaged students' perceptions of engineers and engineering as a profession?
4. Is there any change in the disadvantaged students' learning of engineering design processes?

Method

Research Design

This research was an as a single group pretest and post-test weak experimental design using qualitative data sources. In the single-group pretest-posttest design, while studying with only one group, the difference in success between the two tests is examined by applying a pretest before instruction and a posttest after instruction (Buyukozturk, Kılıç Çakmak, Akgun, Karadeniz, & Demirel, 2014). The qualitative data tools were used to find answers to the research questions with a descriptive, comparative, and interpretative approach. The study consisted of three stages. In the first stage, questionnaires were applied as a pre-test to the participants. In the second stage, out-of-school engineering design-based activities in the program prepared within the scope of the study were applied to students. In the last stage, writing a story and a post-test of the questionnaires were applied.

Sample group

Sixty students between 4th to 8th grades who reside in a children's house under the protection of the government were selected with the purposeful sampling method. Of the participants, 64% were boys, and 36% were girls. The purposeful sampling method was used in this study. Purposeful sampling focuses on information-rich situations providing answers which will shed light on the research questions (Patton, 2001). The demographic backgrounds of the students cannot be given in detail because of legislation. But generally, they have no family or family members cannot look after them because of poverty, refugees without family or family members are in prison or died in the war). These students had no model of an engineer in their life, and throughout the implementation, the researchers realized that boys spent their free time watching television series related to the police or football matches, while girls watched mostly programs about cooking, fashion, and romance series on TV. The students participating in the study were divided into three groups according to their age levels: 3rd and 4th grades, 5th and 6th grades, and 7th and 8th grades. In this classification, although the ages of the students are taken into consideration, the aim was to combine the students close to each other in terms of the education process.

Instruments

Data were collected through the following data collection tools: Career Choice Test (CCT), Draw an Engineer Test (DAET), and Story Writing.

Career Choice Test (CCT): It was used as a pre-test and post-test to see the changes in students' future career plans. The test includes questions like "Which profession would you like to have? Do you want to be an engineer? If yes, which branch of engineering do you want to work in?"

Draw an Engineer Test (DAET): It aims to determine students' knowledge and perceptions about engineering and engineers through writing and drawing (Knight & Cunningham, 2004). In the present study, it was used as a pre-test and post-test to examine students' perceptions about engineers, engineering, what engineers do, and branches of engineering by making a minor adaptation from the original form (Cunningham, Lachapelle & Lindgren-Streicher, 2005; Knight & Cunningham, 2004). The DAET comprises two main parts: drawings and questions. In the drawing part, students are expected to draw an engineer; in the questions part, they are expected to answer the following seven questions:

1. Tell us about the engineer you drew
2. Where does your engineer work?
3. In which fields do they work?
4. What is your engineer doing in your drawing?
5. What is engineering?
6. What do the engineers do?
7. Do you know any engineers? If so, would you tell us about them?

While the first four questions were related to the drawing, the last three questions were used to define the engineering knowledge of the students and to determine if they know what engineers do.

Story Writing: Students were asked to write a story with the title "If I am an engineer in the future" at the end of all implementations to understand the reasons for their choice to be an engineer in-depth. The writing is one of the most powerful communication tools humans have and is one of the keys to writing success in and out of school (Haris, 2005). In the stories, the students' answers to questions about how they define engineering, along with their dreams, what they want to work at, what was added to their social lives, and why they want to become an engineer, were sought. Along with the stories, it was tried to determine how the students defined engineering, their dreams, what they wanted to do, what they added to their social life, and why they wanted to be an engineer.

Implementations

In the study, engineering design process activities with 11 different engineering fields were implemented for a total of 15 days with a 6-hour duration. Since the students in the sample were disadvantaged students protected by the state, all the researchers and the instructors who carried out the applications received pedagogical training from pedagogical experts. This pedagogical training was carried out before the implementation. At the same time, all trainers and researchers met to plan the engineering applications before the implementation. The engineering activities applied in the study were developed together with architects, engineers, and science educators who participated in the activities.

The 5E learning model was chosen to teach the science concepts to students participating in the study. The model consists of engage, explore, explain, elaborate, and evaluation stages (Bybee & Landes, 1990). The engineering design process activities were applied in the elaborate stage of the 5E learning model. Even though the engineering design model has many variations, they all have similar processes. In this study, eight steps of the engineering design cycle were used: 1) Ask (define the problem), 2) Research the problem, 3) Imagine (developing possible solutions), 4) Plan (selecting promising solution), 5) Create (building a prototype), 6) Test (testing and evaluating prototype), 7) Improve (re-design if needed), 8) Present (sharing design with the whole group). One of the activity plans is given in the appendix, and a detailed description of all activities can be found elsewhere (<https://moaa.comu.edu.tr/>, 2022). Table 1 gives a listing of each engineering design process activity, along with topics taught in the implementation.

Table 1. Topics and engineering design process activities included in the implementation.

	Engineering type	Name of Activity	Topics
Week 1	Civil engineering	Tower construction	EDP, the center of gravity, collaborative work
	Aerospace Engineering	Telescope construction	EDP, refraction by reflection, lenses
Week 2	Software engineering	Robber kidnapping robot	EDP, coding
Week 3	Biomedical Engineering	Producing natural creme	EDP, controlled experiment, dependent independent variable, natural materials
	Chemical Engineering	Producing natural spoon	EDP, chemical change, viscosity, properties of natural materials, controlled experiment, dependent independent variables,
Week 4	Electrical engineering	Vacuum cleaner	EDP, elements of electrical circuits, building electrical circuits, current, potential difference, short circuit, electric motor, energy transfer
	Electrical engineering	Toy car	EDP, elements of electrical circuits, building electrical circuits, current, potential difference, short circuit, electric motor, energy transfer
Week 5	Agricultural Engineering	Fruit Tree Grafting	EDP, DNA, gene transfer
Week 6	Architecture	Insulated houses	EDP. insulation
Week 7	Textile engineering	Fabric production	EDP, production steps from cotton to fabric
	Environmental engineering	Garbage separator	EDP, mixtures, methods of separation of mixtures
	Environmental engineering	Recycled goods	EDP, recycling
Week 8	Mechanical Engineering	Discoverer engineers at work Engineers Committee (Drama)	EDP, engineers work with other disciplines

While designing the activities, attention was paid to ensuring that the materials to be used were cheap and could be found in every region of the country. The study group continued their formal education during the implementations that were carried out on weekends and Saturdays for a total of 15 days with a 6-hour duration. Architecture, agricultural engineering, and mechanical engineering activities were carried out in one day. Also, activities were held in different learning environments for instance, the orchard (agricultural engineering, factory (mechanical engineering), garden, laboratory, classroom, beach, and the art gallery of Selimiye mosque, which was built by a world-famous architect Mimar Sinan.

Data Analysis

The code system developed by Weber, Duncan, Dyehouse, Strobel, and Diefes-Dux (2011) was used for the analysis of the DAET. This coding system consists of type, skin color, gender, location, inferences about the work done, and objects sections. In the present study, the skin color part was not used in the test, but the coding for the branch of the engineer was added. The reason for this change is to determine whether the activities are chosen from different engineering branches and whether there are differences in the perceptions of students towards these different engineering branches. In addition, the open-ended questions in the DAET test were coded by the researchers using open coding, and then the pre- and post-test percentages were compared. The drawings of students before and after implementations were coded, and results were obtained and compared with descriptive analysis by the researchers. In addition, student CCT pre- and post-test answers were compared by the researchers for percentage and frequency. The students' stories were analyzed by four science educators, apart from the researchers. In addition, taking the characteristics of the sample group into account, story analyses were carried out by a specialist in Guidance and Psychological Counseling (GPC). First, all stories were individually coded by each researcher and the GPC specialist, and the codes were collected in specific categories. Then, the researchers and GPC specialists met to compare the codes and categories. When a consensus was reached by reviewing different codes and categories, the analyses were finalized. In qualitative research, especially, the researcher's specific value judgments and expectations from the research are an important factor affecting the process and the result of the study, as well as the research validity (Maxwell, 2013). In this research, attempts were made to ensure both validity and reliability by different field experts managing the process during the activities and including different researchers in the analysis of data. The use of standardized categories is another factor that increases reliability in qualitative research (Silverman, 2015). In this study, both the use of standardized categories used previously for the DAET scale, and the analysis being conducted by different researchers are the factors that increase reliability. In addition to this, attempts were made to ensure reliability by activities being performed in out-of-class environments and applying the measurement tools at certain intervals and

during free time. The data obtained from the data collection tools were organized in an integrated way and presented in the following findings section.

Results

In this section, the analysis of the data collected during the study is presented.

Findings of Career Choice Test (CCT)

Table 2 and Table 3 display the comparison of students' choice of engineering as a future career plan in pre- and post CCT.

Table 2. Findings of students' pre-CCT

Choice of Engineering (Pre-test)	f	%	Branch of engineering	f	%
I want to be an engineer.	17	24.63	Civil engineering	9	53%
			Computer engineering	8	47%
I don't want to be an engineer	30	43.47	Choice of career	f	%
			Police	8	15%
			Soccer	7	13%
			Mechanic	5	10%
			Cook	3	6%
			Doctor	2	4%
			Hairdresser	2	4%
			Singer	2	4%
Veteran	1	2%			
I don't know	15	31.88			

Table 3. Findings of students' post-CCT

Choice of Engineering (Post-test)	f	%	Branch of engineering	f	%
I want to be an engineer	23	46.9	Civil E.	4	17%
			Computer E.	4	17%
			Electronic E.	4	17%
			Software E.	4	17%
			Textile E.	1	4%
			Space E.	1	4.4%
			Mechanic E.	1	4.4%
			engineer		
			Mechatronics	1	4.4%
			Chemistry E.	2	9%
Architecture	1	4.4%			
			Career choice	f	%
I don't want to be an engineer	26	43.1	Doctor	3	11.53
			Police	2	7.69
			Soldier	2	7.69
			Preschool teacher	2	7.69
			Cook	2	7.69
			Soccer	2	7.69
			I don't know	13	42.30
I don't know	-	-			

Before the implementation, 25% of the students stated that they wanted to be an engineer by indicating a preference for civil (53%) and computer engineering (47%). However, of the students, 43.47% did not want to be an engineer, and 32% of them did not specify any career choice for the future. At the end of implementations, the ratios of whether they wanted (47%) or did not want to be an engineer (43%) were close to each other. However, other than civil and computer engineering, other engineering branches such as electrical, software, chemistry engineering were added as branches chosen.

Findings of Draw an Engineer Test (DAET)

In this section, an analysis of students' drawings before and after the implementation was given.

Table 4. Species and other attributes of engineers in DAET pre-test and post-test drawings

Species	pre-test		post-test	
	f	%	f	%
Human	34	72%	45	83%
No person	12	26%	5	9%
Non-human	1	2%	4	7%
Other attributes	f	%	f	%
Laborer's clothing	17	74%	15	52%
Glasses/goggles	2	9%	7	24%
Smart, hard worker, tidy	2	9%	5	17%

While 72% of pre-test drawings included humans, this increased to 83% at the end of the implementation. Protective equipment like laborer's clothing, helmet, and goggles was seen in their post-test drawings (Table 4).

When examining students' gender, it was seen that male students did not draw any female engineers in their pre-test drawings, but after the implementation, they drew female engineers. The number of female engineers (13%) in the drawings of female students increased in post-test drawings (28%) (Table 5).

Table 5. Comparison of student gender and engineer gender on DAET

Gender of engineer	Gender of students							
	Pre-test				Post-test			
	Male		Female		Male		Female	
	f	%	f	%	f	%	f	%
Male	19	40%	9	19%	8	15%	6	11%
Female	0	0%	6	13%	2	4%	15	28%
Unknown	10	21%	3	6%	19	35%	4	7%

Regarding the type of engineers in students' drawings, they mostly drew civil (35%) and computer engineering (24%) before the implementation. After the implementation, even though civil (25%) and computer engineering (18%) were the most preferred engineering branches, the ratio decreased in their final drawings. Furthermore, while the percentage of software (12%) and chemical

(8%) engineering preferences increased, space and biomedical engineering were added, which were not mentioned before the implementation (Table 6).

Table 6. Comparison of engineering branches in pre-test DAET and post-test DAET results

Type of engineering	pre-test		post-test	
	f	%	f	%
Civil engineering	16	35%	13	25%
Computer engineering	11	24%	9	18%
Software engineering	2	4%	6	12%
Chemical engineering	1	2%	4	8%
Aerospace engineering	0	0%	4	8%
Mechanical engineering	5	11%	3	6%
Electrical- engineering	2	4%	3	6%
Environmental engineering	1	2%	3	6%
Aircraft engineering	3	7%	3	6%
Biomedical engineering	0	0%	1	2%
Agricultural engineering	2	4%	1	2%
Architecture	2	4%	1	2%
Nanotechnology Engineering	1	2%	0	0%

When the workplaces of engineers were examined in the drawings, it was found that they drew outdoor (55%) and indoor (33%) spaces as workplaces of engineers before the implementation. However, they used unidentified spaces (35%) in addition to indoor and outdoor spaces after the implementation (Table 7).

Table 7. Comparison of locations in pre-test DAET and post-test DAET results

Locations	pre-test		post-test	
	f	%	f	%
Inside	14	33%	21	39%
Undefined	5	12%	19	35%
Outside	23	55%	12	22%
Space	1	2%	1	2%
Underground	0	0%	1	2%

Regarding objects that they drew in their drawings, there are computers (14%), furniture (e.g., table, chair) (14%), bridges or construction materials (14%), and flying vehicles (7%) in their drawings before the implementation. But after the implementation, computers (15%), furniture (12%), and bridge or building materials (11%), as well as project drafts (e.g., blueprints) (9%), and robots (8%) were used in many drawings. In addition to these objects, laboratory equipment (e.g., beaker, flask, baguette), technological objects such as TV or radio, waste materials, and objects like rockets were included in their final drawings (Table 8).

Table 8. Comparison of objects in pre-test DAET and post-test DAET results

Objects	pre-test		post-test	
	f	%	f	%
Computers	6	14%	10	15%
Furniture-table, chair etc.	6	14%	8	12%
Construction-bridges, edifices etc.	6	14%	7	11%
Blueprints	0	0%	6	9%
Robots	0	0%	5	8%
Flying vehicles	3	7%	4	6%
Building tools-hammer etc.	2	5%	3	5%
Pass vehicles	2	5%	3	5%
Chemistry-beaker etc.	0	0%	3	5%
Technology-tv, radio etc.	0	0%	3	5%
Environment/waste materials	0	0%	3	5%
Construction vehicles	1	2%	2	3%
Space/space objects	1	2%	2	3%
Other machines (clothes, washing machine)	1	2%	2	3%
Rockets/aircrafts	0	0%	2	3%
Writing objects-pencil, paper etc.	1	2%	1	2%
Other plants	0	0%	1	2%
Other people	0	0%	0	0%
Studied plants	2	5%	0	0%
Studied animals	1	2%	0	0%
Others	0	0%	0	0%
Non-human	1	2%	0	0%
Body parts	0	0%	0	0%
Measurement tools-ruler etc.	1	2%	0	0%

Regarding engineering activities, at the beginning of the implementation, students defined the engineering design process (EDP) as design, invention, and production (42%) and handmade, repair, and building construction (33%). Later, they defined EDP by using words such as design, invention, and production, handmade, repairing and building activities, experiments, testing, and knowledge production (26%), in addition to explaining and teaching (11%) and observation (4%) (Table 9).

Table 9. Comparison of engineer activities in pre-test DAET and post-test DAET results

Activities	pre-test		post-test	
	f	%	f	%
Designing/inventing/creating products	10	42%	8	30%
Making/fixing/working on buildings by hand	8	33%	7	26%
Experimenting/testing/creating knowledge	4	17%	7	26%
Explaining/teaching	0	0%	3	11%
Doing research/projects	1	4%	1	4%
Observing	0	0%	1	4%
No action	1	4%	0	0%

Students answered questions about their perceptions of what engineering is in pre-test DAET by using the following words: expert (21%), researcher (14%), facilitating life (14%), and earning money (14%). Their words were diversified to include producer (15%), construction (13%), earning money (11%), explorer (9%), product developer (9%), contributing to science and humanity (9%), and integration of science and mathematics (9%) on the post-test (Table 10).

Table 10. Comparison of answers of students ‘What is engineering?’ in pre-test DAET and post-test DAET results

	Pre-test		Post- test	
	f	%	f	%
Professional	6	21%	4	9%
Researcher	4	14%	1	2%
Making life easier	4	14%	1	2%
Money earned in a job	4	14%	5	11%
Discover	3	10%	4	9%
Product	3	10%	7	15%
Making designs	2	7%	2	4%
Construction of buildings	2	7%	6	13%
Knowledgeable	1	3%	-	-
Product developer	-	-	4	9%
Being successful	-	-	1	2%
Responsible	-	-	2	4%
Hard worker	-	-	2	4%
Contribution to science and life	-	-	4	9%
Integration of science and mathematics	-	-	4	9%

When asked what engineers do, before the implementation, students claimed that engineers mostly construct buildings (24%) and produce things such as robots, cars, or electronic vehicles (30%). In addition, they stated that they are people who do research (11%), repair (8%), and make designs (8%). After the implementation, the students stated that engineers are people who produce mostly cars, robots, electronic vehicles, or everything (46%). In addition, some of the students stated that engineers construct buildings (10%) and make designs (10%). Some students also mentioned that the work done by engineers is based on their branch after the implementation (13%). The students added the following expressions "experimenting," "working for the environment," and "contributing to science" as a new working area of engineers (Table 11).

Table 11. Comparison of answers of the students to ‘What do engineers do?’ in pre-test DAET and post-test DAET

	Pre -test		Post- test	
	f	%	f	%
Constructing buildings	9	24%	4	10%
Researching	4	11%	-	-
Discovering	2	5%	2	5%
Repairing	3	8%	-	-
Making designs	3	8%	4	10%
Producing beneficial tools for humanity	1	3%	1	3%
Depends on branch	2	5%	5	13%
Don't know	3	8%	-	-
Producing robots-electronic tools-computer-car- everything	11	30%	19	46%
Doing experiments	-	-	1	3%
Working for the environment	-	-	1	3%
Contributing to science	-	-	3	8%

Table 12. Analysis of students’ stories entitled 'If I am an Engineer.'

EDP use in stories	
Design	<p><i>- I made a pencil holder I designed myself from an empty jar to put on my desk.</i></p> <p><i>- I will design a robot and it will be able to play football and everything with children.</i></p> <p><i>- The robot I invented will collect garbage more quickly.</i></p> <p><i>- They made different designs, a robot to cut cabbage, a robot to care for people...</i></p>
Imagination	<p><i>To prove to future generations that nothing is impossible, I would make a transporter machine so people can go to places that are difficult to get to in a few seconds.</i></p> <p><i>... they thought one day will I be able to make what they draw real and really be a very good architect...</i></p> <p><i>... I would do a lot of projects, and I would work to implement these projects...</i></p>
Cooperation-Discussion	<p><i>...they asked about the characteristics of an engineer, and they replied we exchanged ideas and said I'm someone like that...</i></p>
Production	<p><i>...I would like to invent a device to collect all the garbage in the environment...</i></p> <p><i>...they would build a house...</i></p>
Student reasons for being an engineer	
Acceptance	<p><i>...the houses they made sold all around the world, and they were a very famous electronic engineer.</i></p> <p><i>...they wrote their name in history with the works they constructed...</i></p>
Earning money	<p><i>...with the money I earn when I'm an engineer, I would save my friends from this swamp.</i></p> <p><i>...In the house bought with the money they earned from mining engineering, they lived together happily with their friends from the children's house. I would earn money by selling the robot I made.</i></p>
Help those around them by increasing living standards.	<p><i>...I would work for years so people wouldn't be homeless.</i></p> <p><i>... and ... siblings became civil engineers and built a house where they could live with their family, and they lived very happily in this house.</i></p> <p><i>...the woman was thrown out of the house because she didn't have money and was crying, I would settle her in one of the houses I built myself.</i></p> <p><i>...I would be a civil engineer building smart houses for my family to live in... The robot I made to help Vesile aunt, who is old and can't walk from our summer home, I will find a solution for people with physical, vision, and</i></p>

	<i>hearing disabilities to live more comfortably; I will make a robot that plays football with children. Alex is a robot cleaning up the kitchen, and people won't lose time in traffic with the flying skateboard I produce; people will very easily reach every place with my software program for transporter technologies.</i>
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Three basic factors were identified in choosing engineering as a career in the students' stories and CCT. These are helping people (disabled, elderly, poor, orphaned), meeting the needs of students about things they lack in life or miss (home, car, money), and gaining acceptance and reputation. For this reason, it was identified that the engineering branches they were interested in (software, computer, civil, electronic, environment) were associated with these 3 factors.

Discussion, Conclusion and Recommendations

The findings of the study are discussed with the literature under sub-titles below to examine the changes in the students' perceptions of engineers, engineering as a profession, learning of engineering design processes, awareness about engineering branches, and their future career choices through engineering design process activities with the 5E learning model for disadvantaged students.

Choosing engineering as a career and learning of engineering branches

Based on the results of CCT, students who wanted to be an engineer before the implementations chose just two engineering branches that are the most popular engineering types in our country: civil engineering and computer engineering. The reasons for these results can be explained by the observations of researchers before the project and through conversations with students during their break times between activities. In our country, the richest engineers are generally civil engineers, and computer engineers can easily find jobs. There is also much news in the media about these two kinds of engineering, as similarly stated by Knight and Cunningham (2004). It can be concluded that the student's choice of civil and computer engineering was related to economic gains. Students who did not want to be an engineer chose jobs like police, soccer player, cook, and mechanics at high rates. These students live in a house similar to one where a family can live, with access to TV, computers, and well-designed furniture. In each house, five students live together with their guardian, and students generally call them brother or sister in this house. Guardians are mostly high school graduates. Also, apart from three students who were orphans, most had poor or divorced families or family members in prison. Based on both post-test DAET and CCT, the students added new engineering branches such as biomedical and aerospace engineering to their choices, and the proportion selecting software, chemical, environmental, and electrical-electronic engineering branches increased. This indicates that the engineer design process activities based on different kinds of engineering helped the students learn about engineering branches. The proportion of students who did not want to be an engineer did not decline sharply, but instead of choosing police soccer player, or cook, they chose "I don't know" more often. Against the student's

family background as mentioned earlier (Bourdeu, 1990, Weininger & Lareau, 2003) to eliminate barriers to STEM in schools (Lowrie, Downes & Leonard, 2018), performing STEM activities out of school contributes to career choices related to science and mathematics for disadvantaged students (Altan & Koroglu, 2019; Baran, Bilici, Mesutoglu & Ocak, 2016; Baran, Bilici, Mesutoglu & Ocak, 2019; Mohr-Schroeder et al., 2014; Shahali et al., 2015; Tseng, Chang, Lou, & Chen, 2013). In other cases, they have no role model in their social life for being an engineer or no one with a similar background to them who has succeeded in becoming an engineer (Bandura, 2001; Schunk and Usher, 2019) to motivate them and help them achieve these tasks. To minimize role model factors in a positive way, most of the activities such as chemistry, agriculture, biomedical, architecture, electric, and mechanical engineering activities were done under the guidance of engineers. Therefore, any kind of role model motivates students' efficacy for STEM activities (Gladstone & Cimpian, 2021). Again, the reason for choosing "I don't know" can be explained by Bandura's social cognitive theory stating students prefer tasks which involve previous successful experiences (Bandura, 1997; Klassen & Usher, 2010; Schunk & Usher, 2019). In the sample group of students with low marks in science and mathematics courses and no experience of STEM, they did not have enough self-efficacy to choose engineering as a career even though they eliminated soccer players police, or mechanics from their career choices. The expectations and values of students may affect their career choice to be an engineer in the future (Wigfield & Eccles, 2002). Their stories, which were written at the end of the implementation, contain their reasons for becoming an engineer. These reasons were very emotional and engrossing with three reasons for their choice of helping people (disabled, old, poor, orphan), meeting the needs of students for things they lack or miss in their lives (house, car, money), and wanting to be accepted and respected by society. It is a thought-provoking result that the students considered spending the money they will earn from the engineering profession to live with their friends or to increase their living standards. Their statements are very meaningful in that they see that the engineering profession will enable them to raise their living standards not only for themselves but also for the people around them. This was a vital outcome of STEM activities for students with different demographic and achievement backgrounds. Moreover, students who did not want to be an engineer at the beginning of the implementation did not know what an engineer is, what engineers do, or how engineers work (Compeau, 2016; Karatas, Micklos, & Bodner, 2011).

Changes in the students' perceptions of engineers and engineering as a profession

According to Knight and Cunningham (2004), engineering is understood to include train operators and people building houses and making car engines. Images of engineers were generally male, working with hammers, wrenches, cars, trains, and computers, and wearing hard hats. In the present study, we used an adapted form of the same DAET to measure the changes in the perceptions of students. According to Efron (1969), perception is a person's primary form of cognitive contact with the world around them, so the image of engineers changed from non-human to human, and protective equipment

like helmets and goggles were seen in their post-test drawings. They wrote that engineers build apartments, repair cars, produce computers, and design projects in their explanations about what engineers do in the pre-test. The statement that ‘engineers can produce everything’ had the highest rate in their answers for both post-test DAET and stories, different from the study by Cunningham et al. (2014). Also, both male and female students changed the gender of engineers from male to female and changed the workplace from outside to inside and undefined places. However, the students noted that the work and workplaces of engineers changed depending on the branch of engineering. During the implementation, different locations like a laboratory, factory, garden, mosque, etc. were used. This may also affect the students’ determination of the workplaces of engineers. While students drew computers, furniture (e.g., table, chair), bridges or construction materials, and flying vehicles in their pre-test drawings, they added project drafts, robotics, and laboratory equipment (e.g., beaker, flask, baguette), technological objects like TV or radio, waste materials and rockets in their final drawings. The different kinds of engineering activities improved or changed their engineering perceptions related to the tools used. Furthermore, they called engineers as experts and researchers and used words like facilitating life and earning money. During the post-test, their words diversified to include producer, construction, earning money, explorer, product developer, contributing to science and humanity, and integration of science and mathematics. The sentences related to the integration of science and mathematics are vital because the students had a limited conception of science and mathematics. This minimal realization proved our 5E learning model for the designed activities worked in practice (Schnittka & Bell, 2011). In the other research, the 5E integrated STEM-based activities increase the students’ attitudes related with science while decreasing their science anxiety (Bozkurt, Altinoz, & Acikyildiz, 2023)

In sum, the perceptions of students can be changed by many EDP activities which involve students being active learners, and their perceptions can be improved easily with out-of-school activities without any formal assessment rather than in school (Bell et al., 2009; Simsek, 2011; Zaff & Redd, 2001).

Learning of engineering design processes

The results in this section were synthesized from engineering activities and what engineers do in pre-DAET and post-DAET tests and from the stories. While words relating to building and production were expressed in pre-test, research, making design, experimenting, and contributing to science were included in the post-test as engineer activities. They identified EDP by using words like design, invention, production, repair, and building construction in pre-tests, but they converted to words like design, invention, production, handmade, repairing, building activities, experiments, testing, knowledge production, and observation on the post-test. Depending on their words, we can conclude that students learned the stages of EDP concerning what engineering is and how engineers work (Compeau, 2016; Karatas, Micklos, & Bodner, 2011, Lotteroperdue et al., 2015). In their stories, statements like ‘I made

a pencil holder I designed myself’, ‘... to help aunt Vesile who can’t walk to...’ and ‘with the flying skateboard, I produce’ were included in the design, production, and problem definition stages. Therefore, the activities improved students’ problem-solving skills for real-life problems and designing creative and innovative solutions to their real-life problems such as “... producing robot which plays with children, flying skateboard (English, Hudson, & Dawes, 2013).

The engineering education activities with the 5E learning model related to the science curriculum completed outside of school with engineers and science educators affected the desired goals of the research. But the most effective result is that students discover their abilities and experience what they can achieve. When the students experienced these activities, improvements in their self-beliefs about being an engineer were observed. These are vital outcomes of STEM activities for disadvantaged groups to ensure they feel hopeful about their future. It was believed that STEM would reduce inequality in education, but the sustainability of STEM education with the disadvantaged group is another vital point for longitudinal outcomes. At the beginning of the study, working with this sample group was very difficult because they had limited experiences in laboratory, factory, or garden, and out-of-school learning and had negative attitudes to science and mathematics. Therefore, the recommendations for future research were given below.

- Students in Türkiye should experience activities outside of school from the early years in well-designed activities.
- The face-to-face interviews with students during the implementation will be used for future research to obtain results about EDP in detail.
- Designing activities with engineers and architects is very effective for creativity and for innovative laboratory experiments. However, not all the engineers were as competent in teaching lessons as teachers with pedagogical experience in this age group.
- Engineers may be introduced at the beginning of activities as role models.

Policy Implications

The study is produced from the project in which STEM applications with 5E learning model were applied to sixty students who are under the protection of the government (orphans) to see their perceptions of engineers, engineering as a profession, learning of engineering design processes (EDP), awareness of engineering branches, and their future career choices. At the beginning of implementations, student’s carrier choice was restricted by their models around us, characters in series on TV, and their academic success specially in science and mathematics lectures were very low. The other problem they had limited self-confidence and self-efficacy to do activities related with engineering design processes. During the implementation period day to day, they realized their skills and as they successfully completed activities, their career choices, self-perceptions, and academic achievements were nurtured by a positive influence. Therefore, the study is important to see the effects of STEM

education on disadvantaged students offering them pathways to future opportunities and contributing to the pursuit of social justice. The study is an experimental study consisting of our experiences that students discovered their abilities and experienced what they can achieve and feel hopeful about their future. Therefore, it is necessary for education policymakers to prioritize STEM education for disadvantaged students by fostering collaboration between education faculty. This collaboration could involve science teacher candidates implementing STEM activities under the guidance of advisors during social responsibility projects, particularly during out-of-school periods.

Conflict of Interest

There is no conflict between authors.

Funding Details

This research was produced by the “Step by Step to be an Engineer” project founded by Scientific and Technological Research Council of Türkiye (TUBITAK) Project no: 118B462 and 119B932 and produced by the permission of it.

Ethical Statement

The study reported in this paper has obtained ethical approval from the Survey and Behavioral Research Ethics Committee. The Higher Education Institute (YOK) Scientific Research and Ethics Regulation were followed. In this article, the rules of scientific research and publication ethics specified in the field.

Credit Author Statement

Ganime Aydın; Designing and writing of project, determining, and controlling implementations of STEM activities, communication with Government Office, university, factory etc. for permissions and planning and controlling budget, writing of literature and discussion conclusion.

Mehpare Saka: Designing the research method, collecting and analysis of data, design of STEM activities and implementations of them on students.

Jale Cakiroglu: Conceptualization of ideas, formulation of the overarching research goals and aims and decision of reach measurement tools, analysis of data, review and editing of article.

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The Relationship Between Teachers' Lifelong Learning Tendencies and Their Curriculum Fidelity Levels ³

Merve KORUCU¹

Ministry of National Education

H. Hüseyin ŞAHAN²

Balikesir University

Abstract

The objective of this research aimed to establish a connection between the inclination towards lifelong learning and the degree of adherence to the curriculum among educators in primary and secondary educational institutions. In the 2021-2022 academic year, data for this screening model investigation were collected from 281 teachers employed in the central Karesi and Altieylül districts of Balıkesir. The data were acquired using the 'Lifelong Learning Tendencies Scale,' designed by Diker Coşkun (2009), and the 'Curriculum Fidelity Scale,' developed by Burul (2018). The data analysis employed descriptive statistics, Two-Way MANOVA, Pearson Correlation Analysis, and Regression Analysis.

According to the results, it was detected that there were moderate lifelong learning tendencies and high degree of fidelity to the curriculum. Regarding the second discovery, it was established that school type and years of professional experience significantly influenced the differences observed in teachers' lifelong learning tendencies and their adherence to the curriculum levels. Furthermore, a statistically significant but modest correlation was identified between teachers' lifelong learning tendencies and their levels of curriculum fidelity.

Keywords: Teacher, Lifelong Learning, Curriculum Fidelity

DOI: 10.29329/epasr.2024.655.4

Submitted: 10 October 2023

Accepted: 16 November 2023

Published: 31 March 2024

¹ Dr., Ministry of Education, Balıkesir, Türkiye, ORCID: 0000-0002-6791-964X

Correspondence: korucu86@hotmail.com

² Prof. Dr., Balıkesir University, Necatibey Education Faculty, Balıkesir, Türkiye, ORCID: 0000-0003-0180-4812, Email: hsahan@balikesir.edu.tr

³ This study has been produced from the doctoral thesis completed by the 1st author under the supervision of the 2nd author.

Introduction

In the 21st century, the need for education is increasing day by day for individuals and societies to be open to innovations and to develop themselves. Accordingly, the scope of the concept of education has changed enormously. Thus, education is no longer only at school age, but it is a quality that starts from pre-school and continues throughout the life of the individual (Tanilli, 1996). Human beings who try to adapt to the globalizing world have to take responsibility for their own learning. This necessitates lifelong learning to have individuals who can keep up with the age and survive (Erdener & Gül, 2017; Soran et al., 2006). Contemporary educational approaches show that knowledge is constantly changing, learning occurs not only in a certain period of life, but also in an ongoing structure and continues throughout life, and therefore the ability to learn is an important feature of the age. Lifelong learning, defined by the European Commission (2006) as a process by which individuals can develop their competencies throughout their lives, emphasizing the spread of learning opportunities, is seen as a necessity for teachers, who are considered both learners and pioneers of change, to constantly renew themselves (Diker Coşkun, 2009; Diker Coşkun & Demirel, 2012; Marion et. al., 2016; Şahan, 2020). Individuals can gain lifelong learning skills by being guided correctly in every period of their lives from an early age. One of the most important roles in this process belongs to teachers. In the contemporary world of education, the successful execution of student-centered educational programs, widely embraced in today's educational landscape, within classrooms, and the transformation of teachers into facilitative guides for learning, hinges exclusively on the cultivation of lifelong learning skills (Evin Gencil, 2013). Considering that teachers' lifelong learning competencies include the ability to plan learning, adapt various learning strategies across disciplines, and effective learning skills, it can be said that they should also have the competencies to implement the programs and the changes made in the program in their classrooms (Knapper & Cropley, 2000).

It is possible to say that different features of the curriculum affect the level or efficiency of curriculum fidelity, which is defined as teachers or stakeholders being loyal to the designed curriculum and implementing it in the classroom (Bay et al., 2017). As stated by Dusenbury et al. (2003), teachers' characteristics and their training are recognized as factors influencing curriculum fidelity. Whether teachers adopt the curriculum or not, whether they are open to innovations or not, and even their resistance to change cause them to develop positive or negative attitudes towards the renewed curriculum. This situation affects the implementation of the curriculum designed by official institutions by teachers in the classroom. Furthermore, it holds significant importance to furnish both pre-service and in-service training to educators, enabling them to effectively implement the updated curriculum in the classroom as intended (Bümen et al., 2014). Because the successful evaluation of the designed curriculum can only be realized if teachers follow the designed curriculum during the implementation process (Dhillon et al., 2015). Upon reviewing the literature, it becomes evident that there are studies that investigate the lifelong learning inclinations of either teachers or prospective educators (Aykaç et

al., 2020; Brahmi, 2007; Diker Coşkun, 2009; Diker Coşkun & Demirel, 2012; Evin Gencil, 2013; İzci & Koç, 2012; Kılıç, 2015; Mwaikokesya, 2014; Smith, 2012; Şahan, 2020; Şahin & Arcagök, 2014; Şen, 2021; Tortop, 2010; Tunca et al, 2015) as well as studies on their fidelity to the curriculum (Allo, 2020; Baş & Şentürk, 2017; Burke et al., 2011; Burul, 2018; Bümen et al., 2014; Çavuşoğlu, 2022; Dikbayır & Bümen, 2016; Dusenbury et al., 2003; Gül & Erdener, 2018, 2021; Kabaş, 2020; Karabacak, 2018; Maral Polat, 2021; Nevenglosky, 2018; O'Donnell & Lynch, 2008; Pence et al., 2008).

In the context of teachers' fidelity to the curriculum, the fact that they are learners who are open to development with the training they receive in the profession to adapt to new programs can be evaluated within the scope of lifelong learning tendencies. It can be assumed that teachers who are open to change and innovations and who are highly motivated to learn new information may also have a high level of fidelity to the curriculum. Hence, it is deemed essential to uncover the connection between lifelong learning and adherence to the curriculum. Upon reviewing the literature, it is believed that the recommendations stemming from the research findings will not only offer significant insights for the training and enhancement of teachers but also serve as a guiding beacon for future research and researchers. This is particularly noteworthy, as no prior studies have explored the interplay between these two variables, despite separate investigations into lifelong learning tendencies and curriculum fidelity. In this research, the study aimed to address the following inquiries in order to ascertain the correlation between teachers' lifelong learning tendencies and their levels of curriculum fidelity:

1. What are teachers' tendencies towards lifelong learning and curriculum fidelity levels?
2. Do teachers' tendencies towards lifelong learning differ in terms of school type (primary, secondary school) and seniority variables?
3. Do teachers' levels of fidelity to the curriculum differ in terms of the type of school (primary school, secondary school) and seniority variables?
4. Are teachers' tendencies towards lifelong learning and their curriculum fidelity levels related?

Method

Research Model

This study employs a screening approach to gauge teachers' lifelong learning tendencies and their curriculum fidelity levels. It also incorporates a causal comparison analysis to discern potential distinctions concerning variables like professional seniority (ranging from 1-10 years, 11-20 years, and 21 years and above) and school level/type (primary and secondary). Additionally, it conducts a relational survey to explore any co-variations among these variables.

Research Group

The study encompasses a population of 1,895 educators employed in primary and secondary educational institutions under the purview of the Ministry of National Education, located in the central Karesi and Altieylül districts of Balıkesir during the 2021-2022 academic year. The study's data were collected from a sample of 281 teachers selected through random sampling. The sample size calculation adhered to Bartlett et al.'s (2001) sampling table, which suggests that a sample size of 112 individuals with a margin of error of 0.05 is appropriate for a study population of 2000 people. Consequently, the collected data was deemed to be adequate. In the study, there were 196 (69.8%) female teachers and 85(30.2%) male teachers. Furthermore, among the teachers, 172 (61.2%) were employed in primary schools, with the remaining 109 (38.8%) working in secondary schools.

Data Collection Tools

As part of the study, data were collected using two instruments: the "Lifelong Learning Tendencies Scale" and the "Curriculum Fidelity Scale." Reliability analysis and Confirmatory Factor Analysis (CFA) were performed on these scales. When interpreting the CFA fit indices and values, the coefficient values established by Schermelleh-Engel et al. (2003) were utilized as a reference.

Life-long Learning Tendencies Scale:

Diker Coşkun's (2009) "Lifelong Learning Tendencies Scale," comprising 27 items divided into four sub-dimensions, was employed to assess teachers' proclivity for lifelong learning. The scale encompasses a Motivation sub-dimension consisting of 6 items, a Persistence sub-dimension containing 6 items, a Lack of Regulating Learning sub-dimension comprising 6 items, and a Lack of Curiosity sub-dimension consisting of 9 items. Respondents provided their ratings on a six-point Likert scale, ranging from 1 (not at all) to 6 (very much). Although the scale's creator did not furnish reliability analysis information for each sub-dimension, the total scale demonstrated a reliability coefficient of .89 (Diker Coşkun, 2009). In line with the reliability analysis conducted within the scope of this research, the Cronbach Alpha values were calculated as $\alpha=0.90$ in the motivation dimension; $\alpha=0.89$ in the persistence dimension; $\alpha=0.76$ in the lack of regulating learning dimension; $\alpha=0.88$ in the lack of curiosity dimension, and $\alpha=0.78$ in the overall scale, respectively.

Confirmatory Factor Analysis (CFA) was executed to assess the suitability of the factorial structures within the Lifelong Learning Tendencies Scale and to evaluate the model's accuracy. The fit indices resulting from this analysis were found to be $\chi^2 = 519.12$, $sd= 314$, $\chi^2/sd= 1.6$, $GFI= .88$, $AGFI= .85$, $CFI= .97$, $NFI= .94$, $NNFI= .97$, $SRMR= .053$, $RMR= .068$, $RMSA= .048$, $RFI= .93$ and $IFI= .97$. When the fit index values are examined, it is seen that the scale is structurally valid and appropriate and has factor structures compatible with the factorial structure determined by the developer.

Curriculum Fidelity Scale:

The evaluation of teachers' adherence to the curriculum was conducted using the "Curriculum Fidelity Scale," which was formulated by Burul in 2018. This scale encompasses 42 items distributed across 7 sub-dimensions. It was designed as a five-point Likert scale, with responses ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The scale consists of an 8-item compliance sub-dimension, 5-item duration sub-dimension, 5-item quality of implementation sub-dimension, 7-item participant reactions sub-dimension, 5-item program differences sub-dimension, 8-item teacher training sub-dimension, and 4-item school climate sub-dimension. Burul conducted Cronbach's Alpha reliability analysis for the sub-dimensions of the scale one by one. Based on the analysis findings, the reliability coefficients for the different sub-dimensions were determined as follows: 0.84 for the compliance sub-dimension, 0.90 for the duration sub-dimension, 0.82 for the quality of the implementation sub-dimension, 0.89 for the participant reactions sub-dimension, 0.86 for the program differences sub-dimension, 0.91 for the teacher training sub-dimension, 0.79 for the school climate sub-dimension, and 0.91 for the overall scale (Burul, 2018). In line with the reliability analysis conducted within the scope of this study, Cronbach Alpha values were found to be $\alpha=0.88$ in the compliance sub-dimension; $\alpha=0.78$ in the duration sub-dimension; $\alpha=0.78$ in the quality of implementation sub-dimension; $\alpha=0.78$ in the quality of implementation sub-dimension; $\alpha=0.83$ in the participant reactions sub-dimension; $\alpha=0.74$ in the program differences sub-dimension; $\alpha=0.85$ in the teacher training sub-dimension; $\alpha=0.87$ in the school climate sub-dimension and $\alpha=0.96$ in the overall scale.

CFA was conducted to determine the structural appropriateness of the Curriculum Fidelity Scale and as the results of CFA were found to be; $\chi^2 = 1334.78$, $sd= 782$, $\chi^2/sd= 1.7$, $GFI= .81$, $AGFI= .79$, $CFI= .96$, $NFI= .90$, $NNFI= .95$, $SRMR= .071$, $RMR= .064$, $RMSA= .050$, $RFI= .89$ and $IFI= .96$. When the index values are examined, it is seen that the scale is structurally appropriate and has factor structures compatible with the factorial structure determined by the developer.

Data Analysis

During the descriptive analysis conducted as part of the research's first sub-problem, the teachers' lifelong learning tendencies were assessed using a six-point Likert scale. Scores falling within the range of 6.00 to 4.34 were considered indicative of a high tendency, those within 4.33 to 2.67 were classified as medium, and scores ranging from 2.66 to 1.00 were characterized as low tendencies. Likewise, in terms of fidelity to the curriculum, scores between 5.00 and 3.41 were regarded as high, those ranging from 3.40 to 2.61 were seen as medium, and scores within 2.60 to 1.00 were interpreted as indicating a low level of curriculum fidelity. In order to prevent Type 1 error within the scope of the 2nd and 3rd sub-problems and to determine whether the groups formed based on multiple factors show significance in terms of multiple dependent variables, Two-Way MANOVA analysis was performed (Can, 2014). Regarding the second sub-problem, the "Lifelong Learning Tendencies Scale," comprising

4 sub-dimensions, and for the third sub-problem, the "Curriculum Fidelity Scale," consisting of 7 sub-dimensions, were integrated as dependent variables. Meanwhile, the independent variables considered were "school type" (primary/secondary school) and "seniority" (1-10 years, 11-20 years, 21 years and above). To address the fourth sub-problem, a Pearson Correlation Analysis was executed to examine the connection between teachers' inclination toward lifelong learning and their commitment to curriculum fidelity. During the Pearson Correlation Analysis, a coefficient value below 0.30 is indicative of a weak relationship, while values falling between 0.30 and 0.70 suggest a medium-level relationship. Conversely, if the coefficient surpasses 0.70, it is considered to represent a high-level relationship (Büyüköztürk et al., 2015).

Results

Teachers' lifelong learning tendencies and their curriculum fidelity levels

A descriptive analysis was carried out to assess both teachers' lifelong learning tendencies and their adherence to the curriculum. The findings are presented in Table 1.

Table 1. Descriptive analysis results for teachers' lifelong learning tendencies and their curriculum fidelity levels

Dimensions	N	\bar{X}	SS	Skewness	Kurtosis
MT	281	5.53	.45	-.748	-.308
PT	281	5.09	.69	-.632	-.266
LRL	281	1.84	.71	.743	-.281
LC	281	1.77	.75	.948	.066
COMP	281	3.38	.51	-.153	-.059
DUR	281	4.20	.44	.196	-.591
QI	281	3.88	.38	.088	-.025
PR	281	4.33	.43	-.008	-.980
PD	281	3.41	.44	.281	-.385
TT	281	3.67	.55	-.072	-.269
SC	281	3.78	.81	-.341	-.394
LL	281	3.36	.33	.348	.118
CF	281	3.79	.30	.193	-.234

MT: Motivation Tendency, PT: Persistence Tendency, LRL: Lack of Regulating Learning, LC: Lack of Curiosity, COMP: Compliance, DUR: Duration, QI: Quality of Implementation, PR: Participant Reactions, PD: Program Differences, TT: Teacher Training, SC: School Climate, LL: Lifelong Learning, CF: Curriculum Fidelity.

Upon reviewing Table 1, which presents the outcomes of the descriptive analysis for teachers' lifelong learning tendencies, it becomes evident that the Motivation dimension exhibits the highest mean score (\bar{X} =5.53, SD: .45). The Motivation tendency sub-dimension was followed by the Persistence tendency (\bar{X} =5.09, SD: .69), the Lack of Regulating Learning (\bar{X} =1.84, SD: .71) and the Lack of Curiosity (\bar{X} =1.77, SD: .75) sub-dimensions respectively. The mean value for Lifelong Learning Tendencies appears to fall within a moderate range (\bar{X} =3.36, SD: .33). When the results of the descriptive analysis of teachers' curriculum fidelity levels are examined in Table1, The Participant

Response sub-dimension is observed to possess the highest mean score (\bar{X} =4.33, SD: .43). This sub-dimension is followed by Duration (\bar{X} =4.20, SD: .44), Quality of Implementation (\bar{X} =3.88, SD: .38), School Climate (\bar{X} =3.78, SD: .81), Teacher Training (\bar{X} =3.67, SD: .55), Program Differences (\bar{X} =3.41, SD: .44) and Compliance (\bar{X} =3.38, SD: .51). It is seen that the mean for the curriculum fidelity scale is at a high level (\bar{X} = 3.79, SD: .30).

Examining teachers' lifelong learning tendencies in terms of school type and seniority

Box's M Test results for the Lifelong Learning Tendencies Scale were examined and it was determined that the significance value was greater than 0.05. In this case, it is accepted that the matrices are equal [Box's M= 92.432, F (81, 4583.478) =.986, p= 0.475]. Levene's Test, used to assess the equality of error variances, was conducted. The results indicated the following p-values: .678 for the Motivation tendency sub-dimension of Lifelong Learning Tendencies, .756 for the Persistence tendency sub-dimension, .51 for the Lack of Regulating Learning tendency sub-dimension, and .215 for the Lack of Curiosity tendency sub-dimension. Two-way MANOVA was carried out to assess whether there were statistically significant differences in teachers' inclinations toward lifelong learning with respect to the independent variables of school type and seniority. The MANOVA outcomes are detailed in Table 2.

Table 2. Two-way MANOVA results for the lifelong learning tendencies scale

Effect		Value	F	Hypothesis df	Error df	Sig.
School Type	Wilks' Lambda	.988	.850 ^b	4.000	269.000	.495
Seniority	Wilks' Lambda	.971	1.005 ^b	8.000	538.000	.431
School Type * Seniority	Wilks' Lambda	.915	3.057 ^b	8.000	538.000	.002

When Table 2 is examined, it is seen that one or more of the sub-dimensions of lifelong learning tendencies are affected by the variables of type of school and seniority together (Wilks' Lambda= .915; F= 3.057; p=.002). In order to see which sub-dimensions were affected, the interaction between the dimensions (Test of Between - Subjects Effects) was examined. The results of the analysis are shown in Table 3.

Table 3. Interaction results between dimensions of lifelong learning tendencies scale

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
School Type	MT	.282	1	.282	1.487	.224
	PT	.066	1	.066	.140	.709
	LRL	.592	1	.592	1.168	.281
	LC	.918	1	.918	1.672	.197
Seniority	MT	.385	2	.193	1.015	.364
	PT	.498	2	.249	.531	.589
	LRL	1.668	2	.834	1.644	.195
	LC	.077	2	.038	.070	.933
School Type * Seniority	MT	2.875	2	1.437	7.568	.001
	PT	3.607	2	1.804	3.843	.023
	LRL	1.051	2	.525	1.036	.356
	LC	7.486	2	3.743	6.822	.001

As indicated in Table 3, both school type and seniority variables collectively exerted an influence on the Motivation Tendency sub-dimension ($p=.001$), the Persistence Tendency sub-dimension ($p=.023$), and the Lack of Curiosity sub-dimension ($p=.001$). To discern the nature of these significant differences, Estimated Marginal Means Plots for the Motivation Tendency, Persistence Tendency, and Lack of Curiosity sub-dimensions were scrutinized. The direction of the significant difference in the Motivation Tendency sub-dimension is shown in Figure 1.

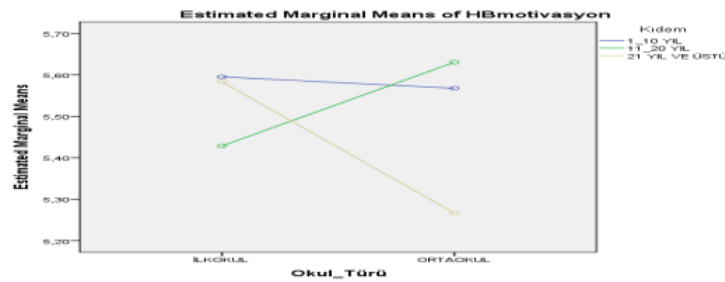


Figure 1. Motivation tendency profile plots

Upon examination of Figure 1, it becomes apparent that primary and secondary school teachers with 1-10 years of seniority exhibit closely aligned values. Nevertheless, it is worth noting that the motivation of secondary school teachers with 11-20 years of seniority appears to be higher. Additionally, among teachers with 11-20 years of experience, those working in primary schools appear to display lower motivation compared to their counterparts with 21 years or more of seniority. Notably, there seems to be no substantial disparity in motivation tendencies between teachers with 1-10 years of experience and those with 21 years or more. The direction of the significant difference in the Persistence Tendency sub-dimension is illustrated in Figure 2.

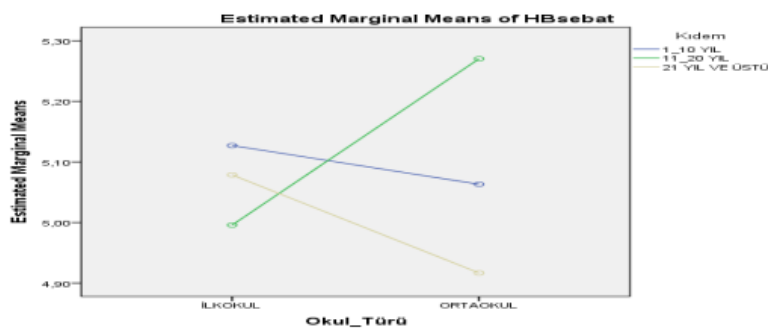


Figure 2. Persistence tendency profile plots

In Figure 2, which illustrates the Persistence Tendency sub-dimension of teachers' lifelong learning tendencies, it is evident that secondary school teachers with 11-20 years of seniority exhibit greater determination to engage in self-improvement activities compared to their primary school counterparts with the same seniority range. Conversely, it appears that primary school teachers with 21 years or more of seniority display a higher level of persistence in this regard compared to their peers

with equivalent seniority in secondary schools. No noteworthy distinction is discernible between primary school teachers with 1-10 years of experience and those with 21 years or more in terms of their Persistence Tendency. The direction of the significant difference observed in the Lack of Curiosity sub-dimension is elaborated upon in Figure 3.

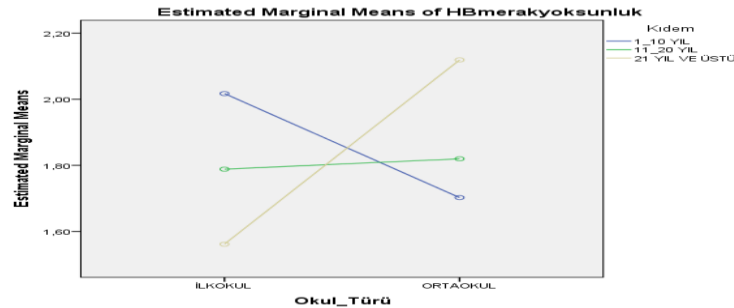


Figure 3. Lack of curiosity profile plots

Upon reviewing Figure 3, it becomes apparent that in the Lack of Curiosity sub-dimension, teachers with 21 years or more of experience in secondary schools exhibit a higher degree of curiosity deprivation when compared to teachers with equivalent seniority in primary schools. Furthermore, it can be noted that primary school teachers with 1-10 years of experience appear to have a lower inclination toward curiosity in comparison to their counterparts in the same school category but with varying seniority levels. Notably, teachers with 11 years and above of seniority in both primary and secondary schools do not exhibit a statistically significant difference in terms of their Lack of Curiosity tendency.

Investigation of teachers' curriculum fidelity levels in terms of school type and seniority

Box's M Test results for the Curriculum Fidelity Scale were examined and it was determined that the significance value was greater than 0.05. In this case, it is accepted that the matrices are equal [Box's $M=282.546$, $F(186, 7236.160) = 1.218$, $p = 0.085$]. Levene's Test, used to assess the equality of error variances, was conducted. The results indicated the following p-values: .451 for the Compliance sub-dimension, .090 for the Duration sub-dimension, .253 for the Quality of Implementation sub-dimension, .162 for the Participant Reactions sub-dimension, .060 for the Program Differences sub-dimension, .355 for the Teacher Training sub-dimension, .290 for the School Climate sub-dimension. A Two-way MANOVA analysis was performed to ascertain whether there were statistically significant differences in teachers' levels of curriculum fidelity concerning the independent variables of school type and seniority. The outcomes of this MANOVA are detailed in Table 4.

Table 4. Two-way MANOVA results for the curriculum fidelity scale

Effect		Value	F	Hypothesis df	Error df	Sig.
School Type	Wilks' Lambda	.972	1.076 ^b	7.000	266.000	.379
Seniority	Wilks' Lambda	.913	1.771 ^b	14.000	532.000	.040
School Type * Seniority	Wilks' Lambda	.898	2.102 ^b	14.000	532.000	.011

Upon reviewing Table 4, it becomes apparent that seniority (Wilks' Lambda= .913; F= 1.771; p=.040) and school type and seniority variables together (Wilks' Lambda= .898; F= 2.102; p=.011) affect one or more of the sub-dimensions of teachers' level of fidelity to the curriculum. In order to see which of the sub-dimensions were affected, the Test of Between - Subjects Effects was examined. The analysis outcomes are presented in Table 5.

Table 5. Interaction results between dimensions of the curriculum fidelity scale

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
School Type	COMP	.419	1	.419	1.626	.203
	DUR	.044	1	.044	.223	.637
	QI	.158	1	.158	1.135	.288
	PR	.071	1	.071	.395	.530
	PD	.031	1	.031	.164	.686
	TT	.595	1	.595	2.098	.149
	SC	.009	1	.009	.013	.908
Seniority	COMP	1.580	2	.790	3.062	.048
	DUR	.608	2	.304	1.543	.216
	QI	1.275	2	.637	4.573	.011
	PR	.597	2	.299	1.665	.191
	PD	1.314	2	.657	3.427	.034
	TT	.879	2	.440	1.549	.214
	SC	1.394	2	.697	1.075	.343
School Type Seniority	*COMP	.201	2	.101	.390	.678
	DUR	.190	2	.095	.483	.618
	QI	.266	2	.133	.955	.386
	PR	1.327	2	.664	3.701	.026
	PD	.033	2	.016	.086	.918
	TT	2.398	2	1.199	4.225	.016
	SC	1.016	2	.508	.783	.458

Upon examining Table 5, which displays the outcomes of the inter-dimensional interaction test for curriculum fidelity levels, it is evident that the seniority variable influences the Compliance sub-dimension with a value of p=.048, the Quality of Implementation sub-dimension with a value of p=.011 and the Program Differences sub-dimension with a value of p=.034; while the school type and seniority variables together affect the Participant Reactions sub-dimension with a value of p=.026 and the Teacher Training sub-dimension with a value of p=.016. The Pairwise Comparisons section of the seniority variable was scrutinized to ascertain the nature of the significant differences observed in the sub-dimensions of Compliance, Quality of Implementation, and Program Differences. The findings are provided in Table 6.

Table 6. Pairwise comparison results for the sub-dimensions of compliance, quality of implementation and program differences in terms of seniority

Dependent Variable	(I) Seniority	(J) Seniority	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
						Lower Bound	Upper Bound	
COMP	1_10 years	11_20 years	-.1177	.08588	.358	-.3201	.0847	
		21 years and above	-.0651	.09224	.760	-.2825	.1522	
	11_20 years	1_10 years	.1177	.08588	.358	-.0847	.3201	
		21 years and above	.0526	.06831	.722	-.1084	.2136	
	21 years and above	1_10 years	.0651	.09224	.760	-.1522	.2825	
		11_20 years	-.0526	.06831	.722	-.2136	.1084	
QI	1_10 years	11_20 years	-.0222	.06313	.934	-.1710	.1266	
		21 years and above	-.1404	.06780	.098	-.3002	.0193	
	11_20 years	1_10 years	.0222	.06313	.934	-.1266	.1710	
		21 years and above	-.1182	.05021	.050	-.2366	.0001	
	21 years and above	1_10 years	.1404	.06780	.098	-.0193	.3002	
		11_20 years	.1182	.05021	.050	-.0001	.2366	
	1_10 years	11_20 years	-.1267	.07403	.203	-.3012	.0477	
		21 years and above	-.2020*	.07951	.031	-.3894	-.0146	
	PD	11_20 years	1_10 years	.1267	.07403	.203	-.0477	.3012
			21 years and above	-.0753	.05888	.409	-.2140	.0635
		21 years and above	1_10 years	.2020*	.07951	.031	.0146	.3894
			11_20 years	.0753	.05888	.409	-.0635	.2140
21 years and above		11_20 years	-.1892	.10830	.190	-.4444	.0660	
		21 years and above						

Upon reviewing Table 6, it becomes evident that there exist noteworthy distinctions in teachers' curriculum fidelity levels. Specifically, there are significant differences observed in the Quality of Implementation sub-dimension ($p=.050$) and the Program Differences sub-dimension ($p=.031$). While a significant difference is detected in the Compliance sub-dimension during the Interaction Test between Dimensions, it does not emerge as significant in the Pairwise Comparison Results. An examination of the Mean Difference reveals that the significant disparity in the Quality of Implementation sub-dimension favors teachers with 21 years of seniority and above. Similarly, the results in the Program Differences sub-dimension also favor teachers with 21 years of seniority and above. To ascertain the direction of the significant difference identified in the Participant Reactions sub-dimension, considering the combined influence of school type and seniority variables, Estimated Marginal Means were analyzed and are visually presented in Figure 4.

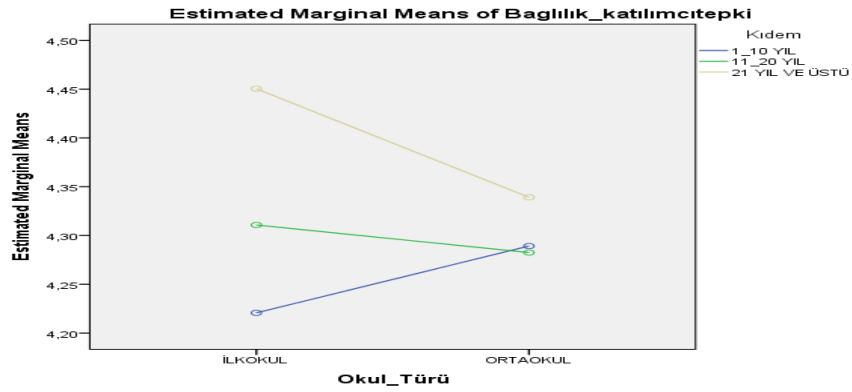


Figure 4. Participant reactions profile plots

Upon reviewing Figure 4, which presents data on the Participant Reactions sub-dimension, it becomes evident that primary school teachers with 21 years or more of seniority exhibited a higher degree of responsiveness to curriculum-related changes when compared to teachers in other seniority groups. Conversely, it is plausible to assert that teachers with 1-10 years of seniority in primary schools displayed relatively lower reactivity in contrast to their counterparts in other seniority categories. Notably, there was no statistically significant difference in the Participant Reactions sub-dimension between teachers with 1-10 years of seniority and those with 11-20 years of seniority. The direction of the significant difference in the Teacher Training sub-dimension is elucidated in Figure 5.

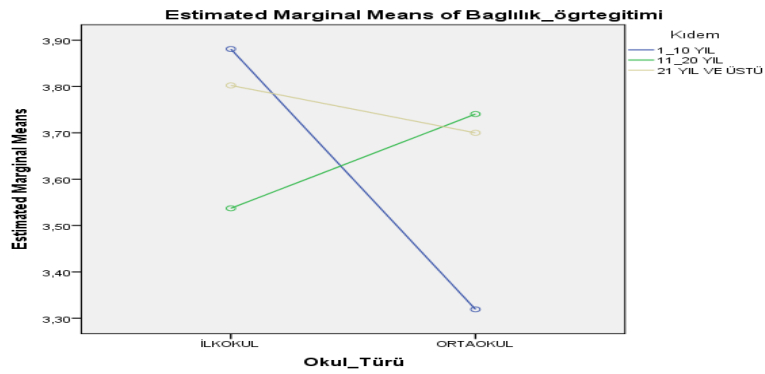


Figure 5. Teacher training profile plots

Upon reviewing Figure 5, which illustrates the Teacher Training sub-dimension, it becomes apparent that the significant difference favors primary school teachers with 1-10 years of seniority. While a significant distinction exists between teachers with 11-20 years of seniority and those with 21 years or more of seniority in primary schools, there is no statistically significant difference between teachers with 11-20 years of seniority and those with 21 years or more of seniority in secondary schools.

The relationship between teachers' lifelong learning tendencies and their curriculum fidelity levels

To explore the correlation between teachers' lifelong learning tendencies and their curriculum fidelity levels, Pearson Correlation Analysis was initially conducted on all scales. The outcomes of this analysis are presented in Table 7.

Table 7. The relationship between teachers' lifelong learning tendencies and their curriculum fidelity levels

Scales	Lifelong Learning Tendencies	Curriculum Fidelity Levels
	1	.118*
Lifelong Learning Tendencies	281	.048
	.118*	1
Curriculum Fidelity Levels	.048	281
	281	

*p<.05

The analysis reveals that there exists a statistically significant, yet low-level ($r=.12$), positive relationship between teachers' Lifelong Learning Tendencies and Curriculum Fidelity levels. Additionally, correlation analysis was extended to encompass all sub-dimensions of the scales, and the associations between these sub-dimensions were computed and are displayed in Table 8.

Table 8. The relationship between the sub-dimensions of teachers' lifelong learning tendencies and the sub-dimensions of their curriculum fidelity levels

VARIABLES	COMP	DUR	QI	PR	PD	TT	SC
MT	.09	.25**	.27**	.28**	.09	.20**	.25**
PT	.08	.22**	.25**	.25**	.12	.29**	.31**
LRL	.07	-.12*	-.06	-.14*	-.01	-.07	-.09
LC	.16**	-.17**	-.23**	-.22**	-.01	-.14*	-.13*

** p<.01, * p<.05

According to Table 8, it becomes evident that the Motivation Tendency sub-dimension within teachers' lifelong learning tendencies scale exhibits a low-level positive correlation with sub-dimensions of Curriculum Fidelity, such as Duration ($r_{\text{Duration}}=.25$), Quality of Implementation ($r_{\text{Quality of Implementation}}=.27$), Participant Reactions ($r_{\text{Participant Reactions}}=.28$), Teacher Training ($r_{\text{Teacher Training}}=.20$) and School Climate ($r_{\text{School Climate}}=.25$), conversely, no statistically significant relationship is observed in the sub-dimensions of Compliance and Program Differences. Upon scrutiny of the Persistence Tendency sub-dimension, it is apparent that there exists a low positive correlation with the Duration ($r_{\text{Duration}}=.22$), Quality of Implementation ($r_{\text{Quality of Implementation}}=.25$), Participant Reactions ($r_{\text{Participant Reactions}}=.25$), Teacher Training ($r_{\text{Teacher Training}}=.29$) and School Climate ($r_{\text{School Climate}}=.31$) among the sub-dimensions of the Curriculum Fidelity, while no significant relationship exists in the Compliance and Program Differences

sub-dimensions. In the context of the Lack of Regulating Learning sub-dimension, it is discerned that there exists a low-level negative correlation with certain sub-dimensions of Curriculum Fidelity, specifically Duration ($r_{\text{Duration}}=-.12$) and Participant Reactions ($r_{\text{Participant Reactions}}=-.14$). However, no statistically significant relationship is observed in the other sub-dimensions of Curriculum Fidelity. When the sub-dimension of Lack of Curiosity is examined, there is a low positive relationship with Compliance ($r_{\text{Compliance}}=.16$), a low positive relationship with Duration ($r_{\text{Duration}}=-.17$), Quality of Implementation ($r_{\text{Quality of Implementation}}=-.23$), Participant Reactions ($r_{\text{Participant Reactions}}=-.22$), Teacher Training ($r_{\text{Teacher Training}}=-.14$) and School Climate ($r_{\text{School Climate}}=-.13$), but no significant relationship is found in the sub-dimension of Program Differences.

Discussion, Conclusion and Recommendations

Upon analyzing the lifelong learning tendencies of the teachers, it was determined that, in general, their inclinations toward lifelong learning fell within the moderate range. Within the sub-dimensions, it is evident that the Motivation dimension boasts the highest mean score. Teachers' high motivation tendencies can be accepted as a positive result in terms of the teaching profession. In existing literature, numerous studies have been conducted (Evin Gencil, 2013; Ödemiş, 2013; Şahan, 2020; Şahin et al., 2010; Yıldırım, 2015) that support this result of the research, as well as some studies (Diker Coşkun, 2009; Tunca et al., 2015) that contradict this result of the research. Upon scrutinizing teachers' fidelity levels to the curriculum, it was revealed that, on the whole, their fidelity levels tended to be high. In this direction, it can be said that teachers adopt and try to implement the curriculum and have a positive perspective towards curriculum fidelity. Regarding the dimensions, the highest mean is observed in the Participant Response sub-dimension. In the literature, studies supporting this result of the study (Burul, 2018; Can, 2020; Çavuşoğlu, 2022; Zöğ, 2022) were also found. In addition, many studies (Arslan et al., 2014; Dinç & Doğan, 2010; Kamber et al., 2011) found that teachers had positive opinions about the structure and implementation of the curriculum. Teachers' curriculum fidelity and their positive perspectives on the implementation may contribute to the implementation of the innovations in the curriculum in the classroom in accordance with its purpose and to achieve the real results expected from the curriculum. In line with the studies, it can be said that different factors such as teachers' lack of knowledge about the curriculum, lack of materials, and teacher characteristics have an important effect on ensuring fidelity to the curriculum (Bümen et al., 2014; Dusenbery et al., 2003; Fullan & Pomper, 1977).

Upon analyzing teachers' lifelong learning tendencies with respect to school type and seniority, it was discerned that significant differences existed in the dimensions of Motivation tendency, Persistence tendency, and Lack of Curiosity, concerning both school type and seniority variables. Upon investigating the Motivation sub-dimension with consideration to school type and seniority variables, it became evident that teachers working in secondary schools with 11-20 years of seniority exhibited a

higher level of motivation. It can be said that this situation is due to the fact that teachers working in secondary schools have free days because they are not regular classroom teachers and have the necessary time and rest to improve themselves. Furthermore, it is speculated that teachers with 11-20 years of seniority in primary schools may display lower motivation than their counterparts with 21 years or more of seniority. This could be attributed to the perception that their knowledge acquired during their graduation is relatively recent, whereas teachers with 21 years or more of experience may feel a greater motivation to enhance their skills in order to adapt to new educational paradigms and systems. Upon exploring the Persistence sub-dimension, it is evident that teachers with 11-20 years of seniority in secondary schools exhibit a higher degree of determination to engage in self-improvement activities that they themselves decide upon, in comparison to teachers with 11-20 years of seniority in primary schools. It can be said that being a branch teacher and having free days compared to regular classroom teachers are effective in the Persistence Tendency as well as in the Motivation Tendency. Furthermore, it can be asserted that primary school teachers with 21 years or more of seniority demonstrate greater perseverance in comparison to their peers with equivalent seniority who work in secondary schools. The age of the students that primary school teachers instruct, which tends to be younger than that of secondary school students, and the requirement for greater patience in dealing with younger learners, could potentially influence the disposition of primary school teachers, fostering a greater sense of patience. Within the Lack of Curiosity sub-dimension, it is apparent that secondary school teachers with 21 years or more of seniority exhibit a lower level of curiosity compared to their primary school counterparts with equivalent seniority. The fact that secondary school teachers do not feel the need to improve themselves because they teach the same subject continuously and every year may be effective in this result. Moreover, it can be asserted that primary school teachers with 1-10 years of seniority display a lower inclination toward curiosity compared to their counterparts within the same school category but possessing varying levels of seniority. It can be said that the fact that teachers are new graduates of education faculties and that they think that their knowledge is up-to-date in this direction is effective in this result. In the literature, studies supporting the research result in terms of seniority variable (Erdamar et al., 2021; Yıldırım, 2015; Yılmaz, 2016) were found. Contrastingly, there are several studies (Kılıç, 2015; Şahin & Arcagök, 2014; Şen, 2021) that present findings contradictory to the results of this research. Within the existing literature, studies (Ayaz, 2016; Kesici, 2023; Torun & Güvercin Seçkin, 2021) were identified that reported a significant difference in terms of the school type variable, mirroring the findings of this research.

Significant distinctions were observed concerning seniority in the Quality of Implementation and Program Differences sub-dimensions of teachers' curriculum fidelity. Regarding the Quality of Implementation sub-dimension, it is evident that teachers with 21 years or more of seniority exhibit a greater emphasis on the quality of implementation compared to teachers with 11-20 years of seniority. In this context, it can be surmised that teachers with 21 years or more of seniority perceive the program

as a framework and endeavor to execute it with a higher level of quality in alignment with the program's framework. Within the Program Differences sub-dimension, it can be asserted that teachers with 21 years or more of seniority demonstrate a heightened focus on discerning the distinctive attributes of the new curriculum, distinguishing it from the previous curriculum. This inclination is more pronounced when compared to teachers with 1-10 years of seniority. Regarding the quality of curriculum implementation, it can be affirmed that teachers with 21 years or more of seniority are better equipped to track and adapt to changes in curricula compared to their counterparts at different seniority levels. In the literature, studies supporting this research result (Aşçı & Yıldırım, 2020; Karakuyu & Oğuz, 2021) were found. In addition, there are various studies (Baş & Şentürk, 2019; Berkant & Can, 2022; Can, 2020; Çavuşoğlu, 2022; Gürbüz, 2020; Gürbüz, 2021; Zöğ, 2022) that found a significant difference between teachers' fidelity to the curriculum and their seniority. In addition, there is a study (Sakallıoğlu & Özüdoğru, 2022) in the literature that reaches results that contradict this result of the research. It is seen that school type and seniority variables have a joint effect on the Participant Reactions and Teacher Training sub-dimensions of teachers' curriculum fidelity. Regarding the Participant Reactions sub-dimension, it can be noted that teachers with 21 years or more of seniority, particularly those working in primary schools, tend to exhibit more pronounced reactions than teachers with different seniority levels when they perceive curriculum-related practices as not relevant to their teaching context. Due to their desire to implement the curriculum better and their ability to follow and distinguish the changes in the old and new curricula more easily, it can be interpreted as a natural attitude to react when the curriculum is not in line with their expectations. In addition, it is seen that teachers who are included in all changes within the system increase their motivation towards the profession and show less resistance to change (Dalkıran, 2018; Dalkıran & Erdener, 2018). Upon reviewing the Teacher Training sub-dimension, it becomes apparent that primary school teachers with 1-10 years of seniority believe that the training they received at universities prior to their service is adequate, especially when compared to teachers with differing seniority levels and school types. It can be said that this situation is in parallel with the findings of the Motivation Tendency sub-dimension of lifelong learning tendencies. When the literature was examined, studies supporting this research result (Deniz & Erdener, 2016; Erdener, 2022; Karakuyu & Oğuz, 2021; Sakallıoğlu & Özüdoğru, 2022) were found. In addition, Burul (2018) found a significant difference in the School Climate sub-dimension regarding the effect of school type and seniority variables together.

Upon exploration of the dimensions of teachers' lifelong learning tendencies and their degree of commitment to the curriculum, it was observed that a positive, albeit low-level, relationship existed in the dimensions of Motivation, Persistence, Duration, Quality of Implementation, Participant Reactions, Teacher Training, and School Climate. Conversely, a negative, yet low-level, relationship was observed in the dimensions of Lack of Regulating Learning and Lack of Curiosity sub-dimensions. In this direction, it is possible to say that teachers need the necessary motivation and determination to comply

with the curriculum, to implement the curriculum and to use the most accurate method while implementing it, even to talk about the curriculum with their colleagues. It should not be forgotten that having no goals or having vague goals can lead to low performance (Alev, 2021; Eranil & Sevgin, 2023; Erdener & Dalkıran, 2017).

It is seen that teachers have a tendency towards lifelong learning, but this tendency is at a moderate level. Enhancing the quality of education necessitates the imperative of teachers perceiving themselves as both individual and professional learners. For this reason, teachers' motivation toward lifelong learning should be increased first and foremost. It can be said that if teachers develop positive perceptions towards learning in schools, if their work is rewarded and honored, and if they feel valued in their institutions, their lifelong learning tendencies will increase. Although it is concluded that teachers' level of fidelity to the curriculum is high, it is seen that there are differences between sub-dimensions. In order to increase teachers' fidelity to the curriculum, it is important to give importance to the opinions of teachers who are in the field during the curriculum development process so that the designed curriculum can actually be implemented in the classrooms. In addition, teachers should be given the necessary training about the updated programs quickly and awareness training on the importance of program fidelity.

A significant correlation was identified between teachers' proclivity for lifelong learning and their adherence to the curriculum. Based on the fact that teachers' being lifelong learners is closely related to their fidelity to the curriculum, guidance activities can be carried out at certain intervals by school administrators and units affiliated with the ministry.

The study's participant group comprised teachers employed in the central Altieylül and Karesi districts of Balıkesir. The new study to be designed can be repeated with a larger study group or by using various sampling methods and different independent variables (gender, age, school district (rural-urban), private or public school). In addition, the results of the study were obtained by using the quantitative research method. In-depth research can be conducted with studies to be designed using qualitative or mixed methods. The study was carried out with teachers from both primary and secondary schools. The studies to be designed can be repeated for teachers working at different levels of education.

Policy Implications

Individuals need to have lifelong learning skills to adapt to the changing times and acquire new knowledge and skills. These skills begin in the family and gain momentum in school. At the forefront of guiding individuals in their continuous self-improvement are teachers. Therefore, it is necessary for teachers, who play a guiding role in individuals' lifelong learning skills, to possess the same skills themselves. Teachers continue to develop themselves both individually and professionally on an ongoing basis. The trainings that teachers receive in order to adapt to changing curricula or educational technologies emerge as factors influencing teacher commitment to the curriculum and teacher

characteristics and training factors. Teachers' acceptance of the curriculum, their attitudes towards the new program, their resistance to change, or their openness to innovations, and their motivation all affect their adherence to the curriculum. The success of a renewed program can be properly evaluated through teachers' implementation of the program in the classroom as designed by experts. Therefore, the training teachers receive within their professional processes to adapt to new programs and their perception of themselves as learners can be evaluated within the scope of lifelong learning tendencies. It is believed that teachers who are open to innovations, have high motivation to learn new information, will also have high adherence to the curriculum. Therefore, it can be said that there is a relationship between lifelong learning and adherence to the curriculum. It is believed that this study will guide decision-makers responsible for educational policies and demonstrate the importance of considering teacher characteristics in enhancing the quality of education. Furthermore, this study will reflect teachers' views on the curriculum to specialists involved in designing new instructional programs. It can also assist teaching staff in understanding how future teachers, as teacher candidates, should be trained and in developing the qualifications of the next generation of teachers.

Conflict of Interest

There is no conflict of interest between the authors of the article.

Funding Details

No funding or grant was received from any institution or organization for this research.

Ethical Statement

The research has been prepared adhering to the principles of scientific research and publication ethics. Ethics committee approval within the scope of the research has been obtained from the Balıkesir University ethics committee of scientific research with the decision numbered 124701 on 11.03.2022.

Credit Author Statement

The authors collaborated and made equal contributions throughout the conceptualization, methodology, method determination, data collection, data analysis, interpretation of findings, and writing processes of the research. Contribution rate statement of researchers: First author % 50, Second author %50.

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Investigation of the Relationship Between Learning Styles and Creativity of Middle School Science and Art Centres Students

Güliz KAYMAKCI¹

Tokat Gaziosmanpaşa University

Şendil CAN²

Muğla Sıtkı Koçman University

Abstract

The current study, which uses a survey approach, aims to identify middle school students who visit BILSEMs (Science and Art Centers) in terms of their creativity and learning preferences and to look into the impact of various factors on these traits. In the 2021–2022 academic year, 214 fifth, sixth, and seventh graders were chosen using the purposive sampling technique. The "How Creative Are You?" scale, "Kolb Learning Style Inventory," and a personal information form were used as data gathering tools. The study's findings indicate that the creativity of the participating students is above medium, and the majority have "converging" learning styles. At the same time, the minority has "diverging" learning styles, that gender, grade level, type of school, BILSEM program, and family income level have no bearing on the children's creativity, and learning styles vary significantly depending on these factors. Additionally, there was no discernible link between the students' learning preferences and creativity.

Keywords: Learning style, creativity, Science and Art Centre, gifted student, quantitative analysis

DOI: 10.29329/epasr.2024.655.5

Submitted: 10 October 2023

Accepted: 16 November 2023

Published: 31 March 2024

¹Asist. Prof. Dr., Tokat Gaziosmanpasa University, Education Faculty, Tokat, Turkey, ORCID: 0000-0002-3428-5214

Correspondence: gulizkaymakci@gmail.com

² Prof. Dr., Mugla Sıtkı Kocman University, Education Faculty, Muğla, Turkey, ORCID: 0000-0001-9313-7273, csendil@mu.edu.tr

Introduction

High-quality education is believed to be the fundamental building block of progress, particularly economic development. Through education, it is intended to produce creative people capable of thinking critically about things like knowledge, ideas, goods, etc. This qualification is particularly sought after in the twenty-first century. Gardner argues that qualified individuals possess 21st-century talents or the ability to perform tasks that machines cannot perform (Akgündüz et al., 2015). Creativity is one of the essential abilities among these abilities. Since it helps individuals and governments formulate policies to address present and potential issues, creativity and creative thinking in society have long been among the most hotly debated subjects. According to Parnes (2004), creativity is the ability to react to distinguishing external and internal inputs like words, pictures, symbols, and drawings. According to Torrance (1962), the fundamental components of creativity include sensing a problem or something missing, differentiating the problem's elements, formulating ideas or solutions for the problem or the missing pieces, making educated guesses, testing out the proposals for an answer, and ultimately arriving at a solution. Wallas (1926) asserted that the creation process consists of four stages: preparation, incubation, illumination, and verification, which also includes the problem-solving stage. When creativity is viewed as a personality characteristic, it can be claimed that creative people are curious, love dealing with difficult situations, have a high tendency to take chances, are original and flexible thinkers, and are introverted, independent, and inquisitive (Guilford, 1968). Csikszentmihalyi (2004) asserts that creative people can accomplish their goals through more excellent environmental adaptation skills than their counterparts, regardless of the circumstances. Specific requirements must be met to foster, define, and assess creativity in people. These requirements include redefining problems, analyzing and defending ideas, two-sided information flow, overcoming obstacles, taking risks, being willing to grow, believing in oneself, resisting uncertainty, and engaging in one's passions (Sternberg, 2006).

The results of the intelligence tests used to identify giftedness have started to be insufficient due to current intelligence research, and numerous evaluations to gauge creativity, problem-solving skills, situational awareness, etc., have become necessary (Arseven and Yeşiltaş, 2016). When the literature is examined, it becomes clear that the definition of a gifted person is someone prolific, has strong leadership qualities and can perform at a high level in various artistic fields (Marland Report, 1972). On the other hand, Renzulli (1978) defined giftedness as possessing both strong drive and above-average creative ability in any skill area. According to Cropley (1992), having a high IQ is not enough for someone gifted to succeed. Originality, consistency, and the ability to effectively communicate outcomes to others are among the requirements for true talent. This suggests that the success of gifted people depends on elements frequently linked to creativity and psychological traits typically recognized to be connected with intelligence. A thorough approach in these areas must foster creativity, giftedness, divergent thinking instruction, and learning-style-specific educational materials. Rita Dunn established

the idea of learning styles in 1960, and it became widely employed in the years that followed (Scales, 2000). In reality, finding disparate terms in the literature is feasible, such as learning styles, cognitive styles, sensory preferences, and personality traits. Many of these concepts are interchangeable, although in certain situations, they have developed their meanings (Cassidy, 2004). Learning styles are the methods a learner uses to process, store, and retain information (James and Gardner, 1995). The three main categories of learning styles are generally cognitive (including the dichotomies of analytic and global, dependent and independent fields, impulsive and reflective); personality (including the dichotomies of extrovert and introvert, random-intuitive and concrete-sequential, as well as closure-oriented and open-ended with sensory including visual, tactile, kinaesthetic, and auditory); and personality (including the dichotomies of random-intuitive and concrete). In light of intelligence theories, Karabey and Yürümezoğlu (2015) analyzed the notions of creativity and giftedness. Research on creativity and bipolar disorder was collated by Maçkal, Gülöksüz, and Oral (2014). The teaching environments should be planned by the learning characteristics of the individuals in a way that will permit the efficient learning process to occur, particularly from the perspective of the efficiency of the learning process of gifted students and the development of their innate skills (Kürüm, 2008). It is possible to plan the entire process—from the materials to be used in the lessons to the evaluation tools—for talented children by being aware of the different learning styles that the students exhibit and then designing the teaching environment, method, technique, and strategies accordingly. Students go through a quicker and easier learning process than they did in the past when they become aware of their learning preferences. In doing so, people come up with solutions to problems they run into in daily life faster, which boosts their creativity (Biggs, 2001; Entwistle, McCune, and Walker, 2001). Kolb (1984) asserts that people gain from their experiences as they learn. Through physical experiences and abstract ideas, information is gleaned from the environment. Reflective observation and active experiences process the knowledge learned through environmental experiences. There are four fundamental learning styles, according to Kolb (1984). People with differing learning styles demonstrate behaviors from the fusion of significant experience and reflective observation. They enjoy and favor learning that considers their senses, especially their sense of sight. Their feelings and intuitions are dominant. Individuals with the assimilation learning style/type exhibit behaviors that mix abstract conceptualization with reflective observation. They focus on the finer points and nuances. Individuals with the convergent learning style/type prioritize behaviors from active experience and abstract conceptualization. These people are cautious and don't make quick decisions. People with an accommodating learning style/type display behaviors that merge active experiences with concrete experiences. These people make snap decisions and act quickly. They enjoy trying and creating new things while working on a project. Another well-known learning style model is the one created by Grasha and Riechmann. Instead of the Kolb learning style, six alternative learning styles were identified in this paradigm (Grasha, 2002). Outperforming the other students in their class is the top priority for kids with a competitive learning style. They enjoy

being the center of attention and receiving praise for their achievements in the classroom. They believe they must compete with other pupils to win the awards in the classroom. Students who learn cooperatively love collaborating with teachers and other students and think that learning can be accomplished through sharing information and abilities. On the other hand, students with the avoidant learning style are not interested in what is happening in the classroom. They are not excited about learning the subjects and engaging in the lesson. They are also easily bored. On the other hand, students who learn by learning, like taking part in courses and in-class activities, consider themselves part of the group. They try to participate as much as possible in all mandatory and elective class activities. On the other hand, students who learn dependently are uninterested in what they are learning and only retain the learning that is pertinent to them. They look to their professors and peers for encouragement and seek someone to give them direction. On the other hand, students who prefer autonomous learning choose to work alone to study the material they believe to be crucial. They enjoy independent learning and thinking (Grasha, 2002).

Learning a gifted person's potential and critical thinking abilities is made more accessible by structuring their learning environments and processes to differentiate them from their peers with typical development. It is tailored to their learning preferences and interests (Bildiren, 2013). It is believed that the ideas of creativity and learning preferences are essential elements of a jigsaw puzzle (Levine, 2002). When studies from previous years are analyzed, it becomes clear that gifted students have superior spatial perception and attentional control skills to their peers with typical development, that they enjoy taking an active part in the learning process, and that they are more eager to collaborate in groups with other gifted students (Aşkar, 2006). In their study, Köksal, Göksu, and Kılıç (2017) polled 1116 individuals from three different groups—teachers, students, and parents—to determine which traits should be encouraged in the growth of gifted individuals. Most participants (80.6%) agreed that talented children must strengthen their creative thinking skills. According to the study by Tüysüz, Karakuyu, and Aydın (2008), which looked into the learning styles of talented kids, these students are more likely to exhibit participant and collaborative learning styles than others. Another study by Demirtaş and Baltaoğlu (2010) revealed that students with the visual learning style had better levels of creativity than those with the other learning styles.

Apaydın and Güven's research aims to assess undergraduate education processes in developing and using creativity abilities and determine the prospective teachers' creativity level.

In this context, the purpose of this research is to investigate the link between the degree of creativity and styles of learning of middle school BILSEM students by examining the effects of gender, school type, grade level, the program the student is enrolled in at BILSEM, and family income on both the general level of creativity and learning styles. There are multiple learning styles represented in each class of pupils. In this regard, enriching learning environments is crucial. It is anticipated that students

who have the chance to collaborate with peers who have various learning styles will develop their problem-solving and creative thinking abilities. The learning process is more effective and engaged in groups with diverse learning preferences. Each student adds something to the group. Students can benefit from this situation by being encouraged to consider other people's viewpoints from various angles. The learning process can be made more efficient and successful by knowing about the learning preferences of gifted students, including them in active learning, and carrying out activities to boost their creativity. This study is expected to help teachers organize and assess the educational environment and actions by their awareness of their students' preferred learning styles to make the teaching process more effective.

In this instance, with the purpose of the current study, replies to the undermentioned questions will be sought:

1. What is the middle school BILSEM students' creativity level?
2. Does the level of creativity of middle school BILSEM students change significantly according to;
 - a) Gender,
 - b) Grade level,
 - c) School type,
 - d) The program the student is attending in BILSEM,
 - e) Monthly income level of the families?
3. What are the learning styles of BILSEM students?
4. Does the learning styles of BILSEM students change significantly according to;
 - a) Gender,
 - b) Grade level,
 - c) School type,
 - d) The program the student is attending in BILSEM,
 - e) Monthly income level of the families?
5. Is there a significant correlation between the creativity level of middle school BILSEM students and their learning styles?

Method

Sample

This study was designed as descriptive research using a survey approach, and the sample consisted of 214 gifted middle school students randomly chosen from seven different BILSEMs in four other Turkish regions during the 2021–2022 academic year. Among the pupils taking part, 117 are in fifth grade, 53 are in sixth grade, and 44 are in seventh grade. Among the sample's students, 86 are girls, and 128 are boys; 106 attend public schools, and 108 participate in private ones. The following are the

programs offered in BILSEMs and the number of students enrolled in each program: 53 kids are enrolled in the Special Talent Development program, while 161 students are enrolled in the Recognizing Individual Talents (RIT) program (STD). It can be seen that the monthly income of the sample's three families with students is less than the minimum wage, while the monthly payment of the 36 families with students is between the minimum wage and 7500 TL, the 103 families with students is between 7501 and 15000 TL, and the 72 families with students is between 15001 and higher.

Data Collection Tools

The "How Creative Are You?" scale, created by Whetten and Cameron in 2002 and translated into Turkish by Aksoy in 2004, was used to gauge general creativity among middle school pupils at BILSEM. This one-dimensional scale, a three-point Likert scale, has 39 items. It was created to assess people's creativity levels and perceptions of that creativity by letting them select the adjectives that best characterize who they are. People are asked to choose ten adjectives to represent themselves in the category area of the 40th item of the scale. Students who receive a score between 116 and 95 on the scale are considered to be exceptionally creative; those who receive 94 to 65 are superior creative; those who receive 64 to 40 are above average creative; those who receive 39 to 20 are average creative, those who receive 19 to 10 are below average creative, and those who receive less than 10 are not creative. The reliability coefficient (Cronbach's Alpha coefficient) was found to be 0.95 in the study done to translate the "How Creative Are You?" scale into Turkish, and it was therefore determined that the scale is appropriate for usage in Turkey. The "How Creative Are You?" scale's reliability coefficient was found to be 0.89 in the current study.

The study's sample of students was assessed using the Kolb Learning Style Inventory, created by David Kolb in 1971, refined in 1984, and translated into Turkish by Aşkar and Akkoyunlu (1993). The Kolb Learning Style Questionnaire was developed to help people better understand the learning process and their particular learning preferences. Abstract conceptualization (AC), reflective observation (RO), active experimentation (AE), and concrete experience (CE) are the four learning styles that make up the Kolb Learning Style Inventory (Kolb, 2005, as referenced in Genç and Kocaarslan, 2013). The questionnaire asks participants to rank the four statements most accurately representing their learning styles out of 12 items with four options. The primary learning style of each person is identified based on their scores on the inventory items. The following Cronbach Alpha reliability values were obtained from Aşkar and Akkoyunlu's (1993) Analysis of the Kolb Learning Style Inventory's validity and reliability shows that abstract conceptualization scores are 0.71, concrete experience scores are 0.58, active experimentation scores are 0.65, reflective observation scores are 0.70, abstract-concrete scores are 0.77, and active-reflective scores are 0.76. (as cited in Denizoğlu, 2008).

Because all of the Cronbach Alpha reliability values obtained were higher than 0.70, it can be claimed that the inventory is sufficiently reliable for the current investigation.

The Cronbach Alpha reliability ratings for tangible experience were 0.79, reflective observation was 0.72, abstract conceptualization was 0.76, and active experimentation was 0.79, according to the current study's findings. In the reliability values of the combined scores, Cronbach Alpha was found to be 0.78 for abstract-concrete and 0.71 for the active-reflective. A "Personal Information Form" that the researchers developed was also used in the study to collect information on the sociodemographic characteristics of middle school BILSEM students, such as gender, school type, grade level, the BILSEM program the child is engaged in, and family income level. The "Kolb Learning Style Inventory" and the "How creative are you?" scale were handed to the pupils simultaneously with the personal information form.

Data Analysis

SPSS 20.0 statistic software was employed to analyze all the student-provided data. Frequency and percentage calculations were utilized in the general distribution calculations using the information gathered from the "How creative are you?" scale and the Kolb Learning Style Inventory. The assumption of normality for the data was checked using the Kolmogorov-Smirnov test and the Skewness and Kurtosis coefficients. Tables 1 and 2 present the results and coefficients.

Table 1. Skewness and Kurtosis Values

	Statistic	Standard deviation
Skewness	-0.06	0.14
Kurtosis	-0.45	0.27

Table 2. Normality Values

	Kolmogorov- Smirnov		
	Statistic	df	Significance
Total	0.03	213	0.20

We can say that the data with a skewness value of -0.42 and a kurtosis value of -1.66 are typically distributed, given that the distribution is considered to be expected if the values obtained when the skewness and kurtosis coefficients are divided by the skewness and kurtosis standard errors, respectively, are between -1.96 and +1.96. In addition, normalcy is attained when the Kolmogorov-Smirnov ($p=0.20$) value is higher than 0.05. (Can, 2014).

Since the data had a normal distribution, a one-way ANOVA was performed to determine whether there were any significant differences in the creative levels of middle school BILSEM students according to their gender, kind of school, and program of study. The independent samples t-test was

also performed to see whether there were significant differences in the pupils' creative levels according to grade level and monthly median family income. The available responses There are three options for each of the 39 statements on the scale "How creative are you?" that rate people's levels of creativity and perceptions of their invention: "I agree," "I am undecided," and "I disagree." The final element of the scale also includes a separate section where participants can choose the words that best describe them. The scale's items are graded from lowest (-2) to highest (4) points.

Data from the BILSEM students' responses to the statements on a scale were entered into a digital environment by coding them CE, RO, AC, and AE in that sequence. At the top of the scale, the combined scores for the CE, RO, AC, and AE total scores were determined. The formulas were used to get the combined scores;

both (AE) and (AC) less (CE) and (RO) points, respectively. A score over zero in AC minus CE points indicates abstract learning, and a score below zero in AC minus CE points indicates concrete education. Similar to how positive and negative scores obtained in AE minus RO points demonstrate active or reflective understanding, respectively. Based on the combined results, the intersection of the two scores in the graphic offers the individual the most suitable learning style/type. Following these procedures, scores between -36 and +36 were produced, and the participant's learning styles/types were identified in Figure 3.1. The relationships between the learning preferences of middle school BILSEM students and their gender, grade level, school type, the program they are enrolled in at BILSEM, and family income level were examined using chi-square test analysis. The Chi-square test was used to investigate the relationship between the creative class and the learning preferences of middle school BILSEM students.

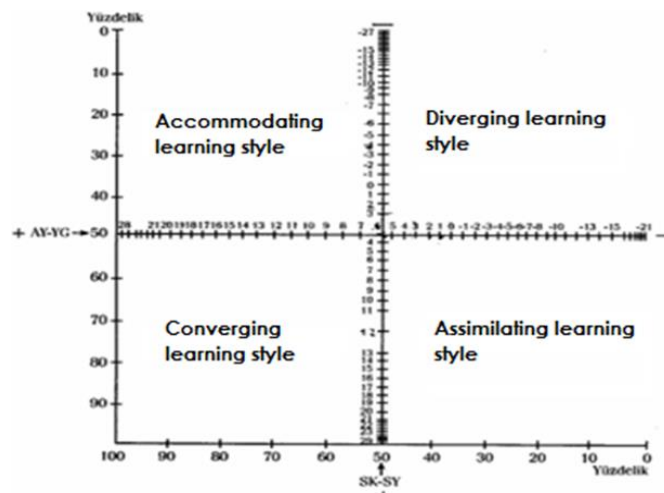


Figure 1. Kolb learning style diagram (Öztuna, 2013)

Findings

The research questions of the study's findings are displayed in tables and explained in the findings section.

Findings for the 1st Sub-Problem

The 1st sub-problem of this research is related to the specification of the creativity level of the middle school BILSEM students. In this context, in Table 3, the creativity level of BILSEM students is given with descriptive statistics.

Table 3. Distribution of the creativity level of the middle school BILSEM students

Extraordinary creative		Superior creative		Creativity level						Scale general			
				Above average creative		Average creative		Below average creative		Not creative		\bar{X}	S
N	%	N	%	N	%	N	%	N	%	N	%		
23	10.7	74	34.6	114	53.3	3	1.4	0	0	0	0	67.93	18.18

As shown in Table 3, 10.7% (N:23) of the middle school BILSEM students are extraordinarily creative, 34.6% (N:74) are superior creative, 53.3% (N:114) are above average creative, 1.4% (N:3) are average creative, no student is below average imaginative or not creative. Therefore, it was concluded that the creativity level of the middle school BILSEM students is mainly above the average.

Findings for the 2nd Sub-Problem

Determining how the gender variable influences the degree of creativity among BILSEM students is the second problem with this study. Table 4 shows the findings of the independent samples t-test carried out in this situation to ascertain the association between the gender of the students' inventiveness.

Table 4. The independent samples t-test results of the correlation between BILSEM students' creativity and gender

The scale "How creative are you?"	Gender	N	\bar{X}	S	t	p
Whole scale	Girl	86	67.74	18.71	-0.13	0.90
	Boy	128	68.06	17.88		

Table 4 shows that there is no discernible gender difference in the middle school BILSEM students' overall creativity score [$t_{(214)} = -0.13, p > 0.05$]. The 214 pupils in the sample consist of 128 boys and 86 girls, and it can be noted that the mean originality score for boys is more significant than that for girls (67.74 vs. 68.06). Therefore, it might be argued that gender does not statistically significantly affect talented students' inventiveness.

Findings for the 3rd Sub-Problem

The third sub-problem of the study is concerned with figuring out how the grade level variable affects how creative the middle school BILSEM students are. The results are shown in Tables 5 and 6. A one-way analysis of variance (ANOVA) was conducted to see whether there is a significant link

between the middle school BILSEM students' scores on the scale "How creative are you?" and their grade level.

Table 5. Arithmetic means and standard deviations of the scores taken by the middle school BILSEM students from the scale "How creative are you?" across the grade levels

The scale "How creative are you?"	Grade Level	N	\bar{X}	S
Whole scale	5 th grade	117	68.22	18.74
	6 th grade	53	68.00	17.99
	7 th grade	44	67.09	17.25
	Total	214	67.94	18.18

Table 5 shows 117 middle school BILSEM students in fifth grade, 53 in sixth grade, and 44 in seventh grade. Table 6 displays the findings of the one-way analysis of variance (ANOVA) performed to assess whether the difference between the arithmetic means is statistically significant.

Table 6. Results of the One-way ANOVA conducted to determine the correlation between the scores taken by the middle school BILSEM students from the "How creative are you?" scale and grade level

Source of the variance	Sum of squares	Sd	Mean square	F	p
Between-groups	41.22	2	20.61	0.06	0.94
Within-groups	70365.86	211	333.49		
Total	70407.09	213			

According to the analysis's results, which are shown in Table 6, there is no statistically significant correlation between the middle school BILSEM students' degree of originality and their grade [$F_{(2,211)} = 0.06, p > 0.05$]. This demonstrates how grade level has no bearing on the creativity of gifted middle school students.

Findings for the 4th Sub-Problem

The fourth sub-problem of this research is to determine how the school type variable affects how creative the middle school BILSEM students are. The findings of the independent samples t-test analysis performed in this context to ascertain the influence of the school type variable on the scores of the middle school BILSEM students obtained from the "How creative are you" scale are presented in Table 7.

Table 7. The independent samples t-test results of the correlation between BILSEM students' creativity and school-type

The scale "How creative are you?"	School type	N	\bar{X}	S	t	p
Whole scale	Public	106	68.01	18.36	0.68	0.95
	Private	108	67.85	18.09		

As shown in Table 7 [$t_{(214)} = 0.68, p > 0.05$], the results of the independent samples t-test analysis conducted to ascertain the impact of the school type variable on the scores of the middle school BILSEM students on the "How creative are you?" scale. Of the 214 participants in the sample, 106 attend a public school, and 108 follow a private one for their academic studies. When Table 7 is looked at, it can be observed that the mean score of the BILSEM students studying in public schools ($X:68.01$) is higher than the mean score of the BILSEM students studying in private schools ($X:67.85$) on the scale of "How creative are you?" However, the school type variable does not statistically significantly affect the level of originality among middle school BILSEM students, as shown by the fact that the p-value is more significant than 0.05.

Findings for the 5th Sub-Problem

The study's fifth sub-problem concerns figuring out how the student's BILSEM program affects how creative the middle school BILSEM pupils are. Table 8 provides the findings of the independent samples t-test analysis carried out in this context to ascertain the impact of the program the student is enrolled in at BILSEM on the scores of the middle school BILSEM students obtained from the "How creative are you" scale.

Table 8. The independent samples t-test results of the correlation between BILSEM students' creativity and the program the student is attending in BILSEM

The scale "How creative are you?"	The program the student is attending in BILSEM	N	\bar{X}	S	t	p
Whole scale	Exceptional Talent Development (STD)	53	67.47	17.66	0.05	0.83
	Recognizing Individual Talents (RIT)	161	68.09	18.40		

Table 8 shows that there is no discernible difference in the inventiveness of middle school BILSEM students according to the program they are enrolled in [$t_{(214)} = 0.05, p > 0.05$]. Of the talented middle schoolers enlisted in BILSEMs, 161 are trained in the program of Recognizing Individual Talents and 53 in the program of Special Talent Development. When Table 8 is studied, it becomes clear that the talented students enrolled in the Special Talent Development in BILSEMs program had higher mean creativity scores than the gifted students enrolled in the Recognizing Individual Talents in BILSEMs program ($X: 67.47$). Since the p-significance value is more significant than 0.05, it can be concluded that the program the student attends in BILSEM does not have any statistically significant effect on the creativity level of the middle school BILSEM students.

Findings for the 6th Sub-Problem

The sixth sub-problem of the study is concerned with figuring out how the family income variable affects the degree of creativity among middle school BILSEM students. The results of a one-way analysis of variance (ANOVA) used to determine whether there is a significant relationship

between the average monthly income of the family and the scores of middle school BILSEM students taken from the scale "How creative are you?" are shown in Tables 9 and 10.

Table 9. Arithmetic means and standard deviations of the scores taken by the middle school BILSEM students from the scale "How creative are you?" across the family income levels

The scale "How creative are you?"	Family income levels	N	\bar{X}	S
Whole scale	Below the minimum wage	3	59.00	13.31
	Minimum wage-7500 TL	36	69.31	3.01
	7501 TL- 15000 TL	103	69.66	1.81
	15001 TL and higher	72	65.15	2.07
	Total	214	67.94	18.18

As seen in Table 9, the average monthly income of the sample's three families with students is less than the minimum wage, while that of the 36 families with students is between the minimum wage and 7500 TL, the 103 families with students is between 7501 and 15000 TL, and that of the 72 families with students is between 15001 and higher. Table 10 displays the findings of the one-way analysis of variance (One-way ANOVA) carried out to ascertain whether the conflict between the arithmetic means is statistically significant.

Table 10. Results of the One-way ANOVA conducted to determine the correlation between the scores taken by the BILSEM students from the scale "How creative are you?" and family income

Source of the variance	Sum of squares	Sd	Mean square	F	p
Between-groups	19.20	39	00.50	0.89	0.67
Within-groups	96.60	174	00.56		
Total	115.80	213			

According to the analysis's findings, which are presented in Table 10, there is no statistically significant relationship between middle school BILSEM students' levels of creativity and their family's wealth [$F_{(39-174)} = 0.89, p > 0.05$]. This suggests that the inventiveness of the middle school BILSEM students is unaffected by their family's income status.

Findings for the 7th Sub-Problem

Identifying the middle school BILSEM students' learning preferences is the subject of the study's seventh sub-problem. The frequency and percentage distribution of the middle school BILSEM students' learning styles are shown in Table 11 in this context.

Table 11. Distribution of the middle school BILSEM students across the learning styles

Learning styles	f	%
Diverging	37	17.3
Assimilating	40	18.7
Converging	81	37.9
Accommodating	56	26.1
Total	214	100.0

When the learning styles of the BILSEM students participating in the study are examined in Table 11, it is understood that the highest percentage of the students have the converging learning style (37.9%) and that the lowest rate of the students has the diverging learning style (17.3%).

Findings for the 8th Sub-Problem

Finding out how the gender variable affects the learning styles of the gifted middle school BILSEM students is the eighth sub-problem of the study. The results of the Chi-square test, which was used to ascertain the impact of the gender variable on the learning styles of the gifted middle school BILSEM students, are presented in Table 12 in this context.

Table 12. Correlation between the learning styles of the middle school BILSEM students and their gender

Gender		Learning Style				TOTAL
		Diverging	Assimilating	Converging	Accommodating	
Boy	N (%)	21 (16.4)	32 (25.0)	51 (39.8)	24 (18.8)	128 (100.0)
Girl	N (%)	16 (18.6)	8 (9.3)	30 (34.9)	32 (37.2)	86 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.8)	56 (26.2)	214 (100.0)

$$\chi^2 = 13.96; \text{sd} = 3; p = 0.03; p < 0.05$$

According to Table 12, there is a statistically significant relationship between the gender and the learning preferences of middle school BILSEM students ($\chi^2(3) = 13.96; p < 0.05$). To put it another way, it may be claimed that the gender variable statistically impacts how the BILSEM students learn. When the study participants' results, boys and girls, are compared, most boys prefer the converging learning style (39.8%). In comparison, the accommodating learning style is selected by the majority of girls (37.2%). The diverging learning style is preferred by a minority of boys (16.4%), while the assimilating learning style is selected by a minority of girls (9.3%).

Findings for the 9th Sub-Problem

The study's ninth sub-problem focuses on figuring out how the grade level variable affects the learning preferences of middle school BILSEM students. The results of the Chi-square test, which was used to ascertain the impact of the grade level variable on the learning preferences of the middle school BILSEM students, are presented in Table 13 in this context.

Table 13. Correlation between the learning styles of the middle school BILSEM students and their grade level

Grade Level		Learning Styles				TOTAL
		Diverging	Assimilating	Converging	Accommodating	
5	N (%)	21 (17.9)	4 (3.4)	50 (42.7)	42 (35.9)	117 (100.0)
6	N (%)	13 (24.5)	33 (62.3)	4 (7.5)	3 (5.7)	53 (100.0)
7	N (%)	3 (6.8)	3 (6.8)	27 (61.4)	11 (25.0)	44 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$$\chi^2 = 108.98; \text{sd} = 6; p = 0.00; p < 0.05$$

Table 13 shows a statistically significant relationship between grade level and learning preferences for middle school BILSEM students ($\chi^2(6) = 108.98; p < 0.05$). According to the grade level variable, the majority of fifth-graders (42.7%) who took part in the study's data analysis have convergent learning styles. Assimilation is the preferred learning approach for the majority of sixth graders (62.3%) and the majority of seventh graders (61.4%). Assimilation is the least common learning style among students in the fifth grade (3.4%), accommodating learning is least common among students in the sixth grade (5.7%), and diverging and assimilating learning styles are least common among students in the seventh grade (6.8%).

Findings for the 10th Sub-Problem

The determination of the influence of the school type variable on the learning styles of middle school BILSEM students is the subject of the study's tenth sub-problem. Table 14 displays the results of the Chi-square test that was used to ascertain the impact of the school-type variable on the learning preferences of middle school BILSEM students in this context.

Table 14. Correlation between the learning styles of the middle school BILSEM students and the school type variable

School type		Learning styles				
		Diverging	Assimilating	Converging	Accommodating	TOTAL
Public	N (%)	22 (20.8)	11 (10.4)	50 (47.2)	23 (21.7)	106 (100.0)
Private	N (%)	15 (13.9)	29 (26.9)	31 (28.7)	33 (30.6)	108 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$\chi^2 = 15.65; sd = 3; p = 0.00; p < 0.05$

The middle school BILSEM students' learning preferences and the school type variable have a statistically significant link, as shown in Table 14 ($X^2(3) = 15.65; p < 0.05$). When the data of BILSEM students are examined in terms of the school type variable, it is seen that the highest percentage of students attending a public school have the converging learning style (47.2%), and the lowest rate of students attending a public school have the assimilating learning style (10.4%). In comparison, the highest percentage of students attending a private school have an accommodating learning style (30.6%), and the lowest rate of students attending a private school has an assimilation learning style (10.1%).

Findings for the 11th Sub-Problem

The study's eleventh sub-problem deals with determining the impact of the curriculum the student is enrolled in at BILSEM on the learning preferences of middle school BILSEM students. The results of the Chi-square test, which was used to ascertain the impact of the variable of the program the student is enrolled in at BILSEM on the learning preferences of the middle school BILSEM students, are presented in Table 15 in this context.

Table 15. Correlation between the learning styles of the middle school BILSEM students and the variable of the program the student is attending in BILSEM

The program the student is attending in BILSEM	Learning styles					
	Diverging	Assimilating	Converging	Accommodating	TOTAL	
Exceptional Talent Development (STD)	N (%)	5 (9.4)	13 (24.5)	23 (43.4)	12 (22.6)	53 (100.0)
Recognizing Individual Talents (RIT)	N (%)	32 (19.9)	27 (16.8)	58 (36.0)	44 (27.3)	161 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81(37.9)	56 (26.2)	214 (100.0)

$\chi^2 = 4.71$; $sd = 3$; $p = 0.19$; $p > 0.05$

Table 15 demonstrates that there is no statistically significant relationship between the middle school BILSEM students' learning preferences and the variable of the program they are enrolled in at BILSEM ($\chi^2 (3) = 4.71$; $p > 0.05$). When the data of the BILSEM students are examined in terms of the program the student is attending, it is understood that the highest percentage of the students attending the Special Talent Development (STD) program have the converging learning style (43.4%) and the lowest rate of the students attending the Special Talent Development program have the diverging learning style (9.4%). In comparison, the highest percentage of the students attending the Recognizing Individual Differences (RISD) program have the diverging learning style (10.1%).

Findings for the 12th Sub-Problem

Determining the impact of the family income variable on the learning preferences of middle school BILSEM students is the subject of the study's twelfth sub-problem. The results of the Chi-square test, which was used to ascertain the impact of the family income variable on the learning preferences of middle school BILSEM students, are presented in Table 16 in this context.

Table 16. Correlation between the learning styles of the middle school BILSEM students and the family income variable

Family income level	Learning styles					
	Diverging	Assimilating	Converging	Accommodating	TOTAL	
Below the minimum wage	N (%)	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	3 (100.0)
Minimum wage-7500 TL	N (%)	7 (19.4)	16 (44.4)	3 (8.3)	10 (27.8)	36 (100.0)
7501 TL-15000 TL	N (%)	27 (26.2)	9 (8.7)	40 (38.8)	27 (26.2)	103 (100.0)
15001 TL and higher	N (%)	3 (4.2)	15 (20.8)	36 (50.0)	18 (25.0)	72 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$\chi^2 = 43.41$; $sd = 9$; $p = 0.00$, $p < 0.05$

As shown in Table 16, there is a statistically significant correlation between the learning styles of middle school BILSEM students and the family income variable ($\chi^2_{(9)}= 43.41$; $p<0.05$). When the data of the BILSEM students are examined in terms of the family income variable, it is seen that the highest percentage of the students whose families' monthly income is below the minimum wage have the converging learning style (66.7%) and the lowest rate of them have the diverging and assimilating learning styles (% 0.0), that the highest rate of the students whose families' monthly income is in the range of minimum wage - 7500 TL have the assimilating learning style (44.4%) and the lowest percentage of them have the converging learning style (8.3%), that the highest rate of the students whose families' monthly income is in the range of 7501 TL- 15000 TL have the converging learning style (38.8%) and the lowest percentage of them have the assimilating learning style (8.7%) and that the highest rate of the students whose families' monthly income is in the range of 15001 and higher have the converging learning style (50.0%) and the lowest rate of them have the diverging learning style (4.2%).

Findings for the 13th Sub-Problem

The examination of whether there is a statistically significant association between the middle school BILSEM students' learning preferences and their level of creativity constitutes the study's thirteenth sub-problem. In this respect, Table 17 displays the results of the Chi-square test that was performed to ascertain the relationship between the middle school BILSEM students' preferred learning styles and their level of creativity.

Table 17. Correlation between the learning Styles and creativity level of the middle school BILSEM Students

Creativity level	Learning styles					TOTAL
	Diverging	Assimilating	Converging	Accommodating		
Average creative	N (%)	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	3 (100.0)
Above average creative	N (%)	19 (16.7)	24 (21.1)	41 (36.0)	30 (26.3)	114 (100.0)
Superior creative	N (%)	14 (18.9)	12 (16.2)	32 (43.2)	16 (21.6)	74 (100.0)
Extraordinary creative	N (%)	4 (17.4)	4 (17.4)	6 (26.1)	9 (39.1)	23 (100.0)
Total	N (%)	37 (17.3)	40 (18.7)	81 (37.9)	56 (26.2)	214 (100.0)

$\chi^2= 6.11$; $sd = 9$; Cramer's $V= 0.10$; $p = 0.73$; $p>0.05$

Table 17 demonstrates no statistically significant relationship between the middle school BILSEM students' learning preferences and their level of creativity ($\chi^2= 6.11$; $p>0.05$). When the data from the middle school BILSEM students who took part in the current study are examined, it is clear that most of the average creative students have a converging learning style (66.7%). The minority of them have a diverging and assimilating learning styles (0.0%), that the converging learning style is used by the highest percentage of students who are above average creative (36.0%) and the lowest percentage of students who have diverging learning styles (16.7%); the converging learning style is used by the highest percentage of students who are superior creative (43.2%) and the lowest percentage of students

who have assimilation learning styles (16.2%); and the converging learning style is used by the highest percentage of students who are extraordinary creative.

Discussion, Conclusion and Recommendations

Discussion

This study examined the links between the student's gender, grade level, school type, program they were enrolled in at BILSEM, family income level, and the level of creativity and learning preferences of the middle school BILSEM students. The relationship between students' creativity levels and preferred learning methods was also examined. According to the current study, most of the middle school BILSEM students showed above-average inventiveness. A review of the literature reveals that there have been many studies on creatively gifted students. For instance, a survey by Hacıoğlu and Türk (2018) that aimed to uncover talented students' opinions of their creativity revealed that gifted students studying in BILSEMs are conscious of their creativity and perceive themselves as creative. According to Petruzzi (1984), who also concluded that they had an above-average level of creativity, the creativity scores of clever children are higher than those of children with average intelligence. On the other hand, Sternberg and Lubart (1993) concluded that creativity is a type of giftedness after comparing the creative talents of gifted and undiagnosed students. This research supports the current study's conclusion that talented individuals have above-average levels of creative talent. According to the findings of the present study, gender, grade level, school type, the BILSEM program a student is enrolled in, and family economic level, had no discernible effects on middle school BILSEM students' levels of creativity. While some of the research in this field made arguments that were comparable to the findings of this investigation, other studies made contrary claims. Koçak and İçmenoğlu (2012) examined independent variables to determine the creativity levels of gifted kids, and it was concluded that there was no discernible difference in creativity levels based on gender, perceived economic position, or birth order. Gender did not significantly affect high school students' originality, according to a study that looked into the relationship between gender and creativity. The study included 95 males and 116 girls (Torrance, 2002). There are studies in the literature as well with various outcomes. The study's findings by Öztunç (1999) led to the conclusion that female students' mean creativity is higher than male students'. According to Davaslıgil (2007), there is no clear-cut relationship between creativity and age. However, he highlights that the dramatic rise in creativity in the first few years of life will persist, with a little decline around the seventh grade. To compare the levels of creativity and critical thinking in gifted and typical kids, as well as to examine the impact of various demographic factors on these skills, Bapoğlu (2010) studied students in the fifth, sixth, seventh, and eighth grades who were enrolled in science and art centers and primary schools. It was discovered that age, grade level, the number of siblings, and achievement perception are all useful predictors of creativity scores and that gender does not significantly affect creativity scores. Students from middle socioeconomic status also scored higher on creativity.

This study discovered that most middle school BILSEM students had a converging learning style, which means that they prioritize actions based on active experience and abstract conceptualization and do not act without first thinking. The minority of the students, on the other hand, were found to have a diverging learning style, which means that they enjoy learning that appeals to their sense organs, particularly their sense of sight and that they give less importance to abstract concepts. Students' learning preferences were found to differ significantly depending on their gender, grade level, type of school, and monthly average family income, but not depending on the BILSEM program they are enrolled in. The study's findings also led to the conclusion that no discernible link exists between the BILSEM students' learning preferences and their creative abilities.

In a study by Alkan, Nacaroğlu, and Mutlu (2020) comparing the most effective learning styles of gifted children with those of their non-gifted classmates, it was discovered that "accommodating" (35.3%) was the most prevalent learning style among the gifted students who participated in the survey. Students' learning styles were found to be significantly influenced by their gender, grade level, and age. However, after completing a study to identify the learning styles of talented students, Tüysüz (2013) found that gifted children displayed high degrees of independent, cooperative, competitive, and participative learning styles. While studying at the secondary school level, gifted students exhibited a high level of "independent," "competitive," and "collaborative" learning styles, as well as a moderate level of "passive," "dependent," and "participant" learning styles, according to a study by Arseven (2016). Additionally, neither the student's gender, grade level, mother's education level, nor father's education level significantly affect the student's scores on the learning styles scale. In addition, Arseven and Yeşiltaş (2016) found that gifted students primarily favor "independent" and "competitive" learning styles in their study, which sought to ascertain the differences in learning styles between students who were identified as gifted and those who were not, as well as the influence of various variables on learning styles.

Conclusion

The findings of this research, in which the creativity level and learning styles of middle school BILSEM students were determined, and the relationships between their creativity level and learning styles and the variables of student's biological sex, participant's current grade, student's type of school, the program the student is enrolled in at BILSEM, and student's family income level were investigated,

According to the findings of this study, gender, grade level, type of school, the BILSEM program a student is enrolled in, and family income level had no impact on the students' creative levels, which were shown to be mainly above average for middle school BILSEM students.

It was revealed that most middle school BILSEM students have a converging learning style, while the fewest have a diverging one. It was determined that learning styles vary significantly depending on the student's gender, grade level, school type, and monthly family income, but not on the

program the student is attending in BILSEM. In addition, no statistically significant correlation was found between the creativity level of the middle school BILSEM students and their learning styles.

Additionally, the current study is limited to;

1. The 2021–2022 academic year, two, seven BILSEMs spread throughout four different provinces, three.
2. The information gathered via the study's data collection methods,
3. The information gathered from gifted students in grades 5, 6, and 7,
4. 214 students who were receiving BILSEM training made up the sample.

Recommendations

The following suggestions can be made in light of the study's findings:

1) This study only included middle school BILSEM students. Studies on the subject at various grade levels may make it feasible for knowledge to be accessible on a grander scale. 2) According to this study, gifted students primarily exhibit convergent learning styles/types. Planning studies that employ qualitative research techniques will allow for a thorough examination of learning styles/types.

3) The current study examined how factors such as student gender, grade level, school type, BILSEM program, and family income level affected middle school BILSEM students' creativity. Research involving various variables that are thought to influence students' creativity can add to the body of knowledge.

4) It is believed that tailoring the curriculum of instruction provided in the Science and Art Centers (BILSEM), which is crucial in fostering the development of creativity skills in gifted students, by the students' learning styles/types, will have a positive impact on the students' learning and self-actualization processes.

Policy Implications

The rapid change in science and technology has led to the differentiation of skills and competencies expected from individuals. In parallel with this, with the rapid increase in knowledge, it is an undeniable fact that individuals should have skills and competencies appropriate to the age, both socially and academically. Today, it is aimed to raise not individuals who memorize information, but individuals with 21st century skills who have quick access to information, share it, have the ability to use it effectively, and can analyze problems and produce solutions. Therefore, organizing education policies according to the current conditions and time will provide maximum efficiency in achieving the targeted goal. Creativity and creative thinking, which are among 21st century skills, will contribute to both individuals and educational policies in producing solutions to existing or future problems.

Individuals' ability to transfer knowledge correctly depends on the learning situation. Today, learning can be expressed as the collaborative, critical and creative co-production of knowledge by individuals rather than being a one-way receiver of information. Therefore, knowing the learning styles that individuals have based on their learning characteristics will enable the planning of the appropriate educational environment, the organization of appropriate methods, techniques and strategies, and the use of appropriate measurement and evaluation tools, thus raising individuals who can construct knowledge and use it effectively. In this context, in this study, the creativity level and learning styles of middle school Science and Art Center (in Turkish BİLSEM is the acronym for this term) students were determined and the effect of demographic characteristics was investigated and the relationship between the creativity level and learning styles of the students was revealed. As a result of the research, it was seen that the creativity level of the students was above average and that they had a "decomposing" learning style, which acts by thinking and shows cautious behavior. It was concluded that there was no statistical relationship between students' learning styles and creativity.

In Science and Art Centers (BİLSEM), which are opened to contribute to the development of creativity skills of gifted students and continue their activities in our country, the planning and implementation of educational activities according to students' learning styles will have a positive impact on students' learning situations and the development of their creativity. It is thought that this research will contribute to current educational problems and future educational practices in both national and international contexts.

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Credit Author Statement

Author 1: Writing – original draft, Conceptualization, Investigation, Methodology, Formal analysis, Visualization

Author 2: Writing – review & editing, Conceptualization, Supervision, Methodology, Investigation.

Funding details

This research received no specific grant from any funding agency

Ethics committee permission and approval

Current research was approved ethically appropriate by Mugla Sıtkı Koçman University Social and Human Sciences Ethics Committee (Dated 15/05/2023; Protocol number: 230046; Decision number: 53)

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