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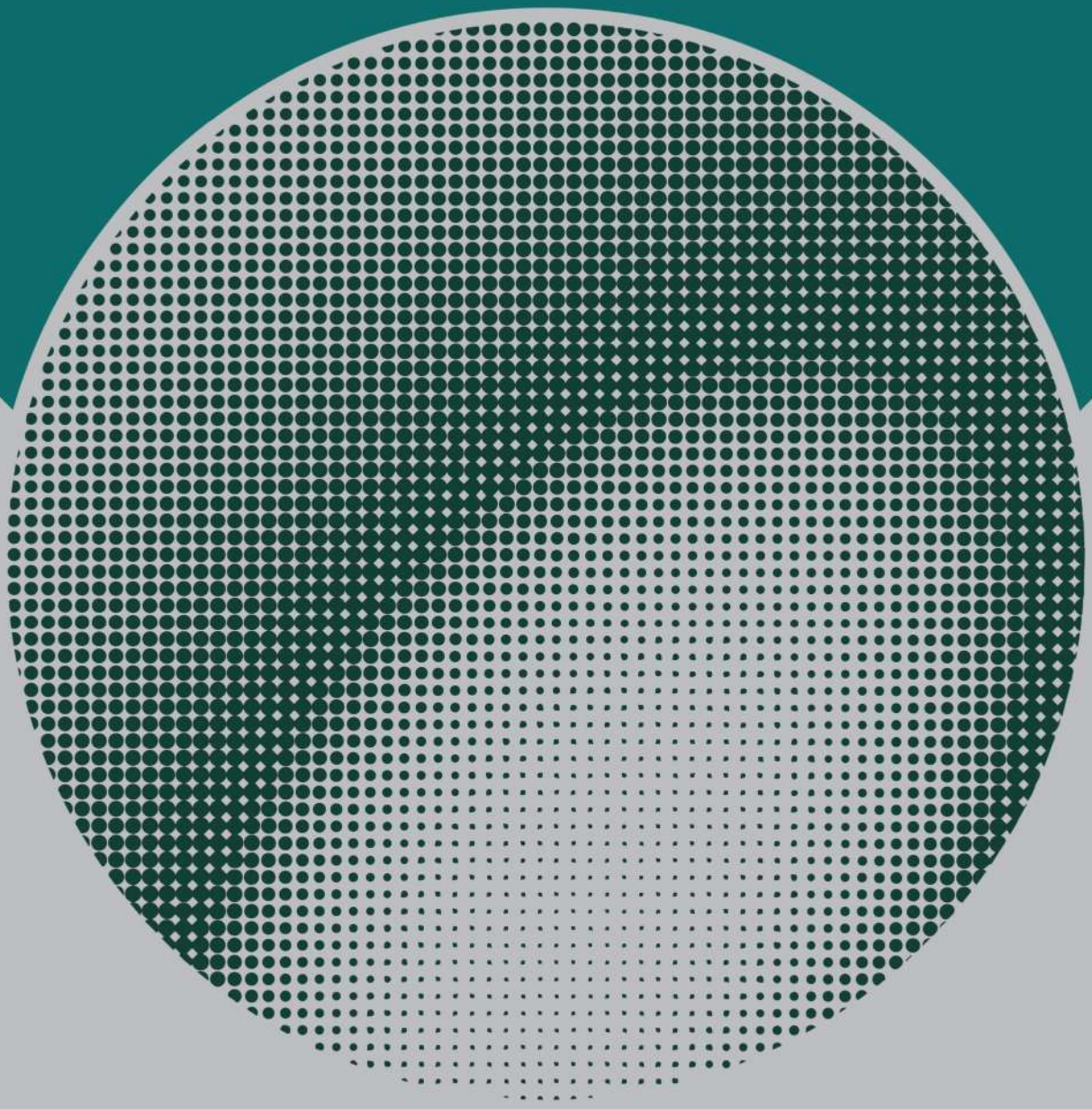
International Journal of Contemporary Educational Research



2024

Volume 11
Issue 4

e-ISSN: 2148-3868

International Journal of Contemporary Educational Research
Volume 11 | Issue 4 | Year 2024

About the Journal

Journal Name	International Journal of Contemporary Educational Research
Abbreviation Name of the Journal	IJCER
e-ISSN	2148-3868
Publication Frequency	Four issues in year (March, June, September & December)
Dergi Web Sitesi	www.ijcer.net
Start Publishing	31.01.2014
Chief Editor	Prof. Dr. Mehmet Nuri Gömleksiz
Publisher	Assoc. Prof. Muhammed Zincirli
Country of Publication	Türkiye
Publication Type	Open access
Publication Content	International Journal of Contemporary Educational Research contains original scientific publications. All published papers, except editorial manuscripts, are subject to a double blind peer review process.
Audience	The target audience is members of the profession, teachers, school administrators, experts, researchers, master's and doctoral students as well as students related to this field with all fields of educational sciences. It aims to contribute to the spread of continuous professional development and research culture.
Publication Language	English

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Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	iThenticate & Turnitin

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Open Academic Journals Index (OAJI)
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Complaint
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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 440-456 Article Type: Research Article

Development and Validation of a Motivation Scale for English Listening

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Abstract
Motivation is crucial in the pace and success of language learning, and the effect of motivation on language learning has been extensively studied. Many scales have been developed to measure the motivation levels of the students. However, there are a limited number of studies conducted to specifically measure the motivation towards English language listening in the EFL context. Motivation has become an important factor that increases success in listening in terms of metacognitive control of listening processes and comprehension outcomes. This study aims to develop a motivation scale specifically for assessing English listening skills among secondary school students. A 25-item questionnaire with five sub-factors has been developed as a result of an exploratory factor analysis of the responses provided by a sample of 294 Turkish secondary school students. Sub-factors have been named as "effort," "self-confidence," "travel and friendship," "unwillingness," and "lack of interest." These factors explain 56.938% of the total variance. Cronbach Alpha value of the scale is 0.898. The values of item-total and item-remaining correlation are significant ($p < 0.01$). Moreover, the item discrimination value obtained from the difference between mean points of 27% of the lower and upper groups is significant. Confirmatory factor analysis shows that the goodness of fit indexes is acceptable (RMSEA=0.047; AGFI=0.86; SRMR=0.060; CFI=0.91; NNFI=0.89, $\chi 2$/sd 1.55). The data also revealed evidence of the reliability and validity of the instrument. The potential uses of the questionnaire and implications for further research are discussed.

Keywords: Construct validity, Listening, Motivation, Scale development

Citation
Hocaoğlu, N. & Ocak, G. (2024). Development and validation of a motivation scale for english listening. *International Journal of Contemporary Educational Research, 11*(4), 440-456. https://doi.org/10.52380/ijcer.2024.11.4.583

Received	01.12.2023
Accepted	28.09.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Ethical Statement	This article is extracted from the corresponding author's doctorate dissertation entitled "Investigation of The Effect of Teaching Listening Strategies in 6th Grade English Course on Students' Listening and Speaking Skills", supervised by Prof. Dr. Gürbüz Ocak (Ph.D. Dissertation, Afyon Kocatepe University, Afyonkarahisar, Turkey, 2023).
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The author(s) acknowledge that they received no external funding in support of this research.

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Introduction

Listening in a foreign language has always been a neglected skill (Flood et al., 2003), as it is considered a skill that can be developed without assistance (Osada, 2004). However, the researchers have proven that listening skills could also be developed through using effective listening tactics, strategies, etc. (Pourhosein Gilakjani & Ahmadi, 2011; Zhang, 2007; Nga Thi, 2015; Nowrouzi et al., 2014; Kassem, 2015), and foreign language acquisition can be improved and accelerated through increasing the motivation levels of the students (Goctu, 2016; Kamaeva et al., 2022). Therefore, teachers should help their students improve and implement listening strategies according to their needs, lacks, and aims. Motivation towards language learning can be increased through appropriate teaching methods and techniques.

Through the students' eyes, listening is still one of the most challenging skills to master (Alzamil, 2021; Vandergrift & Goh, 2012). If teachers want their students to be successful in foreign language learning and help them in the listening process, they need to identify what kind of problems students have and offer solutions to these problems to eliminate those (Bagheri & Karami, 2014). Likewise, it is crucial to determine the levels of motivation towards English language listening.

Although there are many factors underlying the success of language learners, motivation is likely one of the variables for second language listening proficiency. The importance of motivation for successful L2 learning cannot be overestimated (Gardner, 1985; Anjomshoa & Sadighi, 2015; Mitu, 2019; Norris-Holt, 2020). Even those with the greatest abilities cannot achieve long-term objectives without enough motivation. In the same vein, effective instruction and suitable curricula alone are insufficient to guarantee student success (Guilloteaux & Dörnyei, 2008). It is believed that listening involves complex cognitive processes, affective processes (such as the motivation to pay attention to those messages), and behavioral activities (Bodie, 2013). Hence, it is significant to understand the motivational behaviors of language learners.

For this reason, teachers should know the students' motivation levels and then shape the listening activities accordingly. As of this writing, no valid and reliable instrument exists that measures secondary school students' motivation for English listening. Such an instrument is crucial to be developed since motivation is one of the important affective factors directly related to language learning. Therefore, this study aims to develop a scale that measures secondary school students' motivation levels for English listening.

Background Literature

Particularly in the classroom, motivation is crucial to the success and speed of learning a second or foreign language. Motivation is defined as a reason for taking a specific action. It is the effort one is prepared to put in to accomplish a specific goal. It also depends on how long someone can continue to do a particular task (Dörnyei & Ushioda, 2011). According to Dörnyei (1998), the main driving force behind starting a second language is motivation and then continues to be the impetus to continue the protracted and frequently frustrating learning process. The role of motivation in second language learning has been extensively studied, but few studies have been carried out with regard to the relationship between language learning motivation and second language listening. However, motivation is a complex and multifaceted construct. Students' motivation depends on a variety of elements, including the importance they place on a task, how successful they expect to be, whether they believe they have what it takes to succeed, and what they attribute to their success or failure on the assignment (Vandergrift, 2005). In addition, motivation, a dynamic concept, is affected by factors such as teacher, assignments, curriculum, students, exams, classroom environment, and social experiences. Social and personal experiences such as meeting people from different countries, going abroad, and studying abroad can effectively motivate students. Teachers' encouraging behaviors, personalities, interest in the lesson and students, skills, and teaching methods can also influence students' motivation (Lai & Ting, 2013). In most cases, more than one factor affects the source of the motivation level.

Motivation was primarily viewed as a relatively consistent learner feature throughout the first three decades of research on motivation and foreign language learning. Initially, motivation was based on beliefs about the target language community and a desire to learn a foreign language, according to Gardner's socio-educational model (which was created to explain foreign language learning in the classroom). Two orientations (reasons for learning a foreign language) were proposed by this model: an integrative orientation for communicating with the target language group and an instrumental orientation with the aim of more practical advantages such as career advancement in learning a new language (Vandergrift, 2005). From the 1990s onwards, motivation began to be seen as a more dynamic and cognitive-based factor. This understanding sees motivation as a constantly evolving structure, subject to various internal and external influences that the student encounters (Dörnyei, 2001). This new

understanding of motivation has made it possible to explore the connections between motivation and other characteristics of language acquisition behavior typically seen in classroom settings (Crookes & Schmidt, 1991). Beyond the classroom, within the framework of self-determination theory, motivation is explained under three types of orientations: amotivation, extrinsic motivation, and intrinsic motivation, ranging from weak to more powerful.

Students who don't see a connection between their acts and the results of their efforts exhibit a lack of motivation. Unmotivated language learners believe that their time spent learning a foreign language is being wasted. They don't value learning languages, don't believe they can do it, and don't expect to succeed (Ryan & Deci, 2000). The symptoms of a lack of motivation, which include disconnection, passive acceptance, and indifference, are frequently related to "learned helplessness" (Vandergrift, 2005). The strongest type of motivation that can promote learning and accomplishment, according to the majority of research, is intrinsic motivation. According to Ryan and Deci (2000), there are various sorts of motivation depending on various causes or goals that motivate behavior. The most fundamental distinction is between extrinsic and intrinsic motivation, which relates to doing something because it results in a separate outcome as opposed to doing something because it is intrinsically fascinating or enjoyable.

The term "intrinsic motivation" refers to internal elements like enjoyment and self-satisfaction. Intrinsic motivation arises for an individual only for activities that arouse intrinsic interest (Ryan & Deci, 2000). Deci and Ryan (1985) claim that intrinsic motivation is founded on natural desires for self-awareness and competence. Vallerand (1997) expanded the autonomy dimension by dividing intrinsic motivation into three sub-dimensions. First, intrinsic motivation is the motivation to perform an action because it makes one feel good about learning, discovering new information, and expanding one's knowledge. Taking pleasure in learning about French-speaking individuals and their way of life can be an example. Second, in intrinsic motivation, achievement refers to the sensation of attempting to undertake a task or achieve a goal. For example, the emotions experienced when understanding a difficult idea in French. The third is motivation based on feelings experienced during task completion, such as enjoyment, excitement, and aesthetic appreciation (e.g., the enjoyment of hearing French spoken by French speakers, for instance) (Vandergrift, 2005). Extrinsic motivation, contrasting with intrinsic motivation, refers to engaging in an activity purely for its own sake rather than its practical benefits (Ryan & Deci, 2000). Extrinsically motivated activities differ from intrinsically motivated behaviors in that they are carried out in order to attain a specific goal, such as receiving a reward or avoiding punishment (Noels et al., 2000).

Motivation for listening English can be expressed as the feeling of willingness to listen or listening activity. It motivates the person to listen and creates a driving force in listening comprehension (Dölek & Yıldırım, 2021). Listening is often one of the areas where students have difficulty in the process of learning a foreign language. For example, according to Zeng's (2007) study, most of the students stated that they could not cope with speaking speed while listening, could not recognize the words they knew before, and could not understand the words one by one. As a result, they failed because they could not make sense of the text harmoniously (Santos & Graham, 2018, p. 38). The difficulties experienced by the listeners can be influenced by more than one factor. In China, Wang and Renandya (2012) asked 301 students and 30 teachers with a 38-item scale about the reasons for the difficulties experienced in listening. They classified these difficulties into five basic categories. These are text-related factors (speech speed, word load, etc.), process-related factors (immediate forgetting of what was heard, etc.), listener-related factors (anxiety, motivation, etc.), activity-related factors (type of post-listening activities, etc.), and environmental factors (inability to obtain listening materials, etc.) (Santos & Graham, 2018, p. 38). Motivation levels of the students can hinder or accelerate the success of listening English. High awareness in listening processes is related to high motivation intensity. There is an increasing correlation between three different levels of motivation (from amotivation to extrinsic motivation and from extrinsic motivation to intrinsic motivation) and listening strategies and metacognitive awareness. Students with low motivation may have low self-confidence and self-efficacy levels towards foreign language listening. Students with high motivation are likely to engage in metacognitive listening behaviors (Noels et al., 2000).

According to Clément & Kruidenier's research (1983), all learner groups were found to share the following four orientations: (1) travel; (2) friendship; (3) knowledge; and (4) instrumental orientations. The desire to interact with and identify with members of the L2 group was formerly thought to be crucial for L2 acquisition, but it now seems that this desire is only relevant in certain sociocultural circumstances and is not essential to the motivational process (Noels et al., 2000). However, further research on listening and the motivation towards listening English is necessary to understand the common factors behind the motivation of secondary school students. It is needed to have a scale to determine the motivation level of students towards English listening. In this regard, the goal of this

study is to create a scale that measures how motivated secondary school students are to listen to English. It is thought that this scale will contribute to the teachers arranging the learning environments and listening activities according to the level of students' motivation towards listening.

Listening Instruments

Various listening scales were developed for several aims. Some of the aims can be listed as developing a construct for listening, measuring perceived listening ability, and identifying the effects of listening ability on something else (Fontana et al., 2015). Current listening scales concentrate on active listening, listening styles, listening competency, and listening strategies. Mishima et al. (2000) developed an active listening attitude scale for health workers, whereas an active empathic listening measure was developed by Drollinger et al. (2006) for salespeople, as well as by Bodie (2011). Active listening means repeating a paraphrase of the speaker's message, engaging in moderate-to-active nonverbal dialogue, and asking questions as necessary (Weger et al., 2014). Listening styles questionnaires/inventories have also been developed by Watson et al. (1995); Pearce et al. (2003); and Bodie et al. (2013). Moreover, there are also some other scales that measure listening competency, such as Mickelson and Welch (2013) and Ford et al. (2000). The scale developed by Vandergrift and her friends (2006) is the most well-known for assessing the L2 listeners' metacognitive awareness. Although existing scales are related to assessing the listening traits of teachers (e.g., Gilson et al., 2022; Ellis, 2000) and students (e.g., Tsang, 2022; Mahmoud & Taha, 2022), this scale focuses on the motivation levels of the secondary school students specifically for listening English.

Method

A multilevel mixed design, one of the mixed techniques, was chosen since the study's aim is to develop a scale to assess secondary school students' motivation for English listening. There are two types of multilevel mixed designs: parallel and sequential. These designs involve mixing through many layers of analysis, whereby quantitative or qualitative data are processed and blended to address pertinent elements of the same research issue or concerns related to it (Teddlie & Tashakkori, 2009, p. 136). Prior to developing the scale items for this study, interviews and literature research were carried out. In this regard, a sequential design was employed when gathering information from the literature and interviews.

Participants

The study group comprised 140 male (47.6%) and 154 female (52.4%) secondary school students studying in Afyonkarahisar. In this study, the sample size was appropriate for factor analysis (n=294). The number of items is 54. According to Gorsuch (1983), the minimum number of subjects for each variable in a factor analysis is five (Thompson, 2004, p. 24). 72.8% of the students stated that they were at a moderate level in listening comprehension. 33% of them had private English lessons before. 76.9% of them stated that learning English was important for them. 73.8% of them stated that their family supported them in learning English. Table 1 lists the sampling strategy and characteristics of the samples that were used.

Table 1. Data collection tools, sampling method, and samples

Data Collection Tool	Sampling Method	Samples
Interview Form	Convenience Sampling	41 secondary school students
Literature research	Convenience Sampling	Articles and books
Pre-test application (for item comprehensibility)	Convenience Sampling	7 secondary school students
Pilot test application (for item analysis)	Convenience Sampling	294 secondary school students

Open-ended questions were asked to secondary school students about their motives and attitudes towards learning English to generate the items. Open-ended questions were asked to 41 secondary school students. Secondly, the literature on motivation for learning a foreign language and other related scales were examined to form the items. Key concepts were defined according to the literature. After the item pool was created, seven secondary school students shared their opinions on the items' readability. After making the appropriate adjustments, the 54-item scale was applied to 294 secondary school students in Afyonkarahisar in the first term of 2021-2022.

Ethical Approval

Ethical permission was obtained from Afyonkarahisar Governorship, Provincial Directorate of National Education, with the letter dated 21/01/2020 and numbered 81576613-10.06.02-E.1563890.

Findings

To create a motivation scale for English listening (MSEL), a literature analysis (Vandergrift, 2005; Navarroza, 2013; Papi & Teimouri, 2014; Asmali, 2017; Chon & Shin, 2019) was conducted to decide on the items to be included in the item pool. Interviews were held with the students to develop the scale for secondary school students. Qualitative data were collected from 41 secondary school students. These data have guided the creation of keywords. The following questions were asked to the students during the interviews:

In English lessons:
- What are your reasons for learning English?
- What do you do to be successful in listening?
- What qualities do you need to have to be successful in listening activities?
- What are your weaknesses when listening to English?
- What is your attitude towards learning English? (Being positive, eager, not interested, etc.)
- What motivates you to speak English with foreign people?

In light of the data obtained from these interview questions and the literature, the items included in the measurement tool were created to determine students' motivation levels for listening to English. The item pool consists of a total of 62 items. This item pool was presented for expert opinion, and opinions were received from five experts. This measurement tool was finalized in line with their opinions. Twenty-six items were amended because of lack of clarity; seven items were deleted since they were similar to others; one was deleted since it was not related to listening skills; and six were deleted since they were not related to motivation at all.

Pre-test Application

Before the pilot application of the scale, a pre-application was carried out with seven students to determine the intelligence of the items. After the pre-application, twelve items were corrected regarding language and expression problems.

Exploratory Factor Analysis

In factor analysis, the distribution of the data should be normal. The Barlett test is used to verify if the data come from a multivariate normal distribution (Tavşancıl, 2010, p. 51). The best method for determining whether the variances are equal is the Bartlett test. It analyzes whether the variances are homogeneous (Singh, 2007, p. 102). To evaluate if the data were appropriate for factor analysis, the Kaiser-Meyer-Olkin (KMO) coefficient and Barlett sphericity test were utilized (Büyüköztürk, 2012, p. 126). For factor analysis, the data were appropriate, as shown by the KMO result of the items, which was 0.927, and the Barlett test value, which was 0.00 (x2: 7.59; sd: 1431). For each factor, there are enough samples if the KMO is greater than.70 (Leech, Barrett & Morgan, 2005, p. 80). Since the results of the study's KMO and Barlett tests were appropriate, factor analysis was performed.

Factor loads below 0.30 are regarded as low, whereas factor loads of 0.40 or higher are considered high (Leech et al., 2005, p. 83). In this study, subtraction of factors through factor loadings less than 0.40 was considered. For this reason, eight items (No 36, No 38, No 33, No 16, No 35, No 53, No 9, and No 30) were removed from the scale. Items need to be heavily loaded on one factor, whereas being lightly loaded on the other. It is expected that there will be a minimum difference of 0.10 between two high load values (Büyüköztürk, 2012, p. 124). This rule was also considered to determine the factors. Accordingly, 15 items (No 54, No 37, No 49, No 31, No 52, No 6, No 11, No 13, No 34, No 12, No 8, art. 4, No 7, No 32, and No 42) were excluded from the scale. The Varimax method was used for rotation. After the items in the last dimension, which consisted of two items, were removed, the scale took the form of a 5-factor and 29-item scale. As in Table 4, 5 factors explain 56.938% of the total variance, and items with an eigenvalue (initial eigenvalue) greater than 1.00 were included in the scale. Table 2 shows that the variance is explained by the first factor by 29.052%, the second factor by 12.558%, the third factor by 6.168%, the fourth factor by 5.227%, and the fifth factor by 3.933%.

Table 2. Explanation of the total variance of the motivation scale for English listening (MSEL)

	Initial Eigen values			Subtraction of the Sum of Squared Loads			Rotation of the Sum of the Squared Loads		
Items	Total	Explained Variance %	Total Variance %	Total	Explained Variance %	Total Variance %	Total	Explained Variance %	Total Variance %
1	8,425	29,052	29,052	8,425	29,052	29,052	5,133	17,700	17,700
2	3,642	12,558	41,609	3,642	12,558	41,609	3,100	10,691	28,391
3	1,789	6,168	47,777	1,789	6,168	47,777	3,051	10,522	38,913
4	1,516	5,227	53,005	1,516	5,227	53,005	2,756	9,504	48,417
5	1,141	3,933	56,938	1,141	3,933	56,938	2,471	8,520	56,938
6	,988	3,409	60,346						
7	,866	2,985	63,331						
8	,756	2,608	65,939						
9	,732	2,524	68,463						
10	,683	2,356	70,819						
11	,674	2,323	73,142						
12	,637	2,196	75,338						
13	,636	2,194	77,532						
14	,607	2,093	79,626						
15	,551	1,900	81,526						
16	,522	1,801	83,326						
17	,509	1,755	85,082						
18	,461	1,588	86,669						
19	,444	1,532	88,202						
20	,437	1,507	89,709						
21	,425	1,464	91,173						
22	,398	1,374	92,547						
23	,363	1,252	93,799						
24	,355	1,225	95,024						
25	,336	1,160	96,184						
26	,320	1,105	97,289						
27	,284	,980	98,269						
28	,270	,932	99,202						
29	,232	,798	100,000						

Table 3 shows the components of each item with the value of factor loading. According to Table 3, the factor loads of 29 items in the scale range from 0.50 to 0.75. The Cronbach Alpha value of the 29-item scale was found to be α=0.898. The reliability of the test results is demonstrated by the fact that this number must be 0.70 or above (Büyüköztürk, 2012, p. 171).

Table 3. Rotated component values of the motivation scale for English listening (MSEL)

	Components				
Items	1	2	3	4	5
No 19	,753				
No 18	,737				
No 5	,715				
No 2	,669				
No 20	,646				
No 21	,633				
No 22	,601				
No 1	,566				
No 24	,550				
No 23	,507				
No 44		,793			
No 43		,740			
No 46		,721			
No 47		,634			
No 45		,611			
No 51			,739		
No 14			,729		
No 15			,684		
No 50			,621		
No 17			,582		
No 25				,733	
No 29				,709	
No 27				,706	
No 26				,706	
No 28				,634	
No 39					,778
No 40					,772
No 41					,660
No 48					,610

Table 4 presents the results of the t-test for the 27% lower and upper groups, the total correlation values, and the remaining correlation values of the items. According to Table 4, No 25, No 29, No 41, and No 48, whose item-total correlation values are below 0.33, have been omitted from the scale. The item-total correlation shows the consistency between each item and the sum of the remaining items. The 0.33 criterion can be used when deciding on which item to save or remove. A value of 0.33 indicates that approximately 10% of the variance in the scale is explained by the item (Ho, 2006, p. 243). A different use of item analysis is the comparison of the mean scores given to each item by the extreme groups (upper group-lower group), when the group is sorted from the highest score to the lowest score in accordance with the total scores acquired from the scale (Tavşancıl, 2010, p. 55). The differences between the item mean scores of the lower 27% and upper 27% groups based on the total scores of the test are significant ($p < 0.01$). This shows the test's internal consistency (Büyüköztürk, 2012, p. 171).

Table 4. The MSEL's item analysis (validity-reliability results)

Items	Item-total Correlation	Item-remaining Correlation	t-test Results of 27 % of Lower and Upper Groups	p value
No 19	,556	,593	10,452	0,000
No 18	,562	,603	10,359	0,000
No 5	,454	,501	8,840	0,000
No 2	,610	,644	12,233	0,000
No 20	,474	,519	7,646	0,000
No 21	,565	,607	10,452	0,000
No 22	,583	,623	11,424	0,000
No 1	,543	,579	10,231	0,000
No 24	,556	,596	10,688	0,000
No 23	,490	,540	10,301	0,000
No 44	,400	,459	8,339	0,000
No 43	,437	,489	9,302	0,000
No 46	,512	,561	10,885	0,000
No 47	,534	,580	11,977	0,000
No 45	,523	,570	10,225	0,000
No 51	,512	,561	11,063	0,000
No 14	,457	,517	9,492	0,000
No 15	,631	,671	14,782	0,000
No 50	,428	,490	8,500	0,000
No 17	,648	,686	15,446	0,000
No 25	,186	,253	3,413	0,001
No 29	,297	,363	6,183	0,000
No 27	,449	,509	9,931	0,000
No 26	,367	,433	7,269	0,000
No 28	,426	,483	9,459	0,000
No 39	,358	,420	8,889	0,000
No 40	,382	,444	11,351	0,000
No 41	,314	,386	7,739	0,000
No 48	,280	,351	6,155	0,000

The names of the factors are determined by the literature and the content of the items. The 1st factor is named "effort,"; the 2nd factor is named "self-confidence,"; the 3rd factor is named “travel and friendship," the 4th factor is named "unwillingness," and the 5th factor is named “lack of interest." In Table 5, the items of the MSEL are given together with its sub-dimensions.

Table 5. Motivation scale for English listening (MSEL)

Items		Varimax Factor Load
1st Factor: Effort		
No19	I listen carefully to answer questions correctly, like my friends.	,753
No18	I listen carefully to answer the questions in the listening exercises correctly.	,737
No5	I feel happy when I comprehend what I am listening to.	,715
No2	I try to understand all the English words I hear.	,669
No20	I want to be the most successful among my friends in listening exercises.	,646
No21	I think that my success in English listening will increase thanks to listening exercises.	,633
No22	I practice the pronunciation of words for better listening.	,601
No1	I make an effort to comprehend what I am listening to.	,566
No24	Knowing grammar rules is not enough to be successful in English; I must also be good at listening.	,550
No23	I am more successful in listening when I put myself in the speaker's shoes while doing listening exercises.	,507
2nd Factor: Self-Confidence		
No44	I am confident that I can understand difficult-listening texts.	,793
No43	I feel confident while answering questions about listening.	,740
No46	I am confident in understanding the main idea of the text I am listening to.	,721
No47	I feel comfortable during listening exercises.	,634
No45	I feel confident in understanding the other person when communicating in English.	,611
3rd Factor: Travel and Friendship		
No51	I attach importance to listening to English to travel to different countries.	,739
No14	I attach importance to listening to English to study abroad in the future.	,729
No15	I attach importance to listening to English to speak English with people from different countries.	,684
No50	I attach importance to listening to English so that I can play games with children from different countries.	,621
No17	I attach importance to listening to English if I need it one day.	,582
4th Factor: Unwillingness		
No27	I don't want to listen because listening exercises are difficult for me.	,706
No26	While listening to an English text, when I do not understand the first sentence, I do not listen to the next one.	,706
No28	No matter how hard I try, I fail to listen.	,634
5th Factor: Lack of Interest		
No39	I think listening exercises are unnecessary.	,778
No40	I am not interested in listening exercises.	,772

The means, standard deviations, and correlation coefficients for the MSEL's sub-factors are shown in Table 6.

Table 6. Means, standard deviations, correlation coefficients for the sub-factors of MSEL

Factor	N	X	SD	1stFactor	2ndFactor	3rdFactor	4thFactor	5thFactor
1st Factor (Effort)	294	40.52	7.54	1	.554	.648	.269	.197
2ndFactor (Self-confidence)	294	17.17	4.65	.554	1	.515	.173	.077
3rdFactor (Travel Friendship)	294	18.44	4.98	.648	.515	1	.156	.165

4thFactor (Unwillingness)	294	10.44	3.31	.269	.173	.156	1	.505
5thFactor (Lack of Interest)	294	7.59	2.37	.197	.077	.165	.505	1

Table 6 shows that there is a significant and moderate relationship between the first, second, and third factors. A correlation coefficient between 0.70 and 1.00 implies a high level; a value between 0.70-0.30 implies a moderate level, and a value between 0.30-0.00 implies a low level of relationship (Büyüköztürk, 2012, p. 32). However, since the fourth and fifth factors are composed of negative items, the relations between the other factors are low. Finally, MSEL consists of twenty-five items, including five negative items. Participants answered each Likert-type statement on a 5-point scale (i.e., 1-never do, 2-rarely do, 3-occasionally do, 4-often do, 5-always do).

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) verifies theories based on previously accepted factors or examines hypotheses (Urbina, 2004, p. 174). Items in the factor "effort" were presented as items a1–a10; items in the factor "self-confidence" were presented as items b1–b5; items in the factor "travel and friendship" were presented as items c1–c5; items in the factor "unwillingness" were presented as items d1–d3; and items in the factor "lack of interest" were presented as items e1–e2. CFA was performed by taking into account the answers of 250 samples. According to Harrington (2009, p. 46), a sample size greater than 200 is a likely acceptable figure for many models. This model's subscale and combined scale reliability coefficients were determined and tested using CFA.

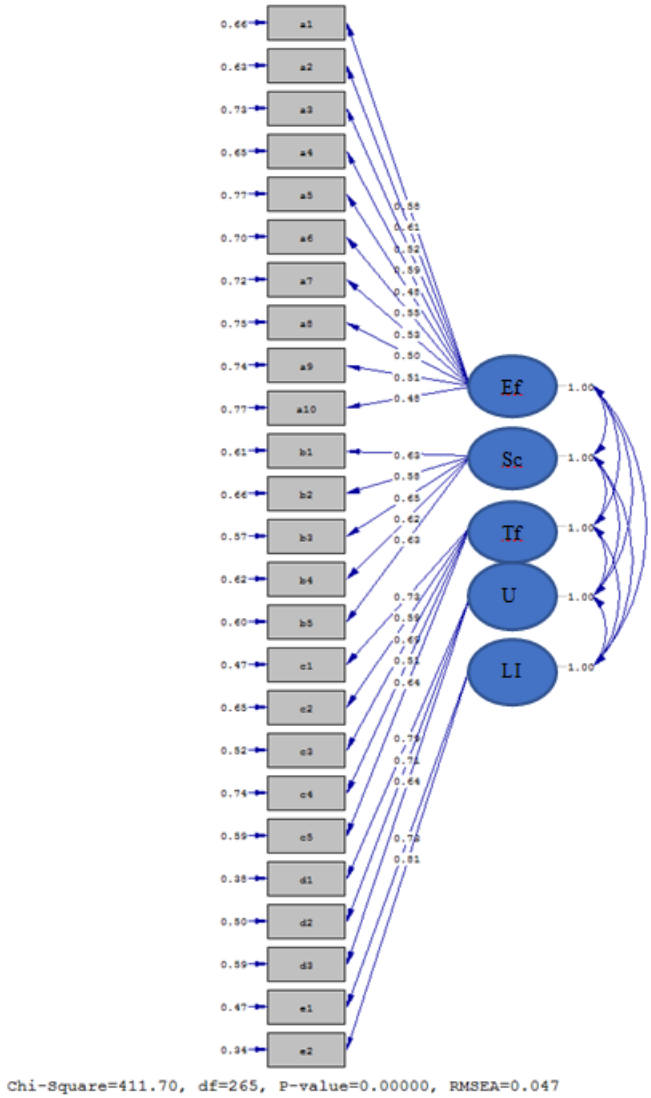

Figure 1. Error variances in the path diagram of the MSEL (1st Level)

The t values of the latent variables that explain the observed variables are given on the arrows in Figure 1 along with the path diagram of the MSEL. Schermelleh-Engel et al. (2003) state that t values greater than 2.58 are significant at the.01 level, given in Table 7. At the.01 level, the parameter estimations of the MSEL are significant. The SD value is 265 and the chi-square value is 411.70. Therefore, $\chi 2/sd$ is 1.55. In large samples, a ratio of less than 3 indicates a high goodness of fit index (Çokluk et al., 2016). The RMSEA value is 0.047. A good fit is defined as RMSEA values below 0.07 (Stieger, 2007).

The error variances for the variables shown in Figure 1 were investigated, and it was found that they were within acceptable bounds (Çapık, 2014). According to Table 7, the $\chi 2/df$ ratio is 1.55. This value shows that there is a good goodness of fit value. The value of RMSEA is .047. According to Brown (2015), the RMSEA value should be near to or below 0.06. If this number is higher than.90, the model has a satisfactory goodness of fit value (Kline, 2011). The SRMR value is .060, and the AGFI value is .86.

Table 7. Goodness of fit index values of the structural model of the MSEL

Goodness of Fit Indices	Values of the Structural Model of MSEL	Good Goodness of Fit Values	Acceptable Goodness of Fit Values
$\chi 2$ /df	1.55	$0 \leq \chi 2$ /df ≤ 2	$2 < \chi 2$ /df ≤ 3
RMSEA	.047	$0 \leq$ RMSEA $\leq .05$	$.05 <$ RMSEA $\leq .08$
Comparative Fit Index (CFI)	.91	$.97 \leq$ CFI ≤ 1.00	$.95 \leq$ CFI $< .97$
Standardized RMR	.060	$0 \leq$ SRMR $\leq .05$	$.05 <$ SRMR $\leq .10$
Goodness of Fit Index (GFI)	.88	$.95 \leq$ GFI ≤ 1.00	$.90 \leq$ GFI $< .95$
Adjusted Goodness of Fit Index (AGFI)	.86	$.90 \leq$ AGFI ≤ 1.00	$.85 \leq$ AGFI $<.90$
NNFI	.89	$.97 \leq$ NNFI ≤ 1.00	$.95 \leq$ NNFI $< .97$

According to Table 7, these values are also between the acceptable goodness of fit values. It is seen that the GFI and NNFI values have a poor fit in the goodness of fit index. The goodness of fit value includes the $\chi 2/df$ ratio and RMSEA value, even if not all indices produce ideal results. Therefore, these results support the MSEL's factor structure. The error variances of the MSEL's second level are shown in Figure 2's path diagram.

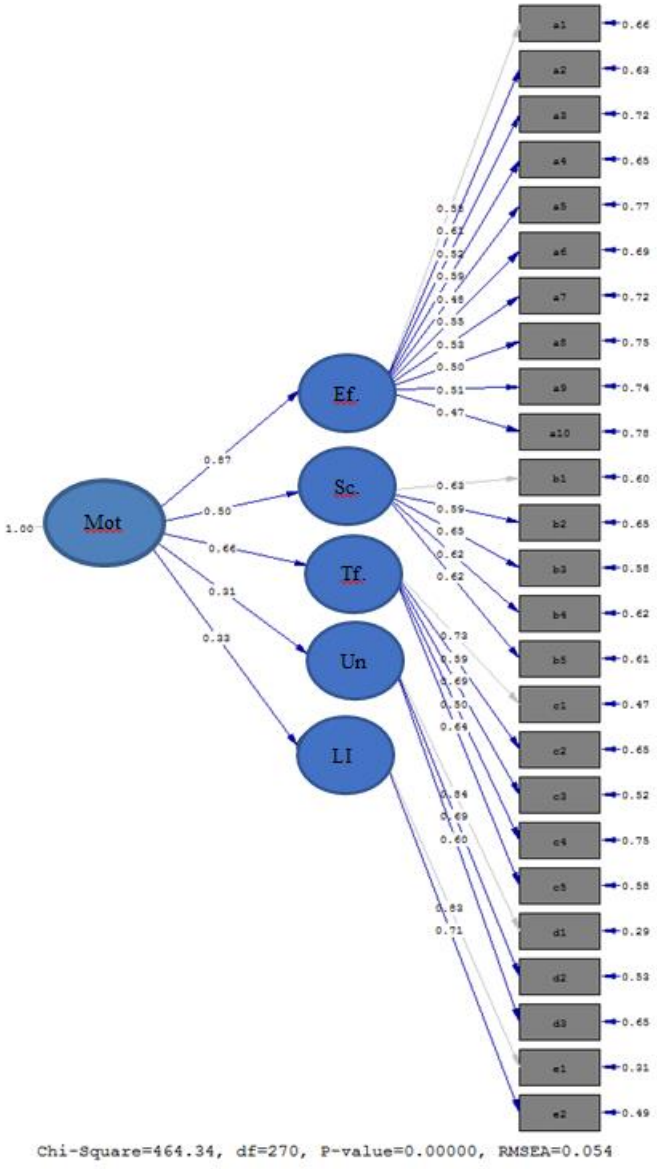

Figure 2. Error variances in the path diagram of the MSEL (2nd Level)

According to Figure 2, it can be seen that error variances at the 2nd level are within acceptable bounds (Çapık, 2014).

Results and Discussion

This study aimed to find out which factors explain secondary school students' motivation for English listening. Therefore, the researchers developed an instrument that focuses on the motivation towards English listening. This study is significant as it specifically determines the motivation towards English listening, and there isn't any instrument specifically measuring the listening motivation towards FL. As a result of the exploratory and confirmatory factor analysis, the scale includes five sub-factors. Accordingly, the first factor (effort) consists of 10 items; the second factor (self-confidence) consists of 5 items; the third factor (travel and friendship) consists of 5 items; the fourth factor (unwillingness) consists of 3 items; and the fifth factor (lack of interest) consists of 2 items. Thus, the five factors explain 56.398% of the total variance. Confirmatory factor analysis was used to ensure that the factors identified by the exploratory factor analysis were accurate and the findings of the analysis supported the factor structure. Additionally, items developed after literature research were statistically validated.

According to Gardner (2010), motivation comprises three main parts. First, motivated language learners put forth an effort to accomplish their particular goal. One of the sub-factors of MSEL, also the main one, is "effort." In this

sub-factor, there are items related to careful listening to succeed, tries for understanding, and other actions for better listening. Language learners show great effort in learning the language, so the first sub-factor is named "effort" depending on the items. Second, they are also motivated by the desire to study that particular language. In our study, the sub-factor "unwillingness" represented the negative expression of desire since there were negative items in the scale clustered in this sub-factor. Third, the attitude towards learning a foreign language (FL) has a significant role in learning. Schiller and Dorner (2022) analyzed the most influential factors affecting the motivational behavior of older language learners, and they found that attitudes towards learning English as a FL and the goal specification were the most important predictors. In addition, when they used attitude toward learning a foreign language as the criteria variable, they discovered that the desire to learn English was the strongest predictor. In line with Schiller and Dorner's (2022) study, in our study, one of the sub-factors is related to the desire to listen to English, although stated in negative items such as unwillingness to listen, failure in listening, etc.

In parallel with the study of Tsang (2022), in foreign language listening, motivation, interest, linguistic self-confidence, and overall proficiency are rather strongly inter-correlated. Using the second language involves emotions of confidence, competence, and command (Rost, 2014). In our study, the scale has a sub-factor named "self-confidence," including the items related to being confident while listening, engaging in listening activities, and during communication in English. According to the study of Schiller and Dorner (2022), traveling abroad was also one of the main factors of instrumental motivation, as indicated in our study as one of the sub-factors called "travel and friendship." This sub-factor consisted of items indicating the reasons why it is important to listen to English in the scope of traveling and having friends from different countries. Studying abroad, practicing the language, and playing games with children are among these reasons.

Conclusion

In the scale development, the following steps were followed according to Carpenter's (2018) suggestions, shown in Table 8.

Table 8. Development of the MSEL

Steps for Scale Development	
1. Theory and Research	
a. Conceptual definitions	Based on the literature, the most appropriate concepts related to motivation such as effort, enjoyment, individual development, success, interest, self-confidence, and feeling inadequate were determined.
b. Possible dimensions	Potential dimensions and items such as intrinsic motivation, extrinsic motivation, and amotivation were determined according to the conceptual definitions in the light of the literature. Through interviews, open-ended questions were asked to secondary school students to determine their motivation for English listening.
c. Item pool	For this scale, 62 items were used to create an item pool.
d. Interviews and Feedback of the experts	Seven open-ended questions were asked to 41 secondary school students. When creating the scale's items, the researchers were guided by the answers to these questions. 62 items were examined by five experts once the item pool was generated. Afterwards, corrections were made to 25 items, and 8 items were removed from the scale.
e. Application of pre-test	Seven secondary school students were given a pre-test to determine whether they had any language and expression issues. After this pre-test, corrections were made in twelve items. The content validity of the remaining items was checked based on the literature, and the scale was applied to 294 secondary school students (6^{th}, 7^{th}, and 8^{th} graders) in Afyonkarahisar for pilot application.
2. Sampling Procedure	
In this study, the sample size was appropriate for factor analysis (n=294). The number of items is 54. According to Gorsuch (1983), the minimum number of subjects for each variable in a factor analysis is five (Thompson, 2004, p. 24).	
3. Quality of the data	

Missing data were checked and omitted from the scale. Also, the data with the same answer only was deleted.
4. Suitability of Data for Factor Analysis
The data were appropriate for factor analysis because the KMO result for the items was 0.927 and the Barlett test value was 0.00 significant (x2: 7.59; sd: 1431; p 0.01).
5. Explanatory Factor Analysis
The explanatory factor analysis was completed.
6. Factor Subtraction Methods
To make interpretation easier, the factoring technique principal component analysis was applied.
7. The Number of Factors
The factors with eigenvalues higher than one were taken into consideration.
8. Rotating Factors
The varimax method was used to carry out the rotating process.
9. Subtraction of the Items According to the Criterion
8 items with factor loading values below 0.40 were removed from the scale (Tabachnick & Fidell, 2007). It is expected that the difference between two high load values will be at least 0.10 (Büyüköztürk, 2012, p. 124). According to this rule, 15 items were removed from the scale. The 3rd and 10th items were omitted from the scale as it was thought that they weren't able to explain that factor well.
10. Results
The scale's Cronbach Alpha value is α=0.898. Item-total correlation coefficient values are between .358 and .648. Four items whose total correlation coefficient values were below 0.33 were removed from the scale. The lower 27% and upper 27% groups, which were determined based on the test's overall scores, had significant differences in their item average scores ($p < 0.01$). According to the features of the items, factors were given names. The scale took its final form as a 25-item scale.
11. Confirmatory Factor Analysis (CFA)
CFA was carried out by taking into account the responses of 250 samples. At the .01 level, parameter estimations of the MSEL are significant. The chi-square value is 411.70 and the SD value is 265. Accordingly, $\chi 2/df$ is 1.55. The RMSEA value, 0.047, is considered acceptable.

MSEL can be used at the beginning of the FL lessons to measure the readiness levels or the motivation level of the secondary school students and can give a general evaluation of the students' orientations towards English listening. The results of the MSEL of the students can provide quantitative data for the teachers so that they can prepare the listening activities accordingly. Future research can concentrate more on the motivation factors of the students through the reflections of the students or the interviews with them. To investigate the difference in motivation levels by demographic and geographic background, other researchers may want to examine the construct validity and reliability of the MSEL with various subgroups of children from particular grade levels.

Author (s) Contribution Rate

NH and GO contributed equally to designing the method of this research. NH conducted the research and collected the data. NH and GO analyzed the data and created the figures. NH carried out the literature review and wrote the manuscript. GO edited the work and offered valuable insights. NH wrote the discussion and conclusion parts of the manuscript. All authors read and approved the final manuscript.

Conflicts of Interest

There are no conflicts of interest with the research, writing, or publication of this paper, as disclosed by the authors.

Ethical Approval

Ethical permission was obtained from Afyonkarahisar Governorship, Provincial Directorate of National Education, with the letter dated 21/01/2020 and numbered 81576613-10.06.02-E.1563890.

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 457-469 Article Type: Research Article

The Effect of Online Entrepreneurial Project Training on the Individual Innovativeness of Pre-service Science Teachers

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Abstract
The purpose of this research was to examine the effect of online entrepreneurial project training on the individual innovativeness of pre-service science teachers. The pilot study and basic study of this research consisted of 11 stages. The pilot study was conducted with 24 third-grade pre-service science teachers, and the basic study was conducted with 33 fourth-grade pre-service science teachers. The research was conducted according to a one-group pre-test and post-test experimental design. The individual innovativeness scale was used in the pre-test and post-test of the pilot and basic study. As an intervention, the online entrepreneurial project training was performed for pre-service science teachers by the researcher-author. While online entrepreneurship project training positively affected the individual innovativeness of pre-service science teachers (large effect), this effect was not observed in the pilot study. In addition, after the implementation of the basic study, the transition of pre-service science teachers from their lower innovativeness categories to upper categories that adapt to innovation is higher (innovators and early adopters). According to these results, one of the ways to improve the individual innovativeness of pre-service science teachers is through entrepreneurial project training.

Keywords: Entrepreneurial project, Individual innovativeness, Online entrepreneurship education, Science teacher education

Citation
Deveci, İ. (2024). The effect of online entrepreneurial project training on the individual innovativeness of pre-service science teachers. *International Journal of Contemporary Educational Research*, *11*(4), 457-469. https://doi.org/10.52380/ijcer.2024.11.4.628

Received	05.03.2024
Accepted	26.11.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The author acknowledges that they received no external funding in support of this research.

Introduction

Entrepreneurship is an important research subject within the literature of science education, especially in recent years (Deveci & Çepni, 2017a). According to the European Commission (2015), the connections between science, creativity, entrepreneurship, and innovation should be strengthened in science education. In Türkiye, entrepreneurship is included in the education curricula from primary school to higher education as a competence that students must acquire. The most comprehensive explanations about entrepreneurship in the middle school curriculum (5th–8th grades) are included in the lower secondary science curricula (Ministry of Education, 2018). Therefore, entrepreneurship education is important in science teacher education curricula in which teachers are trained for lower secondary school science courses in Türkiye.

This study argues that online entrepreneurial project training can be an effective method of developing the innovativeness of pre-service science teachers. It presents the results of online entrepreneurial project training within the scope of the "Entrepreneurship in Science Education" course offered by the research author in the science teacher education program at the faculty of education of a university in Türkiye.

Entrepreneurial Projects

Since the term entrepreneurship is more pronounced in fields such as economics and business, it is necessary to clarify its meaning in the educational context (Dal et al., 2016). The economic perspective is more dominant in the term entrepreneurship used in the traditional context (Haara & Jenssen, 2016). In education, the term entrepreneurship refers to an individual competence that enables turning ideas into practice (European Commission, 2011). Entrepreneurship education has three focal points: business basics, entrepreneurship basics, and entrepreneurial mindset and competencies (Morris & Liguori, 2016). Through entrepreneurship education, educators aim to provide students with an entrepreneurial mindset rather than preparing them to be entrepreneurs. In this sense, educators aim to teach students how to apply their ideas to solving daily life problems through entrepreneurship education (European Commission, 2014). Developing individuals' creativity and innovation, which are the basic components of the entrepreneurial mindset, requires a systematic and comprehensive approach (Zupan et al., 2018). Though the COVID-19 pandemic scenario presents a challenge, it also presents a potential opportunity for entrepreneurship education (Liguori & Winkler, 2020). While some aspects of entrepreneurship education are well-suited to online education, other aspects require much more planning to implement effectively (Liguori & Winkler, 2020). Many entrepreneurship educators need additional curricula, extracurricular pedagogical development, and experiments to teach entrepreneurial mindsets and competencies in online environments (Liguori & Winkler, 2020). In this sense, one of the ways to develop an entrepreneurial mindset is through entrepreneurial projects (Bayram & Çelik, 2023; Deveci, 2019; Deveci & Kurt, 2023; Zupan et al., 2018).

Amid the outbreak of the COVID-19 pandemic, many educational institutions moved the teaching process to online or hybrid modes (Beneroso & Robinson, 2022). Thus, training based on a project-based learning approach was inevitably delivered online. The sudden shift to online learning has created challenges for project training in educational institutions. The profound effects of the COVID-19 pandemic have brought to the agenda the use of online project training and research on what effects it has on participants.

In this sense, the number of studies investigating the effect of online project training on participants is increasing. For example, Samsudin et al. (2014) showed that online project-based learning has a positive effect on students' attitudes towards renewable energy. Moreover, Cholifah et al. (2019) proved that online project-based learning has a positive impact on the innovativeness of pre-service elementary teachers. Recently, both Turkish (Deveci, 2019; Deveci & Çepni, 2014; Deveci & Çepni, 2017b; Deveci & Kurt, 2023) and international literature (Ademola et al., 2023; Hattab, 2010; López-Lemus, 2023; Siam & Rifai, 2012) have discussed the entrepreneurial project. The theoretical foundations of entrepreneurial projects are based on Kilpatrick's (1918) Type 3 projects, which aim to correct intellectual difficulties and solve some problems within the scope of the project method. In addition, the foundations of entrepreneurial projects date back to Dewey's (1910; p. 72) reflective thinking steps. In this sense, Kilpatrick's project method and Dewey's project-based learning approach form the theoretical foundations of entrepreneurial projects. Entrepreneurial projects are product- or service-oriented projects aimed at meeting people's needs in daily life or developing innovative solutions to problems (Deveci, 2019; Deveci & Kurt, 2023). The complex nature of entrepreneurial projects can allow students to develop a variety of skills (Ademola et al., 2023). The current research focuses on the impact of online entrepreneurial project training on the individual innovativeness of pre-service science teachers. Participants need to have some experience during the entrepreneurial project development process. These experiences include identifying the problem, finding an

innovative idea, being selective in finding an idea, developing innovative solutions, finding the difference between the innovative idea and previous ideas, determining the target audience, determining the contribution of the idea to the country's economy, developing a prototype, calculating the cost of the prototype, and sales targets for the idea, determination, developing advertising strategies, developing marketing strategies, finding slogans, and making effective presentations (Deveci, 2019; Deveci & Kurt, 2023; Eltanahy et al., 2020).

Individual Innovativeness

Innovative behaviors of teachers are crucial for the successful implementation of innovations in the education and training process (Thurlings et al., 2015). Teachers must constantly use and adapt to new learning theories, teaching curricula, methods, techniques, and tools in their professional lives. In this sense, there is a need for research on enhancing the individual innovativeness of pre-service teachers in pre-service education. Individual innovation centers around the idea of adopting and adapting to change through risk-taking and is a characteristic not shared by everyone (Bautista et al., 2018). Innovativeness is the degree to which an individual adopts new ideas relatively earlier than other members of a system (Rogers, 2003). The individual innovativeness considered in this research is based on Rogers' theory of the diffusion of innovation. Rogers (1983; 2003) presented the dominant characteristics of each adopter category in five categories. Innovators are individuals who are always actively seeking information about new ideas (Rogers, 2003). Innovators are very eager to try new ideas (Rogers, 1983). The innovator must be able to cope with the high degree of uncertainty involved in adopting an innovation (Rogers, 2003). Early adopters are a more integrated part of the local social system than innovators (Rogers, 1983; 2003). Potential adopters consult early adopters for advice and information about the new idea or innovation (Rogers, 1983). The early majority adopts new ideas in a social system just before the average member (Rogers, 1983). The early majority want to interact frequently with their peers but rarely hold leadership positions (Rogers, 1983; 2003). Late majority are cautious about innovations and wait to make sure if the innovation is in their interests (Rogers, 1983; 2003). The late majority adopts new ideas slightly later than the average among members of the social system (Rogers, 1983; 2003). They expect most others to adopt the innovation (Rogers, 1983; 2003). Laggards are the last to adopt an innovation in a social system. Laggards are, from their perspective, the most local of all adopter categories and have no thought leadership (Rogers, 2003).

There are a small number of studies in the literature that aim to enhance the individual innovativeness of science teachers. For instance, Carungay (2003) examined the innovation attitudes of innovative Japanese secondary science teachers, taking into account factors such as age, gender, attitudes, and self-perception. Ortile and Garcia (2023) explored the innovations implemented (teaching strategies, learning assessment, school management, and projects) and administrative support provided by senior high school science teachers in the Philippines. Carungay and Tsuruoka (2002) investigated the innovativeness and innovation processes of exceptional secondary school science teachers in the Philippines. However, there are a limited number of studies on the innovativeness of pre-service science teachers. Geçikli (2022) examined the levels of individual innovativeness among pre-service science teachers in terms of various variables, including gender, grade level, and daily internet usage time. Yenice and Yavaşoğlu (2018) examined the levels of individual innovativeness among pre-service science teachers and the correlation between their individual innovativeness levels and their individual creativity. There are a few studies regarding online experimental research aimed at enhancing the individual innovativeness of pre-service science teachers in the national and international literature. In this sense, some researchers emphasize that the innovativeness of pre-service science teachers should be developed in science teacher education. Carungay (2003) recommends that the innovativeness of secondary science teachers should be developed through pre-service and in-service training programs. Similarly, Carungay and Tsuruoka (2002) emphasize that teacher education programs must develop innovativeness in order to produce future science innovators. Çelik (2013) recommends that pre-service teachers be encouraged to utilize innovative techniques more effectively and frequently. Moreover, Geçikli (2022) recommends directing pre-service science teachers towards activities and projects that will enable them to gain experience in innovation. Additionally, according to Geçikli (2022), there is a need for research on improving the innovativeness of pre-service science teachers. Bautista et al. (2018) recommend improving the individual innovativeness of pre-service teachers through seminars, workshops, personalized consultancy programs, and similar training. In the current research, online entrepreneurial project training was considered as a way to enhance the individual innovativeness of pre-service science teachers. The purpose of this research is to examine the effect of online entrepreneurial project training on the individual innovativeness of pre-service science teachers.

Method

A one-group pretest–posttest experimental design was used to investigate the impact of online entrepreneurial project training on the individual innovativeness of pre-service science teachers. One-group pretest-posttest experimental design is research in which one group is measured or observed before and after being exposed to an

intervention (Fraenkel et al., 2012; Johnson & Christensen, 2019). The reason for choosing the one-group pretest-posttest experimental design is that there was no control group available for comparison at the university where the research was conducted. The one-group pretest-posttest design has several weaknesses, but it can be utilized in educational institutions when a control group is not feasible (Mertens, 2019).

Contexts and the Participants

The bachelor's degree program in education faculties in Türkiye lasts for four years. Pre-service science teachers receive education in basic sciences (physics, chemistry, biology, environment) and pedagogical fields (science teaching, teaching principles and methods, etc.). Pre-service science teachers are also offered elective field education courses, such as "entrepreneurship in science education." The current research was conducted by the author as part of the entrepreneurship in science education course. The pilot study involved 24 third-grade pre-service science teachers (20 girls and 4 boys, aged 21-23), while the basic study included 33 fourth-grade senior pre-service science teachers (23 girls and 10 boys, aged 21-24). In experimental designs, it is generally considered sufficient to have at least 30 participants per group in educational research (Lodico et al., 2006). In the current study, the number of participants was adequate for the basic study but insufficient for the pilot study. Participants were selected using a convenient sampling method for both the pilot and basic study. In certain situations, researchers may not be able to randomly choose or systematically select participants or groups. In such cases, researchers may resort to convenience sampling (Fraenkel et al., 2012, p. 269). Convenient sampling is based on selecting participants who are suitable for the study (Fraenkel et al., 2012, p. 269).

Implementation Process

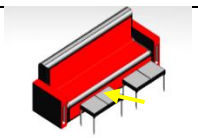
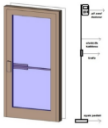
Both pilot and basic studies were conducted at different times. The pilot study was conducted during the spring semester of 2019-2020, and the basic study was conducted during the spring semester of 2020-2021. The author conducted both the pilot study and the basic study. Throughout the intervention, participants utilized the distance learning management system of Kahramanmaras Sutcu Imam University to upload various documents (such as Word, PowerPoint, and other file formats) that were relevant to the project tasks. With the official announcement made on March 16, 2020, distance education due to the COVID-19 epidemic started in universities across Türkiye. Thus, due to the COVID-19 pandemic, the pilot research process was conducted for 2 weeks using face-to-face education, and the remaining 9 weeks were conducted using distance education. The author conducted the basic study synchronously using the ZOOM platform. The intervention process for the pilot and basic study is detailed in the following paragraphs.

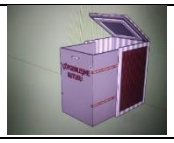
Pilot Study: Participants worked in groups of 3 to 5. The implementation process consists of a total of nine groups. The pilot study was conducted for 11 weeks. ***1st stage***: The participants researched problems that could create value. ***2nd stage***: The participants identified the problem that would create value. They developed solutions to address the problem. ***3rd stage***: The participants decided on a solution and then explained the difference between the problem and the solutions from the previous attempts. ***4th stage***: Participants explored potential economic contributions that their ideas could make to the country. ***5th stage***: Participants explained who their project ideas were aimed at, that is, the target group that would benefit from them. ***6th stage***: Participants decided on the tools and equipment they needed to bring their project ideas to life (for digital prototypes). ***7th stage***: Participants created a plan for the idea/design of the product (prototyping). ***8th stage***: Participants calculated the cost of their project ideas. If the idea was service-oriented, the cost of implementing the service-oriented idea was calculated. If the idea was for profit, the estimated cost and sales price were determined. ***9th stage***: Participants determined the number of target audiences that will benefit if their ideas are oriented towards service. If their idea is commercial, they set estimated daily, monthly, and annual sales targets. ***10th stage***: Participants advertised their project ideas and developed marketing strategies. ***11th stage***: Participants pitched their project ideas convincingly. Participants presented their projects as electronic posters. They used electronic posters as a presentation tool (e-poster-ppt). The pilot study gave the researcher experience on how to conduct entrepreneurial projects online during a sudden transition to distance education. Thus, the researcher conducted the basic study in a more rigorous manner.

Basic Study: The basic implementation process was carried out through distance education (synchronous) using Zoom. The basic study was conducted in 11 stages, and participants worked in groups of 3 to 5, consisting of a total of 13 groups. During the implementation process of the research, all of the participants' project tasks were carried out digitally. The research was conducted using a Word document, images were created using PowerPoint, a prototype was developed using www.tinkercad.com, marketing was done through wix.com, and the project presentation was prepared as an e-poster. ***1st stage***: The researcher presented sample problem situations to the

participants and explained that they were required to identify multiple solutions to each problem. In addition, the researcher presented national and international sample entrepreneurial project ideas to the participants. Additionally, the researcher informed the participants that their project ideas (product or service) could be either commercial or focused on social responsibility. Participants were allowed to think freely during the problem identification phase and were not guided. The participants researched problems that could create value. In preparation for the upcoming stage, the researcher asked the participants to identify at least three problematic situations for the purpose of developing entrepreneurial projects. ***2nd stage***: The participants identified the problem that would create value. The researcher randomly selected one of the group members and asked him or her to explain the problem situations they identified. During this process, participants expressed their opinions on whether the problem situations presented were innovative or not and whether they created value. This process took place in the form of a discussion and question-and-answer session. They developed solutions to address the problem. The researcher asked the participants to develop multiple solution proposals for the problem situations they clarified for the upcoming stage. ***3rd stage***: The working groups presented solutions to solve the problems they identified. The researcher and the participants asked questions about the innovativeness and feasibility of the solutions offered by each group. The participants reached a decision. The researcher asked the participants to explain the differences between their project ideas (solutions) and previous similar products in terms of originality and analysis of similar ideas for the following week. ***4th stage***: One of the group members explained the difference between their project ideas and previous similar projects using visuals. Participants also presented their research on the originality of their project ideas. The researcher asked the participants to explain the contribution of their projects to the country's economy and their target audience. ***5th stage***: Participants explored what kind of economic contributions their ideas could make to the country. In addition, other participants in each group expressed their thoughts on the potential impact of the project ideas. For the next stage, the researcher asked the participants to explain the target audience for their project ideas. ***6th stage***: Participants explained who their project ideas were aimed at, that is, who would benefit from them (target audience). The groups especially drew attention to the value-creation aspect of their project ideas. For the next phase, the researcher asked the participants to identify tools to develop (prototype) their project ideas. ***7th stage***: Participants decided on the tools and equipment they needed to bring their project ideas to life (digital prototype). For the next stage, the researcher asked the participants to create prototypes of their project ideas using Tinkercad (www.tinkercad.com) or similar platforms in the digital environment, with their own efforts. ***8th stage***: The researcher explained to the participants what a prototype is and its importance. Participants created a plan for the idea/design of the product (prototyping). At this stage, some project groups prototyped their designs using Tinkercad and Solidworks, while others used simpler environments such as Paint or Word. Participants benefited from the free versions of these platforms. It was stated that participants were free to use the paid versions if they wished. Table 1 shows some of the digital prototypes.

Table 1. Digital designs of several prototypes

Project Name	Goal of the Project	Slogan of the Project	Digital Prototype
Mask Recycling Machine (Group 1)	Designing a machine to prevent pollution caused by discarded masks.	Bring the old one. Take the new one!!!	
The most practical car tent (Group 4)	Designing an affordable and practical tent to protect cars from the harmful effects of the sun in sunny weather.	Cars need protection too!!!	
Hidden Coffee Tables (Group 7)	Designing a coffee table integrated into both sides of sofa beds.	Hide coffee tables!!!	
Foot Pedal Doorbell (Group 10)	Designing a mechanism to ring bells using your feet, without the need for hands, during the pandemic period.	Doorbells are becoming history!!!	

Width-adjustable garbage pail (Group 12)	Designing a trash can with adjustable volume to prevent it from filling up quickly.	As you throw away garbage, I expand!	

9th stage: Participants reported the estimated cost of their project ideas. If the idea was service-oriented, the cost of implementing the service-oriented idea was calculated. If the idea is for profit, the estimated cost and sales price are determined. Additionally, at this stage, the researcher asked them to come up with an eye-catching slogan (see Table 1) for their project idea. ***10th stage***: The researcher provided participants with information about advertising and marketing strategies. Groups designed websites (using platforms like wix.com) to promote their project ideas. The groups designed their website using Wix.com, which is free to use. ***11th stage***: The researcher explained to participants how to create an effective presentation for the draft e-poster. Participants pitched their project idea convincingly. Group spokespersons or a volunteer from among the group members presented the project ideas on an e-poster. Each group was given approximately five minutes to pitch their project ideas.

Data Collection Tool

The Individual Innovativeness Scale was administered to pre-service science teachers before and after the intervention in both the pilot and basic studies. The original version of the individual innovativeness scale used in the research was developed in English by Hurt et al. (1977). This scale was adapted into Turkish by Kılıçer and Odabaşı in 2010. The Individual Innovativeness Scale determines the levels of innovativeness in individuals and the categories of innovativeness they belong to (Kılıçer & Odabaşı, 2010). Kılıçer and Odabaşı (2010) conducted validity and reliability studies during the process of adapting the scale. They collected data from pre-service teachers in the 1st, 2nd, 3rd, and 4th grades at the faculty of education. The items of the individual innovativeness scale are scored as a 5-point Likert type as a result of the adaptation study. The scale consists of 20 items, with 12 of them being positive (1, 2, 3, 5, 8, 9, 11, 12, 14, 16, 18, and 19) and 8 being negative (4, 6, 7, 10, 13, 15, 17, and 20). By calculating the total score, researchers can evaluate the participants' overall tendencies towards innovativeness (Kılıçer & Odabaşı, 2010). Additionally, the formula for the innovativeness category is (total score from positive items - total score from negative items) + 42, which is used to calculate the participants' individual innovativeness category (Kılıçer & Odabaşı, 2010). With this calculation, individuals' innovativeness categories can be interpreted as **Innovator** with over 80 points, **Early Adopter** between 69 and 80 points, **Early Majority** between 57 and 68 points, **Late Majority** between 46 and 56 points, and **Laggard/Traditionalist** with scores below 46 points (Kılıçer & Odabaşı, 2010). Kılıçer and Odabaşı (2010) found the Cronbach's Alpha reliability coefficient of the scale to be 0.82. In the current study, the Cronbach's Alpha reliability coefficient of the individual innovativeness scale was calculated as 0.78 for the pilot study pre-test, 0.91 for the pilot study post-test, 0.90 for the basic study pre-test, and 0.90 for the basic study post-test. A Cronbach's Alpha reliability coefficient of over 0.70 (Lavrakas, 2008) is considered sufficient. Finally, many researchers have used this scale as a data collection tool in their studies, proving its reliability (Atak & Çaka, 2023; Manbaki & Küçüksüleymanoğlu, 2024; Suer & Kınay, 2019).

Data Analysis

The researcher undertook data analysis using the SPSS software package, which provides a descriptive, interpretative, and reliability analysis of the processes used in this research. Before proceeding with the analysis of the research data, the normality assumptions of the data sets were examined. Firstly, the kurtosis and skewness values were examined to assess the assumption of normality in the pilot study pre-test (skewness=1.004, kurtosis=0.725), pilot study post-test (skewness=-0.217, kurtosis=-0.996), basic study pre-test (skewness=0.418, kurtosis=-0.566), and basic study post-test (skewness=0.226, kurtosis=-0.216). Kurtosis and skewness values for data sets should fall within the range of -2.0 to +2.0, as these limits are considered acceptable for a normal distribution (George & Mallery, 2016; pp. 114-115). In addition, since the study group was less than 50 ($n<50$), the Shapiro-Wilk test results for the data sets were not statistically significant (p-value, pilot study pre-test, pilot study post-test, basic study pre-test, and basic study post-test were 0.882, 0.258, 0.432, and 0.195, respectively). These results indicate that the data was normally distributed (Greasley, 2008). Since the data sets were normally distributed, the paired sample t-test was used to compare the pre-test and post-test scores for both the pilot and the basic study. The significance level of 0.05 was considered statistically significant. The effect size was calculated to determine the effect size of the statistical significance. The effect size for the t-statistic was calculated by converting the t value into the r value. Thus, the formula $r=\sqrt{(t2 / (t2+ df)}$ was used to calculate the effect size

(Connolly, 2007). According to Cohen (1988), the effect size levels of the correlation coefficient are as follows: r = 0.10 indicates a small effect, r = 0.30 indicates a medium effect, and r = 0.50 indicates a large effect.

Research Ethics

At the beginning and end of the intervention process, participants wrote their code names on the measurement tool. In this way, no information that could reveal the identity of the participants was reported. In addition, the researcher avoided any attitudes, behaviors, or statements that could potentially influence the participants during the intervention process (Lodico et al., 2006). Additionally, since there was no control group in the study, no group was deprived of education at the end of the intervention process. While administering the data collection tools, the researcher informed the participants that they were not obligated to complete the scales if they chose not to participate in the research. In this way, participants were able to voluntarily contribute to the research. For example, this is evidenced by the fact that the number of participants enrolled in the course in which the research was conducted (pilot = 30, basic = 48) is different from the number of participants who voluntarily filled out the data collection tools (pilot = 24, basic = 33).

Ethics approval

Ethical approval for this study was obtained from the Kahramanmaras Sutcu Imam University Ethics Committee (Approval Number: E-92405296-100-65552, 08.10.2021, and Meeting Number 7154).

Results

In the study results, first and foremost, the analysis of the dependent sample t-test is presented to examine the impact of the intervention. Then, the results regarding the participants' pre-intervention and post-intervention innovativeness categories are presented in both the pilot study and the basic study. Table 2 displays the results of the dependent sample t-test for the mean scores of the pretest and posttest.

Table 2. Dependent sample t-test results regarding the pre-test and post-test means

Tests		N	Mean	Std. Deviation	Degree of Freedom	t value	p	Effect Size
Pilot study	Pre-test	24	66.00	6.92	23	-0.66	0.51	r=0.13
	Post-test	24	67.00	6.07				
Basic study	Pre-test	33	64.33	7.89	32	-3.31	0.00*	r=0.50
	Post-test	33	67.00	7.25				

*P<0.05

For the pilot study, Table 2 shows that there is no statistically significant difference between the mean scores of pre-service science teachers before and after the online entrepreneurial project training ($p > 0.05$, $t = -0.66$, $df = 23$). For the basic study, the mean score for innovativeness among pre-service science teachers significantly increased after completing the online entrepreneurial project training. The mean score at the end of the training is higher than the mean score at the beginning ($p < 0.05$, $t = -3.305$, $df = 32$). The effect size of this difference in mean scores is a large effect ($r = 0.50$). Table 3 displays the categories of participants' individual innovativeness before and after the pilot study.

Table 3. Categories of individual innovativeness before and after the pilot study

Pilot study participants[1]	Pre-test	Post-test	Pilot study participants	Pre-test	Post-test
[1]P1	Early Majority *	Innovator	P13	Innovator **	Early Adopter
P2	Early Adopter *	Innovator	P14	Early Majority ***	Early Majority
P3	Early Adopter **	Early Majority	P15	Early Majority *	Innovator
P4	Early Majority *	Early Adopter	P16	Early Adopter **	Late Majority
P5	Early Majority *	Early Adopter	P17	Early Majority ***	Early Majority
P6	Early Adopter *	Innovator	P18	Early Adopter ***	Early Adopter
P7	Early Majority ***	Early Majority	P19	Early Majority ***	Early Majority
P8	Early Majority **	Late Majority	P20	Early Adopter *	Innovator
P9	Early Majority *	Early Adopter	P21	Early Majority ***	Early Majority
P10	Early Majority *	Early Adopter	P22	Early Majority **	Late Majority
P11	Early Adopter ***	Early Adopter	P23	Innovator**	Early Adopter
P12	Early Majority **	Late Majority	P24	Early Adopter ***	Early Adopter

*Upgrade =9; **Downgrade =7; ***Same=8

Table 3 shows that before the pilot application, 2 pre-service teachers were in the innovators category, 8 pre-service teachers were in the early adopter's category, and 14 pre-service teachers were in the early majority category. After the pilot application, 5 pre-service teachers were in the innovators category, 9 pre-service teachers in the early adopter's category, 6 pre-service teachers in the early majority category, and 4 pre-service teachers in the late majority category. Additionally, Table 3 shows that after the pilot study, the innovativeness of 9 pre-service teachers upgraded to the next higher adaptation category, the innovativeness of 8 pre-service teachers remained the same, and the innovativeness of 7 pre-service teachers was downgraded. Table 4 shows the categories of participants' individual innovativeness before and after the basic study.

Table 4. Categories of individual innovativeness before and after the basic study

Basic study participants[1]	Pre-test	Post-test	Pilot study participants	Pre-test	Post-test
[1]B1	Early Majority*	Early Adopter	B18	Early Majority*	Early Adopter
B2	Early Adopter***	Early Adopter	B19	Innovator***	Innovator
B3	Early Adopter*	Innovator	B20	Early Adopter**	Early Majority
B4	Early Majority**	Late Majority	B21	Innovator***	Innovator
B5	Early Majority*	Early Adopter	B22	Early Adopter***	Early Adopter
B6	Early Majority*	Early Adopter	B23	Early Adopter*	Innovator
B7	Early Majority**	Late Majority	B24	Late Majority *	Early Majority
B8	Early Majority**	Late Majority	B25	Early Adopter*	Innovator
B9	Early Majority*	Early Adopter	B26	Early Adopter*	Innovator
B10	Early Adopter***	Early Adopter	B27	Early Majority***	Early Majority
B11	Early Majority*	Early Adopter	B28	Early Majority*	Early Adopter
B12	Early Majority*	Early Adopter	B29	Early Adopter*	Innovator
B13	Early Majority***	Early Majority	B30	Innovator***	Innovator
B14	Innovator**	Early Majority ı	B31	Early Majority*	Early Adopter
B15	Early Majority***	Early Majority	B32	Late Majority*	Early Majority
B16	Innovator***	Innovator	B33	Early Adopter***	Early Adopter
B17	Early Majority*	Early Adopter			

*Upgrade =17; **Downgrade =5; ***Same=11

Table 4 shows that before the basic study, 5 pre-service teachers were in the innovators category, 9 pre-service teachers in the early adopter's category, 17 pre-service teachers in the early majority category, and 2 pre-service teachers in the late majority category. After conducting the basic study, it was found that 9 pre-service teachers fell into the innovators category, 14 pre-service teachers fell into the early adopter's category, 7 pre-service teachers fell into the early majority category, and 3 pre-service teachers fell into the late majority category. Additionally, Table 4 shows that after the basic study, the innovativeness of 17 pre-service teachers upgraded to the next higher adaptation category, the innovativeness of 11 pre-service teachers remained the same, and the innovativeness of 5 pre-service teachers was downgraded.

Discussion and Conclusion

This research examined the effect of online entrepreneurial project training on the innovativeness of pre-service science teachers. Results of the pilot research showed that online entrepreneurial project training did not lead to a statistically significant difference in the individual innovativeness of pre-service science teachers. On the other hand, results of the basic study were striking. The basic study results showed that online entrepreneurial project training had a statistically significant positive impact on the individual innovativeness of pre-service science teachers. The effect size value shows that online entrepreneurial project training has a large impact on the individual innovativeness of pre-service science teachers. This means that online entrepreneurial project training positively contributes to the development of individual innovativeness among pre-service science teachers.

One possible reason for the lack of a statistically significant difference in the pilot study could be attributed to the abrupt transition to online education during the Covid period. The researcher's search for suitable digital environments and tools for online entrepreneurial project training during the sudden transition to online education established an infrastructure for the main study. During the pilot study process, the researcher provided online

training for entrepreneurial projects for the first time. This process increased the researcher's knowledge and experience in delivering this training.

The pre-service science teachers' individual innovativeness profiles changed before and after the pilot study as well as before and after the basic study, which is noteworthy. When the participants were evaluated individually, nine pre-service teachers in the pilot study transitioned from their current group to a more innovative group; seven pre-service teachers transitioned to less innovative than their current groups; and eight pre-service teachers retained their current profiles. In the basic study, 17 pre-service teachers transitioned from their current group to a more innovative group; five pre-service teachers transitioned to less innovative than their current groups; and 11 pre-service teachers retained their current profiles. The fact that the number of participants who transitioned from their current group to a more innovative group in the basic study was higher indicates that the implementation process of the basic study had a greater impact on the individual innovativeness of the participants compared to the pilot study. The individual innovativeness profiles of most pre-service teachers fall into the early majority category before both the pilot and basic applications. It is noteworthy that in the literature on quantitative causal comparative or descriptive studies, in which participants are not exposed to a specific intervention, pre-service teachers generally fall into the early majority group. For instance, Bautista et al. (2018) found that primary pre-service teachers generally fall into the early majority group among their innovativeness groups. Similarly, Yüksel (2015) discovered that most pre-service teachers from various undergraduate programs fell into the early majority category of individual innovativeness profiles. Geçikli (2022) determined that the majority of pre-service science teachers exhibit a medium level of individual innovation. The individual innovativeness of pre-service teachers was categorized within the early majority group prior to their exposure to specialized training related to innovation. This categorization can be attributed to their educational background, which supported their placement in this group. After the experimental application, there was an increase in the number of pre-service teachers falling into the innovator and early adopter categories in both pilot and basic studies.

In the literature, there is a limited number of studies on interventions aimed at improving the individual innovativeness of pre-service teachers. Supporting the current research results, Bautista et al. (2021) concluded that the KINANG Project improved the innovativeness of pre-service secondary school teachers in the fields of biological science, English, Filipino, and mathematics. The KINANG Project consists of four stages. The first phase of the project is a seminar-workshop on innovative and effective teaching in the 21st century. The second phase of the project is an orientation program that focused on classroom innovations and empowering teachers. The third phase of the project is the Fixation Ceremony (morale-boosting), which is held to further strengthen their commitment to being innovative teachers. The fourth phase of the project involves creating a visit program that includes focus group discussions. Bautista et al. (2021) conducted an intervention aimed at enhancing the individual innovativeness of pre-service teachers in their study. However, it is important to note that this intervention process differs significantly from the online entrepreneurial project training implemented in the current research. The intervention process of the current study consists of eleven stages. In this sense, the significant and large effect of online entrepreneurial project training on the individual innovativeness of pre-service science teachers in the basic study of the current research can also be attributed to the difference in educational content. In the current research, the processes that enable pre-service science teachers to identify problems, develop solution proposals, create slogans, design digital prototypes, articulate the originality of their ideas, and produce original web designs may have had a positive impact on their ability to adapt to innovation. This effect size is a convincingly large effect. In another study, Cholifah et al. (2019) concluded that online project-based learning has a positive effect on the innovativeness of pre-service elementary teachers. Cholifah et al. (2019) point out that the critical factors influencing the impact of online project-based learning on pre-service elementary teachers' innovativeness are the utilization of projects and information and communications technology (ICT). In another experimental study, Baki (2024) found that the close reading strategy significantly enhanced the individual innovativeness of pre-service Turkish language teachers. Studies on interventions related to innovation in the literature show that individual innovativeness of pre-service teachers can be improved. In this sense, the web tools (Tinkercad, digital poster, website design/Wix.com) used within the scope of information and communication technologies in the current research may have contributed to the individual innovation of pre-service science teachers.

Innovation always requires creativity, but not every creative endeavor leads to an innovative outcome (Nasierowski & Arcelus, 2012). This means that processes aimed at enhancing creativity can indirectly contribute to innovative thinking. Within the scope of the current research, many stages in online entrepreneurial project training require pre-service science teachers to utilize their creativity. The current research focuses on the processes that enable prospective teachers to identify problems, develop solution suggestions, explain the originality of their project ideas, design digital prototypes, devise advertising strategies, come up with slogans for their project ideas, and deliver effective presentations. These processes require them to utilize their creativity.

Recommendations

As a result of the research, online entrepreneurial project training had a positive impact on the individual innovativeness of fourth-grade pre-service science teachers. In the basic study, the categories of individual innovativeness among pre-service science teachers were examined before and after the online entrepreneurial project training, further supporting this conclusion. These conclusions can be generalized with certain limitations. The absence of a control group in the current study limits attributing the results to the intervention. In future studies, it would be beneficial to conduct a similar study that includes a control group in order to compare the results. Additionally, this research was conducted within the constraints of online education. In future research, the impact of face-to-face entrepreneurial project training on the innovativeness of science teacher candidates can be examined. The original individual innovation scale used in this research was developed by Hurt, Joseph, and Cook in 1977. The adaptation scale used in the current research was introduced to the literature by Kılıçer and Odabaşı in 2010. The results of the research conducted using a recently developed innovation scale can be compared with the results of the current research. Based on the results of the current research, educators can benefit from entrepreneurial project training to enhance the individual innovativeness of pre-service science teachers. Educators can examine the effect of face-to-face entrepreneurial project training, a novel type of project, on the innovativeness of pre-service science teachers.

Acknowledgements or Notes

The author received no financial support for the research and authorship of this article.

Author (s) Contribution Rate

The author confirms sole responsibility for the conception and design of the study, data collection, analysis and interpretation of results, and manuscript preparation.

Ethical Approval

Ethical approval for this study was obtained from the Kahramanmaras Sutcu Imam University Ethics Committee (Approval Number: E-92405296-100-65552, 08.10.2021, and Meeting Number 7154).

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 470-478 Article Type: Research Article

Determining the Relationship Between Blood Donation and Altruism Level

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Abstract
Altruism means helping others without expecting anything in return and solely for the sake of others; blood donation is one of the best examples of this pure aid. This research aims to examine the relationship between teacher candidates' altruism levels and blood donation attitude levels. The relational survey method, one of the subcategories of the general survey model, was used in the research. The research was conducted with 204 teacher candidates studying at a state university in Türkiye. Data were collected from the "Blood Donation Attitude Scale" developed by Çelik & Güven (2015). It was obtained by using the "Altruism Attitude Scale" developed by Ümmet, Ekşi & Otrar (2013) and the questions prepared by the researchers by taking advantage of the literature and taking expert opinions. Frequency and percentage calculations, mean, standard deviation, and Pearson correlation analysis were used to evaluate the data. As a result of the research, it was determined that there was a significant and statistically moderate positive relationship between the level of altruism and blood donation attitude. It was determined that the "Social and Social Responsibility" factor had the highest mean value for the Blood Donation Attitude Scale sub-dimensions, and the "Help in Traumatic Situations" factor had the highest mean value for the Altruism Attitude Scale sub-dimensions.

Keywords: Blood donation, Altruism, Teacher candidates

Citation
Önel, A., Konu-Kadirhanoğulları, M & Fırat-Durdukoca, Ş. (2024). Determining the relationship between blood donation and altruism level. *International Journal of Contemporary Educational Research, 11*(4), 470-478. https://doi.org/10.52380/ijcer.2024.11.4.661

Received	20.05.2024
Accepted	19.10.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The author(s) acknowledge that they received no external funding in support of this research.

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Introduction

Blood is considered a vital fluid because it carries all the substances necessary for life to be possible. Nutrient monomers taken into the body through nutrition, oxygen, the vital gas taken through breathing, and all products synthesized by the body are transferred to the relevant places through the blood. Therefore, all substances, both ingested and produced, are present in the blood. This richness gives blood a vital feature.

Throughout their lives, people need blood and blood products in serious clinical situations such as accidents, wars, disasters, surgical interventions, chronic diseases, pregnancy, and birth, where there is no other therapeutic option. Considering some bleeding diseases and surgical operations, sometimes 6-8 units of blood may need to be given to the same patient. On the other hand, one person needs blood every three seconds. In such health situations, human-to-human blood transfusion is a life-saving intervention. Since scientific studies to produce artificial blood have not yet yielded results, humanity needs healthy individuals to donate blood. For this reason, disseminating blood donation behavior and making it sustainable is, above all, a national and humanitarian duty. However, people are reluctant to donate blood for many reasons (Alla et al., 2019; Altındiş et al., 2019; Savaş, 2019; Sameeya & Redy, 2018). A lot of misinformation, attitudes, behaviors, beliefs, and fears prevent people from donating blood (Altındiş et al., 2019).

Voluntary blood donation behavior occurs under the influence of people's attitudes, behaviors, beliefs, values, orientations, and some motivational elements and generally requires sacrifice (Hablemitoğlu et al., 2010), so donating blood is a way to save lives and give the gift of life to someone else. Donating is an altruistic behavior (Steele et al., 2008; Ümmet et al., 2013). Donating blood is one of the important altruistic behaviors that a person does with his own will (Düzgüner, 2013; Gillespie & Hillyer, 2002; Hablemitoğlu et al., 2010; Pennings, 2005; Piliavin, 1990). Altruism means helping others without expecting anything in return and solely for the good of others; blood donation is one of the best examples of this pure aid (Titmuss, 2018).

Altruism, defined as performing a behavior without expecting a reward (Mateer (1993), is based entirely on volunteerism, without any interest, and sometimes requires paying a price (Ferguson & Lawrence, 2016; Silk & House, 2011; Üzümçeker, Gezgin & Akfırat, 2019). Altruism was introduced by Auguste Comte in the 19th century and developed by Pitirim and Sorokin in the 20th century (Mutafçılar, 2008). Donating blood is more altruistic than other types of aid, as it is done without knowing who is being helped, and the only way to provide it is through voluntary donations (Yılmaz, 2022; Düzgüner, 2013). Blood donation is affected by various factors such as age, gender, education, socio-economic status, altruism, social responsibility, peer influence, access to health communication, knowledge about the importance of blood donation, previous donations, and the influence of active blood donors (Yalman and Karagöz, 2021). When the literature is examined, it is seen that studies on blood donation and altruism focus on the fields of medicine, nursing, and theology (Ateş et al., 2023; Çiftçi & Turan, 2021; Sağir, 2020). For example, Ateş et al. (2023) examined whether the altruistic attitudes and empathic tendencies of 2nd, 3rd, and 4th year students at the School of Nursing of a private university affected blood donation behavior. It was determined that only 27.8% of the 258 students who participated in the study donated blood, and no significant difference was found between the donation scores of students with and without blood donation experience. However, a significant difference was found in the helping sub-dimensions. As a result, it was determined that empathy and altruistic attitude alone were not sufficient motivating factors for blood donation. Çiftçi and Turan (2021) examined the effect of the altruism level of nursing students on blood donation attitudes in their study. The study was conducted with the participation of 321 out of 1200 students studying at a nursing faculty in Türkiye. The findings showed that the students' altruism level was high and their attitudes towards blood donation were positive. A positive and moderate relationship was found between the level of altruism and blood donation attitude. As a result, it was determined that as the level of altruism increased, attitudes towards blood donation also increased positively. In his study, Sağır (2020) examined the altruism and religious attitude levels of individuals in four professional groups, such as AFAD employees, nurses, preschool teachers, and religious officials. The research was conducted on 416 personnel. Men had higher altruism scores than women, and a significant difference was found between genders. In addition, a positively significant relationship was found between religious attitude and altruism, and the effects of age, profession, and altruism variables on religious attitude. When the international literature is examined, there are studies on blood donation and altruism. For example, Ferguson and Lawrence (2016) examined whether blood donation is a purely altruistic act. The study introduces the Mechanisms of Altruism (MOA) approach, which suggests that blood donation can be seen as altruistic, but the underlying motivations may be different. It shows that blood donation is a mixture of warm giving and reluctant altruism. Ferguson et al. (2008) proposed that blood donation is based on the benevolence hypothesis rather than altruism. They conducted three different studies and showed that both the donor and the recipient benefit. The results showed that beliefs in personal benefit predicted actual donations; only benevolence beliefs were related to donation intentions, and committed donors were more willing to accept benevolent

messages. Otto and Bolle (2011) examined how economic theory provides suggestions for modeling social motives associated with altruistic behavior. Survey results show that general altruism is associated with philanthropy but not with blood donation behavior. When different aspects of altruism are examined separately, they conclude that specific motives can be associated with specific behaviors. However, when the studies in question are examined, no research has been found specifically for teacher candidates. Therefore, this research can help us understand both teacher candidates' feelings of social responsibility and an important health behavior such as blood donation. This research aims to examine the relationship between teacher candidates' altruism levels and blood donation attitude levels. In this context, it is thought that this research is important in understanding the tendency of teacher candidates to make sacrifices regarding health and in terms of guiding future studies. The main problem of the research is "Is there a relationship between the altruism levels of teacher candidates and their blood donation attitude levels?" It was determined as. The following questions were also asked to the prospective teachers:

- Have you ever received information about blood donation?
- How many times have you donated blood in your life?
- Do you think that the education you received at the faculty contributed to your desire to donate blood?
- Have you ever needed a blood transfusion?
- Has anyone in your family or circle of friends ever needed a blood transfusion?
- Are you a member of any voluntary institution or organization?

Method

Design of The Research

This study is a research conducted in the "relational scanning" type, which is one of the subcategories of the general scanning model. A general survey model is a research method used to reach a general judgment by taking samples from an entire universe or a group within the universe (Karasar, 2000). The relational survey model is a research model that aims to determine the changes between two or more variables or the degree of these changes (Karasar, 1991). This research was conducted in a relational screening model to examine the relationship between teacher candidates' altruism levels and blood donation attitude levels.

Participants

This research was conducted with 204 teacher candidates aged 18-23, studying at the Faculty of Education at a state university in Türkiye. The research group was determined using the appropriate sampling method. Convenience sampling is a method that involves selecting individuals who are easily accessible, readily available, and willing to participate in the research (volunteer) (Christensen, Johnson & Turner, 2015). The sample group consists of 204 teacher candidates, 135 female and 69 male. Teacher candidates are studying in the Department of Mathematics and Science Education.

Data Collection Tools of The Research

In the study, data was collected using a data collection tool consisting of three parts. The first part includes questions that include demographic information, such as gender and family type of the participating teacher candidates, and questions prepared by the researchers by taking advantage of the literature and taking expert opinions. To teacher candidates, "Have you received information about blood donation before?" "How many times have you donated blood in your life?" "Do you think that the education you received at the faculty contributed to your desire to donate blood?" "Have you ever needed a blood transfusion before?" “Has anyone in your family or those around you ever needed a blood transfusion?" and “Are you a member of any volunteering institution/organization?” questions were asked.

The second part includes the "Blood Donation Attitude Scale" developed by Çelik & Güven (2015) to determine the participants' attitude levels towards blood donation. The scale consists of 24 items under the factors "social and social responsibility," "concern," and "social opinion and understanding," which measure attitudes towards blood donation. The scale was prepared in a 5-point Likert type, and the expressions in the scale are: Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree. It was stated that the Cronbach Alpha reliability coefficient of the scale was 0.83.

The third section includes the "Altruism Attitude Scale," which was developed by Ümmet, Ekşi, & Otrar (2013) and consists of 38 items in order to determine the altruism levels of the participants. The scale consists of 7 factors:

"participation in voluntary activities," "financial aid," "assistance in traumatic situations," "assistance to the elderly/patients," "assistance based on physical strength," "assistance during the education process," and "assistance resulting from a sense of closeness.". The scale is structured as a 5-point Likert type, where 1 = I strongly disagree, 2 = I disagree, 3 = I am undecided, 4 = I agree, 5 = I completely agree, and the Cronbach Alpha reliability coefficient is expressed as 0.81.

Data Collection Process and Data Analysis

During the data collection process, scales were applied to 204 teacher candidates studying at the faculty of education at a state university in Türkiye in the 2022-2023 academic year. This application was carried out by the researchers in the classroom and took approximately 30 minutes. The data used in the study were analyzed with the SPSS 22.0 program. In order to evaluate the suitability of the scale scores for normal distribution, the Kolmogorov-Smirnov test was used for the "Blood Donation Attitude Scale" and the "Altruism Attitude Scale," and the skewness and kurtosis coefficients were examined, and it was determined that they met the normal distribution criteria.

In correlation analysis, the degree of relationship is expressed as the correlation coefficient (r) and can take values between -1 and +1. The absolute value of this coefficient indicates the strength of the existing relationship. Among the most commonly used correlation analyses in the literature are Pearson and Spearman correlations. While Pearson correlation analysis is used when the variables have a normal or near-normal distribution, Spearman correlation is preferred when the variables are far from normal (Bonett & Wright, 2000). Since the data showed a normal distribution, Pearson correlation analysis was performed to examine the relationship between altruism levels and attitudes towards blood donation. Frequency distribution, percentage calculations, and mean and standard deviation values were used in the analysis of the data.

Demographic questions were meticulously created by using relevant literature and expert opinions, thus ensuring the validity of the study. B In addition, high reliability coefficients such as the "Blood Donation Attitude Scale" (Cronbach Alpha: 0.83) and the "Sacrifice Attitude Scale" (Cronbach Alpha: 0.81) show that these scales provide solid and consistent measurements. These high reliability values increase the reliability of the measurement processes of the scales and support the accuracy of the data obtained.

Ethical Approval

Ethical permission (08.05.2024-58) was obtained from the Kafkas University Social and Human Sciences Scientific Research and Publication Ethics Committee institution for this research.

Results

In this section, the findings obtained within the scope of the research are presented and interpreted. Within the scope of the research, in the first part, the questions containing demographic information such as gender and family type of the participating teacher candidates and the data obtained from the questions prepared by the researchers by taking advantage of the literature and taking expert opinions were tabulated. (Table 1).

Table 1. Frequency and percentage values of the data obtained from the First Part of the Survey

		n	%
Gender	Female	135	66.2
	Male	69	33.8
Family Type	Nuclear family	149	73.0
	Extended family	53	26.0
	Broken Family	2	1.0
Have you ever received information about blood donation?	Yes	142	69.6
	No	62	30.4
How many times have you donated blood in your life?	None	121	59.3
	1-2	56	27.5
	3-5	22	10.8
	6 or more	5	2.5
Do you think that the education you received at the faculty contributed to your desire to donate blood?	Yes	99	48.5
	No	105	51.5
Have you ever needed a blood transfusion before?	Yes	14	6.9
	No	190	93.1

Has anyone in your family or circle ever needed a blood transfusion?	Yes	69	33.8
	No	135	66.2
Are you a member of any institution or organization that carries out voluntary activities?	Yes	31	15.2
	No	173	84.8

According to Table 1, it is seen that the majority of teacher candidates are women (66.2%), the majority of them have a nuclear family (73%), and a significant portion of them have previously received information about blood donation (69.6%). However, the majority of teacher candidates stated that they had never donated blood in their lives (59.3%), that they thought that the education they received at the faculty did not contribute to blood donation (51.5%), and that they had never needed a blood transfusion before (93.1%). They also stated that the majority of them did not need blood transfusion in their family or circle (66.2%) and were not members of any voluntary organization (84.8%).

Table 2. Descriptive statistics of the altruism attitude scale and blood donation attitude scale sub-dimensions

Blood Donation Attitude Scale	Mean±SD
Community and Social Responsibility	4,00 ± ,7588
Anxiety	3,03 ± ,7736
Social View and Understanding	2,80 ± ,9381
Blood Donation Attitude Average	3,48± ,5701
Altruism Attitude Scale	**Mean±SD**
Participation in Volunteer Activities	3,73± ,8388
Financial support	3,94± ,7955
Help in Traumatic Situations	4,11± ,8441
Helping the Elderly/Sick	4,10± ,8507
Physical Strength-Based Assistance	4,00± ,8071
Assistance in the Educational Process	3,99± ,8363
Help Derived from a Sense of Closeness	4,02± ,8746
Altruism Attitude Average	3,97± ,7379

When the averages of the Blood Donation Attitude Scale sub-dimensions presented in Table 2 were examined, it was found that the "Social and Social Responsibility" factor had the highest average value ($\bar{X}$ = 4.00). When the averages of the Altruism Attitude Scale sub-dimensions were examined, it was found that the "Help in Traumatic Situations" factor had the highest average value ($\bar{X}$ = 4.11). Additionally, it was determined that the Blood Donation Attitude Average ($\bar{X}$ = 3.48) and the Altruism Attitude Average ($\bar{X}$ = 3.97).

Table 3. Evaluation of the relationship between altruism and blood donation attitude scales and their sub-dimensions

	r/p Test Values	Community and Social Responsibility	Anxiety	Social View and Understanding	Blood Donation Attitude Average
Participation in Volunteer Activities	r	,610**	,114	,158*	,501**
	p	,000	,104	0,24	,000
Financial support	r	,709**	,217**	,189**	,622**
	p	,000	,002	,007	,000
Help in Traumatic Situations	r	,718**	,168*	,128	,589**
	p	,000	,016	,068	,000
Helping the Elderly/Sick	r	,706**	,138*	,143*	,572**
	p	,000	0,49	0,41	,000
Physical Strength-Based Assistance	r	,687**	,191*	,182**	,593**
	p	,000	,006	,009	,000

Assistance in the Educational Process	r	,733**	,224**	,154*	,631**
	p	,000	,001	,028	,000
Help Derived from a Sense of Closeness	r	,623**	,143*	,091	,504**
	p	,000	0,42	,197	,000
Altruism Attitude Average	r	,769**	,191**	,169*	,644**
	p	,000	,006	,016	,000

(**) The correlation is significant at the 0.01 level (2-Way).

Upon examining Table 3, a significant and positive relationship between altruism levels and blood donation attitudes is observed. This relationship reached a correlation coefficient of r=0.644** and was found to be statistically significant with p<0.001. This shows that as the level of altruism increases, blood donation attitudes also change positively. Furthermore, it is indicated that this relationship is of medium statistical strength.

Conclusion, Discussion, and Recommendations

Blood is of vital importance as it is an indispensable element for the continuation of life and an alternative treatment tool. For this reason, raising awareness about blood donation and developing policies regarding this is a constantly current issue in modern societies (Düzgüner, 2013). Voluntary and unpaid donors stand out as valuable resources for society, and they provide the majority of donations (Fernández-Montoya, 1997). The relationship between blood donation and altruism has significant effects on the health and well-being of both individuals and society. Based on this, the aim of this research is to understand the relationship between teacher candidates' altruism levels and blood donation attitudes.

When the results obtained from the research are examined, it is noted that the level of awareness about blood donation is generally low and participation in volunteer activities is limited. Data obtained from the current study may provide important clues in the development of targeted strategies and policies to increase awareness and participation in blood donation. The fact that the majority of the participants have never needed a blood transfusion before (93.1%) and that such needs are rare in their surroundings (66.2%) shows that the level of sensitivity on this issue is low. As a matter of fact, Yıldız et al. (2006) stated that the two biggest obstacles to blood donation are misinformation and social insensitivity. Yıldız et al. (2006) determined that people avoid donating blood due to hearsay information such as donating blood has side effects, causes weight gain, causes weight loss, causes addiction, transmits diseases, and causes anemia. Blood donation awareness varies according to countries and cultures. Compared to developed countries, our country ranks very low in blood donation due to the insufficient number of volunteer blood donors. Considering that the population of our country increases by an average of 1 million every year (www.worldometers), there is a great need for the number of blood donors to gradually increase.

It is noteworthy that the majority of teacher candidates are women and have a nuclear family structure. This demographic information reveals the social structure of the sample group and the family dynamics that could potentially affect altruistic behaviors. On the other hand, the fact that the majority of teacher candidates stated that they had never donated blood in their lives indicates that their attitudes and behaviors towards blood donation need to be improved. In addition, the fact that they stated that they thought their education did not contribute to blood donation reveals that the curriculum did not focus enough on this issue or that students did not obtain sufficient information and motivation on this issue. The fact that they stated that they did not need a blood transfusion and that there were people around them who did not experience this situation may be among the factors that reduce individuals' sensitivity to blood donation. In addition, the fact that the majority of teacher candidates stated that they were not members of any voluntary organization indicates that there is a deficiency in terms of developing social responsibility and volunteering awareness. As a result, it reveals the lack of knowledge of teacher candidates about blood donation and the necessity of education and awareness programs to increase their social sensitivity.

Another result obtained from the study is that there are notable differences in the sub-dimensions of the Blood Donation Attitude Scale and the Altruism Attitude Scale. The fact that the "Social and Social Responsibility" factor has the highest mean value ($\bar{X}$ = 4.00) shows that teacher candidates have a sense of responsibility, while the "Help in Traumatic Situations" factor has the highest mean value ($\bar{X}$ = 4.11). It reflects sensitivity to emergencies and tendencies to help. Regarding this issue, Steele et al. (2008) stated that the majority of donors are highly empathetic and altruistic people who donate out of social responsibility. This situation suggests that the concepts

of social responsibility and helpfulness have an important place in the educational processes of teacher candidates. As a result, the high social responsibility and sensitivity to traumatic situations of teacher candidates can be evaluated as both a reflection of their educational processes and an indicator of their acceptance of their future roles and responsibilities. These findings emphasize the importance of programs and activities aimed at increasing the social sensitivity of teacher candidates.

Looking at Table 3, it can be seen that there is a significant relationship between the altruism level of teacher candidates and their blood donation attitude. This result obtained from the research shows that this statistically significant relationship increases positively with the increase in the level of altruism. This finding is also supported by similar studies in the literature. For example, Piliavin & Charng (1990) determined that blood donors were more altruistic than those who never donated blood. Yılmaz (2022) stated that there is a significant and positive relationship between altruism and donation intention. Koca (2003) stated that there is a positive relationship between blood donation attitude and altruism attitude. Therefore, it can be concluded that such socially beneficial behaviors can be encouraged and disseminated by increasing the level of altruism, especially in society-oriented professions such as education. As a matter of fact, Hablemitoğlu et al. (2010) reported that teachers who donate blood are more likely to donate blood than those who do not donate blood. They give directions to strangers, hold the elevator for a stranger, give way in traffic, give money to people asking for help, help people they don't know carry loads such as packages, donate to charities, lend valuable belongings to their neighbors, and voluntarily take care of their neighbors' pets without expecting anything in return. They determined that they helped the elderly or disabled people while crossing the street. Alessandrini (2007) stated that altruism is an element that enables people to continue donating blood. Kılınç (2019) stated that science teacher candidates' attitude levels towards blood donation are high.

As a result, with the increase in the sense of social goodness and solidarity, important social responsibilities such as blood donation can be fulfilled more effectively. According to the Theory of Reasoned Action put forward by Fishbein & Ajzen (1975), individuals behave by taking into account the returns they will provide. Based on this, the benefits of donating blood should be explained to students, especially in the education system. Because research shows that blood donation renews blood cells; It reduces stress, headache, cancer risk, heart disease, and heart attack; it shows that it regulates blood pressure and cholesterol (URL 1). The body produces new ones as much as the given amount. The thought of helping at least three patients with one unit of blood makes the donor psychologically happy (URL 2). Every time the donor donates blood, he or she undergoes screenings such as HIV, hepatitis B-C, and syphilis, and thus a kind of check-up (Altındiş et al., 2019). In addition, based on the results of this research, prospective teachers can be offered opportunities where they can mentor or be a role model in altruism. By organizing blood donation campaigns and activities related to altruism, students can be encouraged to take a more active role in these issues.

Author (s) Contribution Rate
All authors contributed equally.

Ethical Approval
Ethical permission (08.05.2024-58) was obtained from the Kafkas University Social and Human Sciences Scientific Research and Publication Ethics Committee institution for this research.

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 479-494 Article Type: Research Article

Fun-ing: applying a playful and embodied pedagogical approach to an online poetry workshop in the Mobile Arts for Peace project

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Abstract
This paper presents how a playful and embodied pedagogical approach (fun-ing) (Huxley, 2023) was applied to an international online poetry workshop for young people, and in doing so, foregrounds *qualities* of learning experiences, rather than neo-liberal skills-based outcomes alone. The methodology of fun-ing is grounded in a reflexive and emplaced ethnographic approach (Pink, 2011), in which the performing body-mind is perceived as encountering its surroundings and the material elements (living/non-living). By applying the Six Guiding principles of fun-ing (Huxley, 2023), to the design and analysis of an online poetry workshop, organised as part of the Mobile Arts for Peace (MAP) AHRC-funded project, the paper shows that the principles, originally derived from a doctoral study, can be used in other non-formal learning contexts. A retrospective analysis of the workshop recording (Mosley Wetzel, 2017), via researcher-facilitator critical incidents (Tripp, 1993), shows that the principles support creative educationalists in shaping joyful and novel learning experiences. Ultimately, enabling learners to extend their understanding and felt learning capabilities of what they can do/achieve through the art form of poetry. The paper calls for further contextually specific adaptations of the fun-ing principles by educationalists, artists, and researchers alike.

Keywords: Fun, Arts-based education, Poetry, Online embodiment, Qualities of learning, Mediating artefacts

Citation
Huxley, S. (2024). Fun-ing: applying a playful and embodied pedagogical approach to an online poetry workshop in the Mobile Arts for Peace project. *International Journal of Contemporary Educational Research, 11*(4), 479-494. https://doi.org/10.52380/ijcer.2024.11.4.725

Received	11.09.2024
Accepted	18.12.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Ethical Statement	This article is the revised and developed version of the unpublished conference presentation entitled "Flirting with fun-ing: applying a playful and embodied educational approach to a Poetry workshop", orally delivered at the Gentle Gestures stream on 'Embodied spaces of collective care, materialism and collaboration', at the Midland Conference of Critical Thought (MCCT), in the UK on April 6th, 2024. Additionally, this article draws from the author's Ph.D. dissertation, "The relationship between fun and learning: an online embodied ethnography of Coaches Across Continents", which was submitted to the Open University, UK, in 2022.
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	This work was supported by the Arts and Humanities Research Council (AHRC) under Grant AH/T008164/1 of the UK Research and Innovation (UKRI) funding body.
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Introduction: a call for alternative spaces of learning

Several educational researchers (Biesta, 2009; Passarelli and Kolb, 2012; Brown et al., 2020), advocate that learning and education should align more closely with the development of the 'whole person' (Yorks et al., 2006), including the development of social capabilities, and a sense of embodied belonging and personal and social transformation. Advocating for educational practice that moves beyond the often-limited skills-focused agenda, and instead considers alternative processes and qualities of learning. Such a sentiment was also shared at the Gentle Gestures stream on 'Embodied spaces of collective care, materialism and collaboration,' at the Midland Conference of Critical Thought (MCCT), in the UK on April 6th, 2024. The Gentle Gestures stream at the conference rested on the claim that 'there is a gap in methodologies and strategies for activating spaces of alternative forms of learning' (Gentle Gestures call for contributors, February 2024). This presented itself as an opportune moment to share the piloting, and adaptation of the Six Guiding principles of fun-ing (Huxley, 2023), developed through my doctoral research, and re-applied to the design, delivery, and review of an online poetry workshop as part of the Mobile Arts for Peace (MAP) AHRC-funded project (2020-2024). The Six principles seek to generate joyful and novel ways of learning, and to explore, and dwell in processes/methods of learning, rather than products/outcomes. I'll outline my doctoral research in the next section, on situating fun-ing, but for now, I present an overview of MAP and the online ARTing workshop on poetry, as well as two guiding questions to explore if and how poetry can be integrated within non formal learning approaches concerned with generating alternative spaces of learning.

MAP is a 4-year international, interdisciplinary applied research project, funded by the Arts and Humanities Research Council (AHRC) and Global Challenges Research Fund (GCRF) in the UK, which began in 2020. MAP demonstrates the value of arts-based methods for everyday peacebuilding with and for young people in post-conflict affected countries (namely, Kyrgyzstan, Rwanda, Indonesia, and Nepal). The research project provides evidence of the gap in how young people can engage decision-makers to affect local and national policy/curricula changes through innovations with living cultural art forms.

As part of this AHRC project, on 9 November 2023, I facilitated a two-hour online ARTing workshop, on Zoom (Archibald et al., 2019), exploring poetry in analysis/dissemination for research. The exploratory workshop aimed at deepening an understanding of how art forms are (re-)created in MAP to generate/shape innovative approaches towards dialogue and impact. The experiential workshop included exploring: What is the form? How can it be adapted/used concerning MAP's outputs? How is it used for dialogue? The workshop was intended for project team members, specifically young researchers and cultural artists interested in extending their approach to poetry and research i.e., internal MAP project partners. No prior knowledge or experience with poetic inquiry was required. Participants were requested to bring a paragraph of text related to MAP e.g., part of a policy brief from phase 1, or an anonymised interview transcript, as well as a pen and paper, and a curious mind.

This paper focuses on responding to two main questions: firstly, can the Six principles be applied to a different learning context? Secondly, if yes, how does a playful and embodied educational approach (fun-ing) foreground qualities of learning experience during a specific online poetry workshop? I use a retrospective analysis of critical incidents, grounded in a micro ethnographic research design, to demonstrate the possibilities of the principles of fun-ing, as well as the challenges/opportunities of using them in a different learning context. Finally, I advocate for further contextually specific adaptations of the fun-ing principles by educationalists and artists to understand the efficacy of the principles, especially in arts-based education contexts.

A micro ethnographic study: positionality, the participant group, and methods

In learning experiences, the singular and short can be equally as meaningful as a collective long-term experience. Most people can recall a lesson/learning experience that impacted their life. Whilst definitions of ethnography are normally grounded in long-term participant observation (Atkinson, 2007, Hammersley et al., 2019), in this paper I want to signal the importance of bringing an attentiveness to a singular 2-hour workshop – a micro ethnographic study. While there are limitations, which will be discussed in the conclusion, from a *practical educational perspective*, such a focus on the design and unfolding of one workshop has merit. The noticing of particular fun-ing pedagogical aspects, within a broader emplaced ethnographic approach (Pink, 2012), provides a framework and reflection useful for the applied/practical intentions behind this micro study: that educators and artists can take the learnings further – questioning, adapting, and sharing.

As an ethnographer, that is a researcher concerned with the attentiveness to a specific group of people's socio-cultural relations/behaviour (Hammersley et al., 2019), it is always important to outline positionality (Atkinson, 2007). This provides a reader with the contextual lenses through which interpretations are made. Firstly, I brought to this workshop my previous experiences of facilitating non-formal workshops, from my earlier career as a youth specialist in international development projects. This meant I was familiar with learner-centred approaches such as integrating 'energiser games,' partner work, and using flip chart/art-informed methods, such as body mapping and problem tree analysis. During my doctoral research, I extensively considered and researched materiality (Woodward, 2015) and mediating artefacts (Engeström, 1987) in physical and online contexts, respectively. This continues to inform my socio-cultural and learner-centred pedagogical practice. I also became fascinated using poetry as a method of knowledge production: one that provides embodied, affective, and often more than verbal communication (Huxley, 2021). Finally, as a Post Doc on MAP, I continued developing my knowledge and understanding of participatory arts-based approaches in global development (Ware et al., 2024) with young people. These three identity markers all inform how I approached the poetry workshop design.

Attending the online workshop were a diverse group of fifteen participants from the MAP project, ranging in ages from their late teens to mid-life. Participants came from Rwanda, Indonesia, Nepal, and the UK, and had an intermediate level of English. They were a mix of youth researchers, cultural artists, civil society partners, and academics. I had encountered/worked with most of them across a period of 10 months prior, but not concerning poetic inquiry. Most of the participants were young people. There were two participants with limited English language skills, and they partnered/buddied with a friend whose English was proficient. Most participants had limited knowledge/experience of working with poetry in a research context. It was aimed as an introductory session. Participants contributed to the experience and generation of poems, as well as reflections, collectively, on the learning experience, but not towards the research design, or analysis.

The overall approach to this micro study was deductive. I used the knowledge and fun-ing framework generated from a 3-year doctoral study to guide this micro-study, using, and building upon the literature and concepts. As an educationalist/facilitator myself, I designed a lesson plan to incorporate the fun-ing principles: this was a key part of my research method, and I will return to this after the literature review. The online synchronous workshop was recorded via Zoom, and a transcript was generated to serve as a secondary source for the retrospective video analysis of my own critical incidents.

Let us now turn to explaining the notion of fun-ing and where it originates from, before discussing relevant literature, including the value of 'fun' and 'embodied' experiences in learning.

Understanding the context: situating fun-ing

The concept of fun-ing comes from my doctoral research entitled "The relationship between fun and learning: an online embodied ethnography of Coaches Across Continents" (2023). My doctoral work offered a transdisciplinary, socio-cultural-material ethnography, of fun and learning, which took place within an educational charity, Coaches Across Continents (CAC), that uses the concept of 'Purposeful Play.' It considers how CAC pivoted, during the COVID-19 pandemic, towards synchronous online learning experiences. The ethnography explores how fun is socially constructed; how it relates to online learning; and whether fun is a meaningful concept within CAC and beyond.

What is fun-ing? I frame 'fun' as an embodied socio-cultural phenomenon, which is an experience of body-mind-material states and the expressive interpretation of these mediating states (within specific space-times) (Huxley, 2023). In this regard, fun is 'relative, situational, voluntary and natural' (Bisson and Luckner, 1996: 6). Being attentive and becoming in a state of fun-ing (fun-embodied-learning) in a sensorial/body-conscious learning environment is an active provocation to consider and act upon alterities, to the already familiar. This is meaningful in a learning context because it reminds the learner and the educator/coach that there is always a novel way to sense, think, do, be, and learn itself. There is an option, a possibility, a worthwhile consideration of what to value within learning and education. Learning with the intentionality of embodiment and fun-ing brings an attentiveness to the qualities of inhabiting and dwelling in a space, with other peoples' body-minds, and mediating/physical artefacts, across several spacetimes (online and offline, imagined, and physical) (see part of the Bracketing model in Figure 1). Such an attentiveness to qualities of the state (being and becoming), of the learning context itself, generates and invites a different value system, one not solely focused on skill development and outcomes.

In my doctoral research, I developed the concept of fun-ing in the context of an alternative educational charity that used physical play and football-focused games as an approach towards community-based social

action, Coaches Across Continents. The purpose of this paper is not to go into depth about the doctoral study, however, the thesis does explore the concepts/evidence, I briefly touch upon here, in more detail.

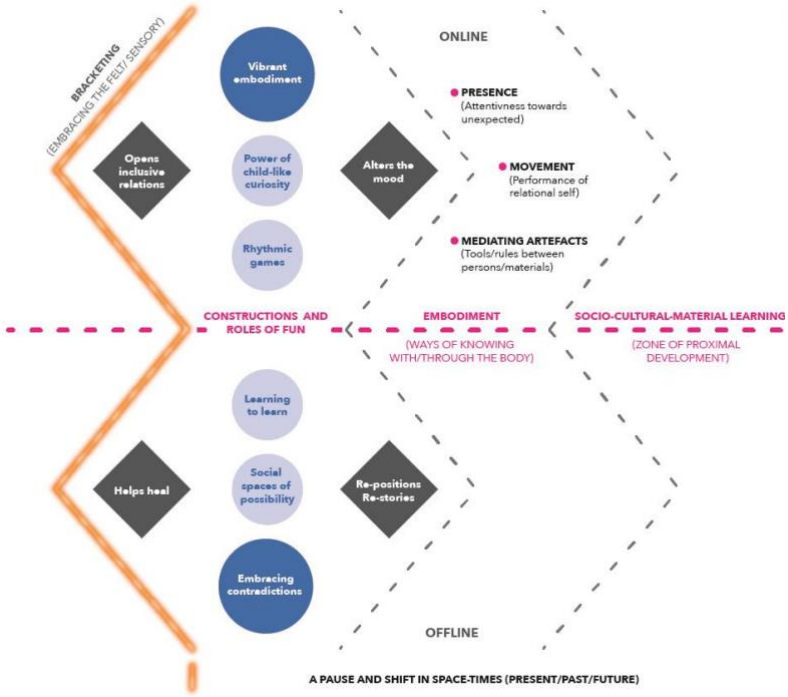

Figure 1: Embodiment as outlined in the Bracketing model – becoming in a state of fun-ing (Huxley, 2023)

In summary, my intention with the poetry ARTing workshop for MAP, was to investigate if the pedagogical principles created in one context could still be relevant, and provide beneficial qualities of learning experiences, in a different arts-based research context. Both settings were online, using Zoom, and in multi-cultural, inter-generational spaces. The ARTing workshop allowed for a further exploration and understanding of the principles themselves. Within my overarching research questions of if/how can fun-ing foreground qualities of learning experience during a poetry workshop, I would also reflect upon: whether the principles were all equally relevant? Did I have a propensity towards one over others? Did that matter? The principles are therefore offered as resources for educators/artists/researchers/youth workers to draw from, if concerned with creative pedagogies that challenge mainstream instructivist and production-orientated pedagogies.

The theoretical scaffolding: building a pedagogy and way of being through fun-ing

Let us now consider sociological and physical educational perspectives that support the conceptualisation of fun-ing. From a sociological perspective, Fincham (2016) researched 'fun' within UK society, drawing from 1950s literature on 'fun morality', as well as research with undergraduates at university, examining the value of how fun provides social functions in different social contexts, namely work, family, education, and leisure. Fincham's (2016) work outlines the relationships of fun as something experienced that is concerned with interaction, identity representation, power, and transgression. He argues that whilst it is multidimensional and multifunctional, it is inherently related to identity and social wellbeing – a phenomenon that 'enhances life' (p.5). Fincham (2016) speaks of the 'nowness of fun…[and] temporality' (p.158) as part of the sensory subjective experiencing of fun. This is recognised as a social construct – coloured by class, gender and so on - and represented affectively. Therefore, the embodied and sensory manifestations are understood to be socially embedded. Furthermore, 'there is no space for reflexivity about fun during fun, that's just not how we experience it or how it works (p. 158). For Fincham (2016) the 'significance often becomes apparent in retrospect' (p.156), and an understanding of fun and how it feels is as much a problem with the limitations of language as it is with assumptions about 'how we experience the world in relation to moments' (p.181). This invites a consideration of the nature of fun concerning

both planned moments, reflexivity, as well as spontaneous unfoldings, and this is corroborated by physical educational researchers, Bisson and Luckner (1996) who reflect that fun is 'relative, situational, voluntary and natural' (Bisson and Luckner, 1996: 6).

I understand fun to be an integral part of our relational experience to deeply connect and notice our aliveness with otherness: otherness being the body-minds, materials, and wider contexts that an individual (person/self) inhabits. This happens through an acute sensory awareness with and through our own bodies. In this way fun-ing (a gerund that moves between present participle and noun), a state of relational being in motion, is a more accurate term because it can be experienced, generated, and passed on with other body-minds, sometimes spontaneously (Huxley, 2023). Whilst there is significant literature on play and learning, fun as a pedagogical possibility is severely undervalued and under-researched.

Whilst there is current research, particularly from gaming and/or learning sciences, which considers the nature/functions of fun in learning contexts, they do not consider fun in relation to qualities of learning experiences, nor arts-based/poetic inquiry. The work by Tisza et al. (2023) focuses on the FunQ, a psychometric instrument for assessing fun consisting of six dimensions (*Autonomy, Challenge, Delight, Immersion, Loss of Social Barriers,* and *Stress*). Fun here is instrumentalised – what's important is what it does. Similarly, the work of Malone et al., (2021) focuses on a taxonomy of intrinsic motivations for learning, and whilst their work references fun, it doesn't substantially grapple with what fun is in and of itself, rather 'fun' is used to encapsulate ways to motivate and engage learners (specifically in gaming contexts). Neither of these approaches are concerned with socio-cultural-material perspectives on learning.

Two main theoretical influences contributed towards the development of the Six principles (and the excerpt of the Bracketing model in Figure 1), socio-cultural-material perspectives on learning and 'online embodiment.' Socio-cultural-material perspectives on learning assume that processes of thinking, sensing, and learning are not contained within individual minds, but rather are distributed and negotiated across persons, tools (artefacts), and learning environments. This perspective, historically inspired by the work of Lev Vygotsky (Vygotsky, 1934/1978) continues to inspire many others (e.g., Passarelli and Kolb, 2011), and can be described as 'mediational' approaches to learning, because the common focus of these approaches is on the tools/artefacts (e.g., language, material tools, other persons) used in the process of learning (Leander et al., 2010). This is particularly relevant for knowledge production through practices of *making* (art), that is meaning making through the dialogic and relational praxis with material, form, body, and performance.

Here it is useful to note the value of 'embodied' experiences in learning, and many educational and dance/performance scholars have evidenced that human communication is much more than simply verbal, and specifically that language alone is insufficient and inexact; and that communication and human understanding are deeply metaphorical (Leigh and Brown, 2021). Lawrence (2012), a dance researcher advocates that the most primal way of accessing knowledge is through the body, as our earliest forms of knowing are preverbal…knowledge is present in the body before it reaches our conscious awareness… [there is] hidden knowledge' (Lawrence, 2012: 7). This means that making meaning (knowledge) of the world around cannot simply 'just be told or read about; it must be experienced' (Snowber, 2012: 55).

My understanding of online embodiment specifically draws from literature that focuses on aspects of 'presence' (Coonfield and Rose, 2012), 'movement' as a performance of self and non-judgemental noticing in a given environment (Ucok-Sayrak and Brazelton, 2021) and 'mediating artefacts' (Engeström, 1987). Mediating artefacts are understood as tools, rules, procedures, and practices that are used as a way of negotiating a representation/identity. I view 'presence' as the embodied sensation of a hyper being/consciousness of the present now, or 'being-here-now' (Coonfield and Rose, 2012); an attentiveness to the spontaneous, unexpected aspects of experience (Coonfield and Rose, 2012). This situates 'presence' as an alignment of self, text, image, and audience. It is therefore understood as a sensitivity, a sensory attunement to being alive, in the specificity of any given moment, whereby a person's relational body-mind is highly alert and open to connecting with other learners.

Applying fun-ing with and through poetic inquiry (found poetry)

Fun-ing is an emergent pedagogy that can be interwoven with the multi-expressive artistic research methodology of poetic inquiry, and specifically 'found poetry' (Leavy, 2009). Originally found poetry was used as an individual form of analysis and dissemination in my doctoral thesis. Whereas in the context of the online poetry workshop, the process and art of making poetry, collectively, with and between facilitator/researcher/poet and learner/poet,

facilitated a way of noticing and generating knowledge as the learning experience itself, as an unfolding, experiential occurrence.

Poetry can add a deeper/more affective layer to how we communicate as researchers, facilitators/teachers, and artists. Poetic inquiry (Penwarden and Schoone, 2021) explores and generates ways of noticing that are grounded in perceiving the world 'as living event', rather than as preservable objects and subjects. 'Found poetry' (Leavy, 2009) uses existing text/extracts from research, such as interview transcripts, and crafts new texts often in participatory ways, and often using metaphor, to emote and communicate the sensory/more than verbal. Or as embodied theorist Ellingson, celebrates, 'poetic writing is inherently sensual, playful, and immersed in the specific moments of specific lives; the genre itself is a refusal of objectivity' (Ellingson, 2017: 185). There is a layering of voices, and a celebration of plurality and multiplicity in found poetry, which plays with temporalities and identities, and this is also a shared attribute of fun-ing.

The Six Principles: inviting an embodied and experiential value system

As part of the MAP project in 2023, we decided to initiate a series of online ARTing workshops. The intention was to consider a specific art form (as research practice), and to unpack how it can be used in research practices, as well as to consider how it may contribute towards the project's goal of developing a two-way form of communication between young people and policymakers. I initiated the first, taking the opportunity to apply fun-ing as a pedagogical resource, considering how the creating, crafting, and speaking aloud of found poetry, may invite in, and extend this embodied and experiential learning opportunity.

I now turn to explain the Six Principles I used to help design the poetry ARTing workshop. The Six Principles challenge neo-liberal thinking on learning, by focusing on joyful and novel ways to: inhabit spaces; relate to each other; pace activities; consider non-verbal ways of communicating; recognise online-offline capabilities; and measure learning focused on feelings and affect. In my doctoral work I called these the 'Six principles of fun embodied learning.' The principles are not mutually exclusive. The intention is that they are used and developed (in their own contexts) by coaches/educators/practitioners/artists. I summarise the Six Principles below and point to key literature that informed each.

1) Inhabit the learning space
Bring an attentiveness to the 'now' (Fincham, 2016) of the learning experience – noticing (with an attentiveness) the qualities your range of senses invites to your learning contexts. Acknowledge the presence of your body-mind and that of others: play brings us into the most immediate moment. Informative literature on this principle included work on the concept of 'presence' by Coonfield et al., (2012) towards the unexpected, and Ucok-Sayrak et al., (2021) on non-judgemental noticing.

2) Consider novel ways of relating to each other
Invite a fun embodied type of learning, which is an explicit engagement with playful undoing, and considering other pedagogic ways of relating, either interspersed as moments within learning, or if the intention of the learning is informality, then as a whole experience. This means seeking out unfamiliar ways of relating to each other. This can employ more horizontal ways of teaching and learning, but it also can be a commitment to pedagogy that emphasises process, alongside or even over outcomes. Informative literature on this principle included the work of Yorks et al., (2006) on embodied and transformative learning as something that occurs within a person's body and mind, *and* between persons.

3) Craft the tempo of a learning experience (allowing for spontaneity)
The subjectivity of how fun is experienced requires that a learning experience needs to be a form of 'disciplined improvisation' (Sawyer, 2004), that structure and spontaneity, are both crucial for a creative pedagogic practice. in that each session is crafted to offer up a change in the pace and type of activities/learning games included, but also the type of fun. This approach to 'changing it up' seeks to keep the learning experience inclusive as all learners, as distinct types of fun appeal more than others to individuals. The group may eventually construct certain games/types of fun as a group. This principle acknowledges the six main types of fun identified from my doctoral research: vibrant embodiment, power of child-like curiosity, rhythmic games, learning to learn, social spaces of possibility and embracing contradictions.

4) Embrace verbal and non-verbal ways of communicating

Verbal and non-verbal ways of communicating are important for an embodied understanding of fun, and its contributions to learning experiences. A core aspect of this is taking on an attitude of playfulness, as 'a shaking off of constraints' (Gordon and Esbjörn-Hargens, 2007). Such an attitude and bodily attentiveness with nonverbal communication open up new possibilities for thinking, doing and being within learning experiences.

5) Recognise online-offline capabilities and limitations
Learning online (-offline) provides different mediating approaches, that is ways of considering the social role and type of interaction of fun learning opportunities and limitations, compared with face-to-face. What are the full-bodied aims of a learning experience, and what physicality and/or online technology is available? Sensory experiences are in some ways greater/more experiential, and in others smaller/lesser. For example, by not always seeing the 'whole body' on screen there can be a felt partiality to the relational experience. However, at the same time, the visibility of a person's room in their background can bring an element of connection/novelty that is not necessarily present in face-to-face learning encounters. Informative literature on this principle included thinking with online 'mediating artefacts' (Engeström, 1987). Mediating artefacts are understood as tools, rules, procedures, and practices to negotiate representation/identity i.e., language, software etc.

6) Sense measurement as rhythm and texture (placement of activities and tools) patterning qualities of experience
Here measurement is focused on affects (emotional changes in someone/something), feelings (a mode of active and responsive engagement), and relationality: with self, other body-minds, and materials. Learning in the now is less focused on real time and output/productivity, and instead values felt time and the experiences of fun(s) as movements of embodied (un)learning, through a heightened sense of inter-relational presence. It expands beyond a reductionist neo-liberal agenda on so-called 'life skills' e.g., problem solving skills, critical thinking skills etc. Informative literature for this principle included the work of Ronkainen et al., (2021) who challenge the narrow focus of skill-based educational pursuits.

Now that I have outlined the literature informing the Guiding Principles and the micro study, let us consider the research method for the micro study – notably the pedagogical session plan for the online workshop. This inherently sought to embed the Six Principles and key attributes within the session delivery placing the researcher as an integral part of the group, by also assuming the role of workshop facilitator. I will return to the opportunities and challenges of these multiple roles in the conclusion.

Workshop planning as method: principles, materiality, mediating artefacts, and social arrangement

The Six Principles of fun-embodied-learning (Huxley, 2023) guided the design of the workshop and helped to articulate intentions as the facilitator and organise/design the tasks. I was curious to understand if the session was well received by participants and activated a space for alternative learning – focused on qualities of learning experiences, rather than outcomes/products. Hence, I am not presenting the poems as products or aesthetic artefacts themselves. The focus is on processes; being, doing and becoming. Planning was therefore a key part of the process and method of research, and involved designing a session plan including which guiding principles I thought would be most informative, as well as suggesting the type/use of a material/digital mediating artefact (Engestrom, 1987), and the social arrangement (see Table 1).

Table 1: Workshop plan aligned to specific guiding principles, mediating artefacts, and social arrangement

No	Workshop activities (plan)	Which guiding principle(s) informed the design	Type & use of a material/digital mediating artefact	Social arrangement (individual, dyad or group)
1	**Invitation/Welcome** - Arting series; experimental - Spoken word & image; mad lib rules/invitation - Overview	(1) inhabiting learning spaces (2) novel ways of relating	Slide	Group with individual contributions elicited
2	**What is the art form**: what makes a poem a poem? Q Do you have any favourite poems? Traditional poetry from your	(1) inhabiting learning spaces (3) tempo & spontaneity	Film	Group (heavy facilitation)

	country? How does it make you feel?			
3	**Poetic inquiry – How can poetry be used in research?**	(1) inhabiting learning spaces	Slide	Group (heavy facilitation)
4	**Embodied practice** – knowing through our bodies	(3) tempo & spontaneity (4) verbal and non-verbal communication	Tapping and acknowledging parts of the learner's own body	Individual focus, but acknowledges the group
5	**Workshop: Found Poetry (as a method for analysis)** - What is found poetry? - How do you make a Found Poem? - Exercise - Sharing	(2) novel ways of relating (5) online-offline capabilities	Use of pens/paper in learners' own spaces, and/or use of Microsoft Word	Individual/dyad focus, but acknowledges the group
6	**Adaptations and alternatives – your ideas?**	(3) tempo & spontaneity	Slide/viewing crafted poems	Group (heavy facilitation)
7	**Dialogue: how can found poetry be used to generate a two-way communication between young people and policymakers?**	(4) verbal and non-verbal communication	Slide	Individual focus, but acknowledges the group
8	**Reflection/feedback/stretching**	(6) alternative concepts for measuring learning	Jamboard	Individual focus, but acknowledges the group

A challenge of such an approach is that it was quite time intensive, and sometimes I began with the principle, and at other times the activity came to mind first. For example, to start the session I knew that the principle of inhabiting learning spaces was important, interpreted as the importance of creating a welcoming, and collaborative space. Whereas for the energiser (number 4 in the table), I started with the need for the short activity and used the principle of verbal and non-verbal communication to help think what/how this might emerge. The relationship between activity and guiding principle is symbiotic, and therefore not as tidy/linear as the table suggests. However, it does provide a useful way to understand the ingredients of a fun-ing workshop, much as a recipe informs the cooking of a dish: orderly and accurate, but without necessarily noting the improvisational embellishments/changes/timings. These will be reflected upon in the conclusion.

A retrospective analysis of the findings: a researcher-facilitator's framing of critical incidents

It is not my intention in this article to discuss the affordances, or otherwise, of Zoom as a video conferencing platform for workshops and/or qualitative data collection. However, it is important to acknowledge that different learners experience the platform in diverse ways (Huxley, 2023), and that online methods can replicate, complement, and potentially improve traditional methods, including in-person interviews and focus groups (Archibald et al., 2019). Online synchronous video conferencing on Zoom, is a lived online-offline embodied experience (Huxley, 2023). It is within this context, I used a self-reflexive and emplaced ethnographic approach (Pink, 2011) to consider the workshop analysis.

An emplaced ethnographic approach means that the body is perceived as encountering its surroundings and the material elements (living/non-living) in any given specific space-times, and therefore is always contextually 'emplaced' (Pink, 2011: 347). Emplacement acknowledges that the performing body-mind is part of a geography of other body-minds and artefacts, in motion, enabling us to see each in relation and representation to the other. With this theoretical framing, I watched the recording of the workshop, considering if/how the intended guiding principles for a fun-embodied-learning experience were generated or otherwise. The workshop was recorded with the permission of the participants, and pseudonyms were used as part of the wider MAP project ethical clearance

and procedures with the University of Lincoln. The overall aim was to see if/how they could be used/adapted in a different context, and in so doing, activate a learning experience focused on qualities of the experience – novel and engaging processes – rather than the aesthetic of the outcome/poem.

The importance of reflective practice on the experiential aspects of teaching, facilitating, and coaching has a long history (e.g., Dewey, 1933; Freire, 1995; Noddings, 2001; Mosley Wetzel et al., 2017). In addition, the affordances of using Zoom recordings to mediate reflective practices are significant. According to Mosley Wetzel et al. (2017), visual forms of retrospective analysis, (in their case through video, in mine through Zoom), provide 'evidence in support of reflection but add the additional affordance of returning more fully to the moment. Often, we want to hold our reflections still in time to understand, to just "slow down the moment" (p. 533). This was evident in my perceptions and notes of returning to the event, watching the recording, and choosing to pause and suspend time at certain moments, deemed critical.

Therefore, by building on a visual 'retrospective analysis' (Mosley Wetzel et al., 2017), my approach involved watching back the full recording, pausing on considerations of 'critical incidents', defined as vivid happenings that are considered significant or memorable (Woods, 1993). Several educational researchers use critical incidents to improve teaching practices, most notably Tripp (1993). Tripp (1993) states that the interpretation of the significance of an event makes it critical. Therefore, it is not something to be uncovered, from a critical realist (Zhang, 2022) perspective, but rather an interpretive inquiry, normally conducted with participants, to jointly seek out meanings. In this instance, a limitation is that I did not ask participants in the workshop, rather I observed, recalled, and noted my sense of criticality, retrospectively, centering instead the facilitators' perspectives rather than the facilitators and participants. The criticality arises from an interpreted broader attunement, in the case of this workshop, with the guiding principles and mediating artefacts; they are crafted and created. The self-reflected critical incidents are shown in the far-right column of Table 2. I chose this understanding of 'critical incidents' because it aligns with Fincham's (2016) suggestion that fun is a phenomenon that comes into being with the *recollection* of a specific moment.

One critical incident relating to the principle of crafting the tempo and allowing for spontaneity I recall in the second main activity of the session, discussing 'What is the art form?' Here I changed the pace of the learning activities by showing a short film and allowing for reflections. In watching the video I was struck by the question of, 'Does anyone think poems are songs?' This was not planned. It had resonance for a few participants, and a discussion on Greek poetry ensued. In addition, the purposeful pause and silence after reciting poems, an intentional space-time for reflection, also added *a quality of presence* (heightened awareness) to the learning experience.

International Journal of Contemporary Educational Research
Volume 11, Number 4, December 2024, Page 479-494 Article Type: Research Article

Table 2: Summary of findings from the poetry workshop

No	Workshop activities (plan)	Guiding principle(s) informing the design	Method of delivery (mediating artefact; tools, language)	Ways in which associated qualities of learning experiences transpired (critical incidents as perceived by the researcher-facilitator)
1	**Invitation/Welcome** - Spoken word invitation & image. - acknowledge & read MAP poems, inviting reflection. - together adapt Mad Lib rules. - present overview.	learning spaces novel ways of relating	Slides – moving flower image, young person's poem	- creating an **intentional atmosphere through spoken word** and moving image at the start: "This moment right now is an invitation for you for us to experiment, play, grow, and heal. With how intentional chosen words, spoken and written can contribute towards making research processes and outputs more artful that is full of emotion, crystallised thought, visual and spoken connection." - playful undoing, informality with relations e.g., **Mad Lib rules**. Encouraging thinking about our 'space' to create as a group. Participants write in the Teams chat. - "In this moment …. I honour the ……. in you I open my …… to…… I seek to understand…. I appreciate…. We are…. Take these intentions along with us (also share and surprise participants that they are starting to write poetically!)
2	**What is the art form**: what makes a poem a poem? Q Do you have any favourite poems? Traditional poetry from your country? How does it make you feel?	spontaneity	Film	- change in the pace and type of activities/learning games; 3-minute video clip on what makes a poem a poem. Reflective questions, slower. - **spontaneity – does anyone think poems are songs?** Conversation brings in Greek poetic culture. - **silence and pause; impactful online after poems/comments.** Didn't feel awkward.
3	**Poetic inquiry – How can poetry be used in research?**	online-offline capabilities/limitations	Slide	- sharing a slide and then asking for reflections; unable to see the chat so asked a colleague to share. Opportunity to bring in another member of the group.
4	**Embodied practice** – knowing through our bodies	verbal and non-verbal communication spontaneity	Group exercise	- introduce embodied practice as coming from gut/heart. - invited to have screen on/off. - **honour hands and arms; stroking; rub hands**; acknowledge how they understand the world. Poets often talk of speaking 'from the gut or heart'; exploring what that could mean for participants.

				- heart and gut, armpits - aware of sensations in different parts of your body; bring an awareness of body into poetry writing/doing. - rough plan – developed as I felt in the moment. - non-verbal; watching others with cameras on and reacting; several participants really showed enjoyment
5	**Workshop: Found Poetry (as a method for analysis)** - What is found poetry? - How Do You Make a Found Poem? - Exercise - Sharing	online-offline capabilities novel ways of relating	Individual exercise – slide examples	- intro found poetry. - give time to get pen, text. - give different options. - start cutting/writing collage. - modelling with each other on camera synchronously; **unblurred my camera** so all could see my transcript and modelling (emplaced) - **material: cutting/tearing transcript and arranging on table.** - Could use Teams chat! - **make camera mobile** to show phrases emerging on my desk (moved my camera closer to modelling) - talking directly to them
6	**Sharing poems**	spontaneity	Slide/viewing all	- Part B of creating found poem: phrases that respond to 'how can art forms contribute towards education?' - Play with silence - give options. - Sharing back; **see material poems created, and participants' physical spaces: 2 young people together from Rwanda, AB screen shares.** - young Nepali 'I found the process very simple. I am not a poetic person, **but I found it doable**. I thought before it would be very difficult, but I came to know this process." - "It takes **courage** to play with the words…it feels scary at first…"
7	**Dialogue: how can found poetry be used to generate a two-way communication between young people and policymakers?**	tempo (spontaneity)	Slide	- more reflective/slower - poetry and body maps (one participant shares screen) - **invite others to read and join in reading poems [didn't fully work**, but gave me an idea for a future session] - new ideas from a participant: dance artist responded to poems through movement at a conference (across art forms)
8	**Reflection/feedback/stretching**	alternative concepts for measuring learning	Jamboard	- notion of measuring – framing a moment through felt time i.e. strong emotions (process orientated) - alternative learning is stretching away from the familiar, healthy challenge. - see Figure 2: Jamboard feedback. - colleagues **spontaneously started to upload their digital poems,** reflecting the 'practical' **experience of embodied making** as important

Figure 2: the Jamboard feedback

Fun-ing through poetry: a discussion

Having shared the findings of the workshop (through Table 2), let us consider how the findings extend the literature/understanding of the Six Guiding Principles:

1) Inhabit the learning space
This principle is concerned with the attentiveness to the sensory 'now' of the learning experience and creating a hypersensitivity of being as 'presence,' often with the unexpected (Coonfield et al., 2012). Performing spoken word helped to generate intrigue in the session, as witnessed in the video playback, and set a collaborative and open learning atmosphere. To further understand this interviews with the participants could be conducted.

2) Consider novel ways of relating to each other
This principle is concerned with an explicit playful undoing. By facilitating group intention setting near the start of the workshop, through the unexpected creation of playful and poetic rules for the session, participants appeared to enjoy generating nonformal rules. I provided the skeleton outline from which participants completed the gaps in the Zoom chat. For example, 'In this moment, I am here with you'. 'I honour the bravery in you.' This was an online way of enabling the learner to notice/experience their learning as something that occurs within their own body-mind i.e. the answers they individually provided, *and* with others i.e. the collective poetic statements/rules (Yorks et al., 2006).

3) Craft the tempo of a learning experience (allowing for spontaneity)
The tempo and pace of learning in fun-ing is important. Through disciplined improvisation (Sawyer, 2004) both structure and spontaneity, are crucial for a creative pedagogic practice. Hence near the start I showed a short film on 'What is poetry' and encouraged learners' reflections on the video – this slower pace allowed learners to consider their assumptions about poetry. This was in contrast to the fast-paced generation of the previous exercise (developing the playful and poetic rules).

4) Embrace verbal and non-verbal ways of communicating
A core aspect of this principle of fun-ing is an attitude of 'shaking off of constraints' (Gordon and Esbjorn-Hargens, 2007). In the workshop, I intentionally chose to remind learners to be aware of the sensations in distinct parts of their bodies through an energiser of patting, stroking, and acknowledging certain body parts, such as their arms,

heart, and armpits. This served two purposes, firstly that poetry requires a subtle engagement of sensing with and through the body, but also in relation to a fun-ing pedagogy: a bodily attentiveness with nonverbal communication opens up new possibilities for thinking, doing and being within learning experiences.

5) Recognise online-offline capabilities and limitations
Learning online (-offline) provides different mediating approaches, that is ways of considering the social role and type of interaction of fun learning opportunities and limitations, compared with face-to-face. In the workshop, during the segment on creating found poetry, we utilized both our individual offline spaces and the collective digital/online screen. This being 'here and there', was most notable when I demonstrated the cutting/tearing of a transcript to begin to craft a poem, arranging phrases of interest on my table, and showing this through moving a portable camera - 'a mediating artefact' (Engestrom, 1987) the process for the learners on screen. Participants chose, scaffolding their own learning, to upload their poems as images or in the chat box, reconnecting the offline with the online. This also emphasises the mediational aspects of socio-cultural-material learning more broadly, whereby processes of thinking, sensing, and learning are not contained within individual minds, but are distributed and negotiated, across persons, tools (artefacts), and learning environments (Passarelli and Kolb, 2011).

6) Sense measurement as rhythm and texture (placement of activities and tools) patterning qualities of experience
Here measurement is understood as recording felt time – that is the main affects (emotional changes in someone/something), feelings (a mode of active and responsive engagement), and relations: with self, other body-minds, and materials. I found it challenging to move away from conventional understandings of measurement, and so combined both a traditional way of measuring i.e. asking questions and gathering feedback on what worked well or could be improved, and within this also trying to capture the key emotional, responsive and relational changes in the learners that consider the patterning of activities/tools as well. In a future session, I would consider asking questions more related to learners' emotions and responsive engagement across the main parts of the workshop. I would ideally do this as a group at the end of the workshop, and then follow up with individual interviews to allow for further reflection.

Having discussed the findings concerning the Six principles and wider literature, let's now return to the two key research questions: 1) Can the Six principles be applied to a different learning context? 2) If so, how? How can a playful and embodied educational approach (fun-ing) foreground qualities of learning experience during an online poetry workshop?

Having developed the concept, model and Six principles of fun-ing in a different context; with an alternative sport and play for education charity, rather than with an arts-based applied research project, it was important to test the assumption that the Six principles can be applied elsewhere. There are many ways to apply them. Should they be used chronologically? Does it matter if there is an emphasis on some more than others? It was important to keep them as a loose framework to honour that learning/education is a process of generation and not of control. I often work with the notion of 'disciplined improvisation' (Sawyer, 2004) in this regard, structure, and spontaneity, are both crucial for a creative pedagogic practice. This interplay/dance between the two will vary from facilitator and group. However, a dialogic and collaborative approach is always essential.

Based on the feedback I received during the session, and on the Jamboard, it suggests that the intention to generate qualities of the learning experience was achieved. In particular, the manifestation of the first three principles/qualities of learning experience were most apparent. This could be due to several different reasons, including that my attention may have been on them more simply for their chronological order. Or was there something intrinsically about the type of workshop i.e., arts-based/poetry that generated/ aligned to these? A more detailed, and layered method, including interviews with participants, would be required to begin to respond to these questions.

The different setting (and positionality of myself as researcher-facilitator-poet) may have contributed to how I understood that fun was interpreted by others. In particular, I could see two types of fun evident in this poetry workshop setting: 'learning to learn' and 'social spaces of possibility' conveyed through two participants' expressions of finding the courage to try: "I am not a poetic person, but I found it doable. I thought before it would be very difficult, but I came to know this process." Furthermore, "It takes courage to play with the words…it feels scary at first…". The experience was both a personal and a collective one. It encouraged some participants to go beyond what they understood of both the topic, and themselves.

Intentionally facilitating and activating spaces of fun-ing (an alternative learning/educational approach) did generate *qualities of learning experiences* (through the guiding principles). The first three principles/qualities seem to have more examples in Table 2. Whether this was due to a personal bias, an ease with their themes and how to

translate these into practice is unclear, however focusing on: inhabiting learning spaces; novel ways to relate to each other; and pacing activities, including spontaneity, are likely to have contributed towards positive feedback in terms of how the session made participants feel.

Conclusion, challenges, and implications

The Six principles, invite in, an embodied and experiential value system that consider learning spaces; novel ways of relating; spontaneity; verbal and non-verbal communication; online-offline capabilities; and alternative concepts for measuring learning based on feelings/affects. They are intended as a generative way of extending beyond the over-emphasis in many educational approaches, on skills acquisition and learning outcomes alone. The principles require further interrogation, expansion, and adaptation in different learning contexts; however, they do invite alternative possibilities concerning the future of learning and teaching both for creativity and with/through creativity, specifically poetic inquiry.

In particular, the Six principles should be adapted further in culturally situated arts-based settings. This condensed micro ethnographic study raises further questions such as, 'What do considerations of presence and mediating artefacts look like in other art-based learning contexts? How do different art forms affect/alter how the guiding principles can be interpreted and vice versa? There is much to be further explored!

Three main challenges provide future opportunities for further research. Firstly, the lack of post-interviews with participants. These would have helped to unpack a multiplicity and perhaps deeper level of interpretation, beyond my interpretations, but also offer participants another opportunity for feedback, retrospectively, away from the group. Secondly, by taking on the role of researcher and facilitator my energies during the workshop were split between delivering the session and reflecting on what was happening. However, my researcher identity/role came to the fore during the retrospective analysis of watching the recording and taking notes, on moments deemed critical. In the future, it would be beneficial to co-facilitate a workshop and understand the choices and interpretations that a peer educationalist/poet/artist might make. Thirdly, the nature of a micro-study of a two-hour workshop. This was both intentional and pragmatic. Intentional in that specific moments/instances of learning have meaning: an individual experience can stay with a learner for a lifetime. Similarly, as ethnographer's individual moments are selected and shaped within the socio-cultural patterning of a longer-term study – so this is a reminder not to forget the individual/small within the whole. However, it was also partly pragmatic, in my role as a Post Doc I was often facilitating and supporting other team member's research, including their ARTing workshops within the broader study. Therefore, This was an opportunity to bring my research directly into alignment with the broader project aims.

Three key implications of this micro-study for educationalists/artists/researchers to take forward:

1. applying fun-ing to an online workshop can bring the feeling body (body-mind) back into a learning space.
2. there are some adaptations that I might make for a future workshop, including moments of collective reading and play-working with the sounding of poetry online-offline; and
3. the Six Guiding Principles have resonance in another research context (to greater/lesser degrees).

Finally, the personal *and* collective experience encouraged some of the participants to *go beyond* their understanding of the topic of found poetry in research, and to also acknowledge their own expansion and growth in their creative capabilities. Expanding knowledge on a topic, and of oneself concerning other mind – bodies – materials, is a definition of learning in and of itself. Indeed, this was my own experience as the facilitator conducting such a workshop, and seeking to understand if fun-ing can be applied in a very different context to its origins. Therefore, This practice paper contributes to making the case that fun-ing and its focus on qualities of a learning experience deserve far more attention in both non-formal and formal learning environments. Learning to generate feelings, sensations, affects, must not be under-valued. Just like fun.

Acknowledgements
The author extends deep gratitude to the young people and artists who participated in the MAP poetry workshop described. She would also like to thank Professor Ananda Breed (from the University of Lincoln) for her kind and ongoing support, Dr Koula Charitonos for her insightful feedback, and the blind reviewers.

Ethical Approval
Ethical permission (2020-3613) was obtained from the University of Lincoln, UK for this research.

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 495-507 Article Type: Research Article

Romantic Relationship Stability of University Students: The Role of Attachment and Self-Change

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Abstract
This study examined whether attachment and self-change predict relationship stability and whether relationship stability differs according to gender. The research data consisted of 403 participants, both online and face-to-face. Multiple linear regression analysis was conducted to determine the predictive power of self-change and attachment on relationship stability in university students. Independent samples t-test was conducted to determine whether there was a difference in the relationship stability levels of the participants according to gender. According to the findings obtained from the analysis, university students' self-expansion, self-contraction, anxious attachment, and avoidant attachment levels significantly predict relationship satisfaction. Self-expansion, self-adulteration, self-contraction, and anxious attachment significantly predict the level of evaluation of the quality of options. Self-expansion, self-contraction, self-adulteration, anxious attachment, and avoidant attachment significantly predicted relationship investment, whereas self-expansion, self-contraction, self-adulteration, and avoidant attachment significantly predicted commitment. In addition, men's relationship satisfaction and relationship investment levels are significantly higher than women's. The findings were discussed and interpreted in line with the literature on relationship stability, and some suggestions were presented for researchers and practitioners.

Keywords: Relationship stability, Relationship satisfaction, Attachment, Self-change, University students

Citation
Özsolak, A., Tuzgöl-Dost, M. & Kızıldağ-Şahin, S. (2024). Romantic relationship stability of university students: The role of attachment and self-change. *International Journal of Contemporary Educational Research, 11*(4), 495-507. https://doi.org/10.52380/ijcer.2024.11.4.671

Received	18.06.2024
Accepted	17.11.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Ethical Statement	* This paper is devoloped from the corresponding author's masters thesis entitled "Attachment and self-change as predictors of romantic relationship stability in university students", supervised by Prof. Meliha Tuzgöl Dost, Ph.D. and Assoc. Prof. Dr. Seval Kizildağ Şahin, Ph.D. (Master's Thesis, Hacettepe University, Ankara/Turkey, 2022).
Plagiarism Checks	Yes - Turnitin
Conflicts of Interest	The authors have no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The authors acknowledge that they received no external funding in support of this research.
Copyright & License	Authors publishing with the journal retain the copyright to their work licensed under the **CC BY-NC 4.0**.

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Introduction

Interpersonal relationships are among the most essential needs for individuals. It is natural that humans, as social beings, grow up, try to understand the world, and lead their lives by forming meaningful and interactive relationships with others. While all close relationships may play a critical role in an individual's life, romantic relationships hold unique significance compared to other types of relationships (Büyükşahin, 2006). In particular, romantic relationships carry great importance in the lives of young adults, especially those aged between 18 and 26, since they are undergoing a key stage of psychosocial development (Erikson, 1968). University life, in which romantic relationships often become more prominent, is a period when individuals form new relationships and endeavor to make them long-lasting (Saraç et al., 2015). University life, including many developmental responsibilities specific to emerging adulthood, is a challenging period with multiple tasks such as separation from the family, adapting to new academic and social life, seeking closeness to a romantic partner, and completing one's personality development. In the course of this process, university students become more willing to establish close relationships or maintain their existing relationships as a result of increasing importance attached to close relationships so that they can accelerate social and emotional adaptation and ensure a healthy transition from adolescence to adulthood (Erikson, 1968; Mosher & Danoff-Burg, 2007). Therefore, individuals experience a change from superficial and unstable relationships to deeper and more stable relationships during this period (Shulman & Connolly, 2013). Having a stable romantic relationship is of great importance for one's psychosocial and self-development (Furman & Rose, 2015), as a stable romantic relationship is closely related with an individual's well-being (Dush & Amato, 2005; Erikson, 1968) and physical health (Bookwala, 2005).

Relationship stability is defined by the course of the relationship in situations where individuals exhibit high levels of commitment, satisfaction, and investment in their relationships but have low levels of evaluating the quality of alternatives outside their current relationship (Büyükşahin, 2006). It was found that many variables, such as the effort individuals exert on their relationships and partners, the satisfaction they feel in the relationship, their levels of commitment, and their views on whether they might satisfy the need for attention from other sources, are related to relationship stability (Aktaş-Akbayrak, 2019; Taylor et al., 2003). As Rusbult and colleagues (1986) posit, individuals' decisions to maintain or end relationships depend largely on relationship satisfaction, relationship investment, and quality of alternatives. These three factors also determine the degree of commitment. According to Rusbult (1983), in a healthy romantic relationship, commitment will increase as relationship satisfaction and relationship investment increase, while levels of evaluating the quality of alternatives will decrease, making the individual continue the relationship. It is, on the other hand, also expected in a healthy relationship that as relationship satisfaction and relationship investment decrease, commitment will decrease, and evaluating the quality of alternatives will increase, directing the individual to end the relationship.

As the abovementioned processes unfold in romantic relationships, certain changes also occur in the individual's sense of "self". Previous studies show that romantic relationships directly affect one's self-esteem, self-perception, self-efficacy, and overall psychological functioning (Aron et al., 1995; Furman & Shaffer, 2003; Mattingly & Lewandowski, 2013; McIntyre et al., 2015). Emphasizing the importance of interaction in romantic relationships and that individuals shape many aspects of each other, Dinçer (2017) states that all close relationships have the potential to have a positive or negative impact on individuals' self-concepts. Moreover, these relationships could potentially not only affect individuals' selves but also change them (Tuncer, 2019). Considering the dynamic structure of the self-concept, it is natural for one to acquire positive or negative qualities or experience an increase or decrease in their content as a result of close relationships. These changes inevitably shape the romantic relationship. According to Mattingly and colleagues (2014), such changes could take place within two major dimensions: direction and valence. While the direction dimension refers to an increase or decrease in the content of the self, the valence dimension is related to whether the content of the self is positive or negative. Accordingly, self-change occurs in four ways: self-expansion (i.e. increased positive qualities), self-contraction (i.e. decreased positive qualities), self-pruning (i.e. decreased negative qualities), and self-adulteration (i.e. increased negative qualities).

Morgan and Shaver (1999) showed that it is necessary to understand individuals' attachment styles to their partners in order to understand stability, satisfaction, and commitment to romantic relationships. Bowlby's (1973) attachment theory, which conceptualizes human beings' tendency to form bonds with other people, proposes that this bond starts with interacting with the caregiver at birth and affects attachment to the partner in a romantic relationship and has a structure that could form the basis of close relationships. In this line, Hazan and Shaver (1987) argued that the individual establishes a romantic relationship similar to the relationship with their caregiver at an early age. Previous research suggests that if the attachment between the caregiver and the infant is firm and secure, the relationships established by the individual in adulthood also tend to be secure; however, if this

attachment in the early period is insecure, the relationships established in adulthood might also be insecure (Waters et al., 2000). This shows that attachment theory can also be applied to cases of partner attachment in romantic relationships (Hazan & Shaver, 1987).

Despite the importance of romantic relationships in an individual's life, increasing divorce rates, the ending of short-term romantic relationships prior to marriage, and the fact that some relationships end even if they are satisfying while others continue even if they are not satisfying, pushed researchers to investigate factors that may affect the maintenance or termination of romantic relationships (Buğa, 2009; Le & Agnew, 2003). Studies on the reasons underlying the decisions to continue or end romantic relationships are crucial for understanding the stability of romantic relationships (Le & Agnew, 2003). When the related literature is examined, it is seen that there are studies examining the relation between relationship stability and various variables. Some examples directly associated with relationship stability include individuals' attachment styles (Kirkpatrick & Hazan, 1994), levels of infidelity (Fricker, 2006), styles of coping with stress (Bilecen, 2007), personality traits, self-esteem (Doğaner, 2014), and irrational beliefs in romantic relationships (Saraç et al., 2015).

All things considered, the critical role of romantic relationships in general, the importance of relationship stability draws attention. The attachment styles, which are a result of early childhood experiences, and differentiations in the self-concept caused by changes in the romantic relationship are important factors that could affect the satisfaction felt from the romantic relationship. In addition, other factors that may affect the decision to continue or end one's romantic relationship include investment in a relationship, commitment to a relationship, and whether the individual would remain in a relationship despite other available alternatives. Accordingly, this study aims to contribute to the literature on romantic relationships by examining how individuals' attachment styles and changes that occur in their self-concepts as a result of romantic relationships affect relationship stability, relationship satisfaction, commitment in a relationship, investment in a relationship, and levels of evaluating other alternatives.

Method

Research Model

The research is designed as a relational survey model because it is aimed to examine the predictive roles of self-change and attachment levels of university students on relationship stability. The relational survey model aims to examine the change between two or more variables together (Karasar, 2014). Therefore, the dependent variable of this study is relationship stability, and the independent variables are self-change, attachment levels, and gender.

Research Group

Convenience sampling and criterion sampling were used in the selection of the research group. The reasons for choosing these sampling methods are twofold: In the convenience sampling method, which accelerates the research process, the researcher includes the individuals that can be easily reached; and in the criterion sampling method, it is thought that a certain period should pass for the participant to experience relationship stability and self-change, which are independent variables of the current research. For this reason, university students who have been in a romantic relationship for at least six months were selected for the research group. The data were collected from a total of 403 undergraduate students consisting of 316 females (78.4%) and 87 males (21.6%).

Data Collection Tools

In the study, the "Relationship Stability Scale (RSS)" was used to collect relationship stability data from undergraduate students. In order to collect data on self-change, the "Turkish Self-Change in Romantic Relationships Scale (TSCRRS)" was used. Lastly, "Experiences in Close Relationships-Revised (ECR-R)", was used to collect data on attachment. In addition, the researchers constructed a "Personal Information Form" to collect the participants' demographic information, including their gender, age, and duration of romantic relationships.

Relationship Stability Scale (RSS)

The "Relationship Stability Scale" used to collect data on relationship stability was developed by Rusbult and colleagues (1998). The scale was adapted into Turkish by Büyükşahin and colleagues (2005). Büyükşahin and Taluy (2008) revised the scale and added a commitment subscale consisting of 7 items. Following this revision, the scale was composed of four subscales (i.e. relationship satisfaction, evaluating the quality of alternatives, relationship investment, and commitment) with 37 items in total. The Cronbach's alpha internal consistency coefficients obtained in this study were .94 for relationship satisfaction, .86 for quality of alternatives, .76 for relationship investment, and .92 for commitment. In the current study, the Cronbach's alpha internal consistency coefficients of the scale were .90 for relationship satisfaction, .80 for evaluating the quality of alternatives, .82 for relationship investment, and .87 for commitment.

Turkish Self-Change in Romantic Relationships Scale (TSCRRS)

In order to collect data on self-change, the "Turkish Self-Change in Romantic Relationships Scale" was used. This scale, originally developed by Mattingly and colleagues (2014) and titled “the Relational Self-Change Scale”, is an outcome of the adaptation study into Turkish done by Dinçer and colleagues (2018), which aims to determine the relational self-change experienced by individuals in romantic relationships. The Turkish Self-Change in Romantic Relationships Scale consists of four sub-dimensions. These sub-dimensions are self-expansion, self-contraction, self-pruning, and self-adulteration (Dinçer et al., 2018). Exploratory and confirmatory factor analyses and criterion-related validity tests were conducted to examine the validity and reliability of this scale. This was conducted on two research groups, comprising 426 participants and 348 participants, respectively (Dinçer, 2017). The Cronbach's alpha values were .80 for self-expansion, .85 for self-contraction, .76 for self-pruning, and .63 for self-adulteration in the first application. In the second application, the Cronbach's alpha values were .80 for self-expansion, .85 for self-contraction, .74 for self-pruning, and .61 for self-adulteration (Dinçer, 2017). As for the current study, the Cronbach’s alpha internal consistency coefficients of the scale were found to be .75 for self-expansion, .79 for self-contraction, .51 for self-pruning, and .60 for self-adulteration.

Experiences in Close Relationships-Revised (ECR-R)

The "Experiences in Close Relationships-Revised", developed by Fraley et al. (2000) and adapted into Turkish by Selçuk and colleagues (2005) was used to collect data on attachment styles. While 18 items of this inventory are related to the dimension of anxious attachment style, the other 18 items are for the dimension of avoidant attachment style. The Cronbach's alpha coefficients of the scale were calculated as .90 for the avoidance subdimension, and .86 for the anxiety subdimension. In the current study, the Cronbach’s alpha internal consistency coefficients of the scale were .87 for anxious attachment and .85 for avoidant attachment.

Data Collection Process

Prior to collecting the data, permissions for applying the aforementioned instruments were obtained from the researchers who developed and/or adapted the scales. Afterward, the necessary permissions were obtained from the Social Sciences and Humanities Research Ethics Committee at Hacettepe University. After obtaining the necessary permissions, a social media text was prepared, and the data collection process started via Google Forms. The social media text that called for volunteering participants was shared on Instagram, WhatsApp, and Twitter. With permission obtained from Yozgat Bozok University, additional data were collected from university students who have been in a romantic relationship for at least six months. Participants agreed to participate in the study by reading the informed consent form provided to them before filling out the scales sent to them.

Data Analysis

Since missing data and outliers in the data set should be identified before analyzing the data (Kline, 2011), an initial missing data analysis was performed. No missing data were present in the data set. In order to identify outliers, Mahalanobis distances were calculated, and 20 observations were consequently removed from the data set. Upon controlling missing data and outliers, descriptive statistics were utilized to determine the distribution of the variables. The scores obtained from the scales were analyzed in the context of the dimensions of the respective scales. In addition to descriptive statistics, the assumption of normal distribution was evaluated using skewness and kurtosis coefficients. Skewness and kurtosis coefficients between +3 and -3 indicate that data do not show a significant deviation from a normal distribution (Kalaycı, 2008). In this study, the skewness coefficients of the variables ranged between -1.58 and .58, and the kurtosis coefficients ranged between -.79 and 1.94. Accordingly, it was determined that the data showed a normal distribution.

A t-test was used to examine the scale scores according to demographic variables, and the Pearson Moment Correlation Coefficient was used to determine the relationships between variables. A Multiple Linear Regression analysis was done to determine the predictors of students' Relationship Stability Scale scores. In the regression analysis, a high level of correlation between predictor variables may affect the results (i.e. the multicollinearity problem). In this study, the multicollinearity problem was checked in two ways. First, the correlation coefficients between the variables were examined. The presence of a relationship higher than .90 between predictor variables indicates that there may be a multicollinearity problem (Pallant, 2007). The correlation coefficients between the dependent and independent variables vary between .51 and -.44, which indicated no multicollinearity problem. Secondly, tolerance and variance inflation factor (VIF) values were examined during each regression analysis. In a Multiple Linear Regression analysis, a tolerance value greater than .10 and a variance inflation factor (VIF) value less than 10 are essential indicators signifying that there is no multicollinearity problem (Hair et al., 2009). According to the results, the tolerance value was between .87 and .59, and the variance inflation factor (VIF) was

between 1.68 and 1.18. SPSS 26 package program was used in all steps of data analyses that were conducted in the course of the research.

Ethical Approval notification

Ethical permission (20.12.2021-E-35853172-300-00001927807) was obtained from Hacettepe University Institute of Educational Sciences for this research.

Results and Discussion

A Multiple Linear Regression analysis was conducted to determine the predictors of the participants' relationship stability scores. The RSS, used to assess relationship stability, constitutes the study's dependent variable and consists of four subdimensions. Therefore, each subdimension (i.e. relationship satisfaction, quality of alternatives, relationship investment, and relationship commitment) was analyzed as a dependent variable. Without determining the variables predicting each dimension of the RSS, the subdimensions of the TSCRRS and the ECR-R were included in the analysis as predictor variables. The findings obtained from the Multiple Linear Regression analysis are presented in Tables 1-5. The results related to relationship satisfaction are given in Table 1.

Table 1. Results of regression analysis for relationship satisfaction

Variable	*B*	*Std. Err.*	*β*	*t*	*p*	F (6,402)	R	R^2
Constant	37.19	1.54		24.18	.000***			
Self-Expansion	.37	.04	.37	8.44	.000***			
Self-Contraction	-.14	.04	-.17	-3.34	.001***			
Self-Pruning	.11	.06	.08	1.89	.059	34.37 ***	.59	.34
Self-Adulteration	.04	.07	.03	.62	.537			
Anxious Attachment	-.04	.02	-.14	-2.60	.010			
Avoidant Attachment	-.08	.02	-.22	-4.70	.000***			

***p<.001

As seen in Table 1, the regression equation for relationship satisfaction was significant (F(6,402) =34.37, p<.001). Self-expansion (β= .37, p<.001) explained relationship satisfaction positively and significantly, while self-contraction (β= -.17, p<.01), anxious attachment (β= -.14, p<.05), and avoidant attachment (β= -.22, p<.001) explained it negatively and significantly. On the other hand, it was found that self-pruning (β= .08, p> .05) and self-adulteration (β= .03, p> .05) were not significant predictors of relationship satisfaction. When the standardized regression coefficients are examined, the relative order of importance among the predictor variables in explaining relationship satisfaction was self-expansion, avoidant attachment, self-contraction, and anxious attachment. As a result of the regression analysis, 34% of relationship satisfaction was explained by self-change and attachment. The results regarding the level of evaluating the quality of alternatives are given in Table 2.

Table 2. Results of regression analysis for evaluating the quality of alternatives

Variable	*B*	*Std. Err.*	*β*	*t*	*p*	F (6,402)	R	R^2
Constant	24.58	2.9		8.47	.000***			
Self-Expansion	-.29	.08	-.18	-3.54	.000***			
Self-Contraction	.20	.08	.15	2.47	.014			
Self-Pruning	-.06	.11	-.03	-.56	.58	6.71***	.30	.09
Self-Adulteration	-.41	.13	-.19	-3.24	.001			
Anxious Attachment	.07	.03	.14	2.28	.023			
Avoidant Attachment	.01	.03	.01	.17	.86			

***p<.001

When Table 2 is examined, it is seen that the regression equation for evaluating the quality of alternatives was significant (F(6,402) =6.71 p<.001). Self-expansion (β=-.18, p<.001) and self-adulteration (β=-.19, p<.01) explained the level of evaluating the quality of alternatives negatively and significantly. In contrast, self-contraction (β=.15, p<.05) and anxious attachment (β=.14, p<.05) explained the level of evaluating the quality of alternatives positively and significantly. However, self-pruning (β=-.03, p>.05) and avoidant attachment (β=.01, p>.05) were not significant predictors of evaluating the quality of alternatives. When the standardized regression coefficients are examined, the relative order of importance among the predictor variables in explaining the level

of evaluating the quality of alternatives is self-adulteration, self-contraction, and anxious attachment. As a result of the regression analysis, it was seen that 8% of the scores pertaining to evaluating the quality of alternatives were explained by self-change and attachment. The results regarding relationship investment are given in Table 3.

Table 3. Results of regression analysis for relationship investment

Variable	*B*	*Std. Err.*	*β*	*t*	*p*	F (6,402)	R	R^2
Constant	4.15	2.59		1.60	.11			
Self-Expansion	.46	.07	.28	6.28	.000***			
Self-Contraction	.14	.07	.10	1.99	.047			
Self-Pruning	.05	.10	.02	.53	.596	30.79***	.56	.32
Self-Adulteration	.67	.11	.31	5.91	.000***			
Anxious Attachment	.07	.03	.14	2.67	.008			
Avoidant Attachment	-.09	.03	-.15	-3.17	.002			

***p<.001

When the results given in Table 3 regarding relationship investment are considered, it is seen that the regression equation was significant (F(6,402) =30.79 p<.001). Self-expansion (β=.28, p<.001), self-contraction (β=.10, p<.05), self-adulteration (β=.31, p<.001), and anxious attachment (β=.14, p<.01) explained the size of relationship investment positively and significantly, whereas avoidant attachment (β=-.15, p<.01) explained the size of relationship investment negatively and significantly. However, self-pruning (β=.02, p>.05) was not found to be a significant predictor of relationship investment. When the standardized regression coefficients are examined, the relative importance of the predictor variables in explaining relationship investment is as follows: self-adulteration, self-expansion, avoidant attachment, anxious attachment, and self-contraction. As a result of the regression analysis, it was revealed that 32% of relationship investment was explained by self-change and attachment. The results regarding commitment levels are given in Table 4.

Table 4. Results of regression analysis for levels of commitment

Variable	*B*	*Std. Err.*	*β*	*t*	*p*	F (6,402)	R	R^2
Constant	58.35	2.28		25.57	.000***			
Self-Expansion	.27	.06	.19	4.24	.000***			
Self-Contraction	-.27	.06	-.23	-4.31	.000***			
Self-Pruning	-.03	.09	-.02	-.38	.705	24.93***	.52	.27
Self-Adulteration	.38	.10	.20	3.79	.000***			
Anxious Attachment	-.01	.02	-.01	-.26	.794			
Avoidant Attachment	-.18	.03	-.35	-6.98	.000***			

***p<.001

The results presented in Table 4 indicate that the regression equation was significant (F(6,402) =24.93, p<.001). Self-expansion (β=.19, p<.001) and self-adulteration (β=.20, p<.001) explained the level of commitment positively and significantly, while self-contraction (β=-.23, p<.001) and avoidant attachment (β=-.35, p<.001) explained the level of commitment negatively and significantly. On the other hand, self-pruning (β=-.02, p>.05) and anxious attachment (β=-.01, p>.05) were not found to be significant predictors of the commitment level. When the standardized regression coefficients are examined, the relative order of importance of the predictor variables in explaining the level of commitment is avoidant attachment, self-contraction, self-adulteration, and self-expansion. As a result of the regression analysis, it was found that 27% of the level of commitment was explained by self-change and attachment. The results of the t-test conducted to examine the relationship stability scores according to gender are given in Table 5.

Table 5. Results of the t-test for relationship stability

Variable	Gender	N	Mean	SD	*t-value*	*df*	*p*
Relationship Satisfaction	Female	316	39.36	6.19	-2.00	401	.047**
	Male	87	40.60	4.78			
Evaluating the Quality of Alternatives	Female	316	18.78	9.39	-1.17	401	.240
	Male	87	20.14	9.96			
Relationship Investment	Female	316	26.74	9.82	-4.59	401	.000**
	Male	87	32.06	8.54			
Commitment	Female	316	56.71	8.38	.44	401	.662
	Male	87	56.27	8.40			

**p<0.05

As seen in Table 5, relationship satisfaction (t(401)=-2.00, p<.05) and relationship investment level (t(401)=-4.59, p<.001) differ significantly according to gender. However, no significant difference was found between genders for evaluating the quality of alternatives (t(401)=-1.17, p>.05) and commitment levels (t(401)=.44, p>.05). When the group averages were analyzed, it was found that the relationship satisfaction levels of males ($\bar{x}$=40.60, SD=4.78) were significantly higher than those of females ($\bar{x}$=39.36, SD=6.19). Similarly, the relationship investment sizes of men ($\bar{x}$=32.06, SD=8.54) were significantly higher than those of females ($\bar{x}$=26.74, SD=9.82). Evaluating the quality of alternatives (t(401)=-1.17, p>.05) and commitment levels (t(401)=.44, p>.05) did not differ significantly according to gender. The effect size for the difference between female and male university students' relationship stability subscales was calculated using Cohen's d. The effect size for relationship satisfaction between the groups was calculated to be .22. Accordingly, it is possible to infer that the effect of gender on relationship satisfaction is at a low level. The effect size for relationship investment sizes between the groups was calculated to be .58, suggesting a medium-level effect of gender on relationship investment.

The results of this study showed that relationship satisfaction predicts self-expansion positively and significantly, whereas self-contraction, anxious attachment, and avoidant attachment predict relationship satisfaction negatively and significantly. On the other hand, self-pruning and self-adulteration did not significantly contribute to the model. When the related literature is examined, it is seen that self-expansion and self-pruning, which are sub-dimensions of self-change, have a significant positive effect on relationship satisfaction, whereas self-contraction and self-adulteration have a significant negative effect on relationship satisfaction (Mattingly et al., 2014; Dinçer, 2017). In addition, previous research suggests that the processes related to self-expansion in relationships are highly effective in relationship quality. In other words, the processes of self-expansion increase the quality of individuals' relationships (Aron et al., 2000). These self-expansion processes are also effective in improving ongoing negative relationships (Carson et al., 2007). From this point of view, it becomes evident that in this study, similar results have been obtained on the relationship between self-expansion and self-contraction variables and relationship satisfaction. This is, however, not the case for self-adulteration and self-pruning. Moreover, many studies show that anxious and avoidant attachment styles have a negative relationship with relationship satisfaction (Büyükşahin, 2006; Fricker, 2006; Hazan & Shaver, 1987; Keelan et al., 1994; Londero-Santos et al., 2020; Pistole et al., 1995; Sarı & Korkut-Owen, 2016; Umuç, 2021). These findings are in parallel with the findings obtained in this study. It is thought that it is an expected result for individuals with an avoidant attachment style to be distant toward their partners (Kirkpatrick & Davis, 1994); and for individuals with an anxious attachment style to have fluctuating feelings and thoughts toward their partners and often experience trust problems and fear of loss, and hence experience low levels of satisfaction from the relationship (Sarı & Korkut-Owen, 2016).

According to the results related to evaluating the quality of alternatives, self-expansion, and self-adulteration explain the level of evaluating the quality of alternatives negatively and significantly. In contrast, self-contraction and anxious attachment predict the level of evaluating the quality of alternatives positively and significantly. However, there is no significant relationship between self-pruning and avoidant attachment and evaluating the quality of alternatives. In the existing literature, no study examines the relationship between self-change and evaluating of the quality of alternatives, which is one of the components of relationship stability. It is an expected result that individuals evaluating other possible relationships and partners outside their romantic relationship exhibit a negative relationship with self-expansion. In other words, if an individual's romantic relationship positively affects their self-concepts, it will reduce the possibility of seeking for other relationships. Similarly, it

is expected that a decrease in positive qualities of the individual will also decrease thanks to the romantic relationship experience. Put more simply, the level of evaluating the quality of alternatives will increase with an increase in the level of self-contraction. However, a decrease in evaluating possible romantic relationship alternatives and the individual staying in the existing relationship may be related to one's culture despite the increase in negative qualities in the self-concept. According to Saraç and colleagues (2015), this may be due to the collectivist structure of Turkish culture. Individuals in collectivist cultures may show close ties with other individuals and live dependently rather than individually. In this context, although the individual knows that the relationship is harmful to them, they may hesitate to end the relationship and evaluate new alternatives.

Considering the studies on individuals' attachment styles and levels of evaluating the quality of alternatives, Fricker (2006) and Dewall and colleagues (2011) posited a positive relationship between evaluating the quality of alternatives and avoidant attachment. This means that individuals with an avoidant attachment style perceive relationships other than their current romantic relationship more positively. On the contrary, it was suggested in the studies examining anxious attachment and relationship stability that anxiously attached individuals have a low level of evaluating the quality of alternatives. In addition, it is thought that anxiously attached individuals do not evaluate possible alternatives due to their intense closeness to their partners and fear of losing them (Mikulincer & Erev, 1991; Simpson, 1990). In the study conducted by Umuç (2021), it was observed that there was a significant positive relationship between anxious and avoidant attachment styles and the level of evaluating the quality of alternatives. Taking into account the studies denoting a connection between evaluating the quality of alternatives and relationships that happened in the past or observed in the near environment, (Kayabaş & Atak, 2021), it is thought that the reason for the inconsistency between the findings reported in such studies may be environmental factors and past experiences.

In terms of the results on relationship investment, self-expansion, self-contraction, self-adulteration, anxious attachment, and avoidant attachment significantly predict the size of relationship investment, one of the components of relationship stability. While self-expansion, self-contraction, self-adulteration, and anxious attachment positively predict the size of relationship investment, avoidant attachment predicts it negatively. However, there is no significant relationship between self-pruning and relationship investment. No study examining the relationship between self-change and relationship investment was found when the related literature was reviewed. It is expected that the investment size in a relationship will increase with positive qualities of the self-concept during the romantic relationship because the individual is likely to make more significant investments in the relationship as they gain something from it. Nonetheless, it is thought that the individual may continue to invest in the relationship despite an increase in negative qualities, and a decrease in positive qualities, which may be due to beliefs about the romantic relationship and social learning (Vannier & O'Sullivan, 2018). For example, beliefs such as "love overcomes everything" may lead to expectations that differ from actual relationship dynamics. These beliefs may, in turn, lead individuals who tend to maintain the relationship despite increased negative qualities or decreased positive qualities to some unrealistic expectations.

Previous research suggests that the findings demonstrating individuals with avoidant attachment styles having low levels of relationship investment (Pistole et al., 1995; Shaver & Brennan, 1992) are in parallel with the findings of this study. The studies on the relationship between anxious attachment and relationship investment indicate that as the level of anxious attachment increases, the size of investment in a relationship also increases (Büyükşahin, 2006; Umuç, 2021). The results of these studies are consistent with the results of this study. It is expected that individuals with an anxious attachment style invest more in the relationship in order not to lose their partner, and individuals with an avoidant attachment style make low-level investments due to their more distant approach to the relationship.

As for the results on the level of commitment, self-expansion, self-contraction, self-adulteration, and avoidant attachment significantly predict the level of commitment, which is one of the components of relationship stability. Among these variables, self-expansion and self-adulteration predict the level of commitment positively, while self-contraction and avoidant attachment predict the level of commitment negatively. However, self-pruning and anxious attachment do not predict one's commitment to the relationship. According to McIntyre and colleagues (2015), while self-expansion and self-pruning have a positive relationship with individuals' behavior and motivation to maintain the relationship, in other words, with the level of their commitment, there is a negative relationship between self-contraction and self-adulteration and commitment. It is expected that the level of commitment will increase with increased positive qualities in the self-concept. Additionally, it is also expected that the level of commitment will decrease as the self-concept shrinks, meaning that the decrease in positive qualities increases with the romantic relationship. This is because an increase in positive qualities or a decrease in negative qualities will increase the individual's desire to stay in the relationship. However, an increase in one's

level of commitment despite an increase in negative qualities in the self-concept may be related to the individual's self-esteem and investment in the relationship. In particular, individuals with low self-esteem may tend to stay in the relationship even if their negative qualities increase, rather than ending the relationship. Similarly, when an individual invests in a relationship, they may be determined to maintain it even if negative qualities increase during the relationship.

The related literature suggests that the low commitment levels of individuals with avoidant attachment styles (Feeney & Noller, 1991; Pistole et al., 1995) are parallel to the results of this study. According to Rusbult's (1980) Investment Model, commitment entails the individual's desire to maintain the relationship, but it is an expected result for individuals with avoidant attachment style to have low levels of commitment due to their distance from the romantic relationship, hence their low levels of desire to stay in a relationship.

The results of the gender analysis indicate a significant difference in relationship satisfaction and relationship investment levels of university students. It was uncovered that both relationship satisfaction and relationship investment levels of males are higher than those of females. That is to say, males get more satisfaction from their romantic relationships and invest more in their relationships than females. However, evaluating the quality of alternatives and commitment levels do not show a significant difference based on gender. When the related literature is considered, the results of the studies examining the relationship between gender and relationship satisfaction differ from each other. While some studies concluded that there is no significant difference between relationship satisfaction, which is one of the components of relationship stability, and gender (Çelik-Zeren, 2020; Saraç et al., 2015; Satıcı & Deniz, 2018; Stackert & Bursik, 2003; Yılmaz & Gündüz, 2021); some others discussed that gender is a crucial variable predicting relationship satisfaction (Aslan-Yılmaz, 2019; Beştav, 2007; Buğa, 2009; Rusbult et al., 1986; Rusbult et al., 1998; Sarı, 2008; Vaillant & Vaillant, 1993). Consistent with the results of this study, some studies concluded that males have higher relationship satisfaction levels than females (Collins & Read, 1990; Debord et al., 1996; Falconier & Epstein, 2010; Sarı & Korkut-Owen, 2016; Lesch & Engelbrecht, 2011). Previous research on the relationship between relationship investment and gender shows that the obtained results could be different from each other. Whereas some studies suggest that females have higher levels of relationship investment than males (Duffy & Rusbult, 1986; Fitzpatrick & Sollie, 1999; Le & Agnew, 2003; Rusbult et al., 1998; Taluy, 2013), some of them report that males have higher levels of relationship investment than females (Akbalık-Doğan, 2010; Çelik-Zeren, 2020; Uyanık, 2022). On the other hand, there is no significant difference in evaluating the quality of alternatives and commitment levels according to gender. In this respect, the majority of the previous studies conclude that men's levels of evaluating the quality of alternatives are higher than those of women (Aslan-Yılmaz, 2019; Buğa, 2009; Büyükşahin et al., 2005; Çelik-Zeren, 2020; Le & Agnew, 2003; Rusbult et al., 1998). This implies that males are more moderate than females in evaluating romantic relationships outside of their existing relationships. The number of studies addressing commitment, one of the components of relationship stability, is extremely limited in the literature. This is likely to be due to the fact that commitment was not initially included in the adaptation study of the Relationship Stability Scale into Turkish, yet it was included in a later scale study. According to Çelik-Zeren (2020), the level of commitment does not differ according to gender. However, Rusbult and colleagues (1998) and Fitzpatrick and Sollie (1999) put forth that females have higher levels of commitment than males. The differing results encountered in such studies may be because the study groups consist of individuals with different cultural qualities. In addition, attributing different meanings to gender roles in societies and romantic ideologies may have caused differing views on romantic relationships (Dinçer, 2017).

Conclusion

This study found that university students' self-expansion, self-contraction, anxious attachment, and avoidant attachment levels significantly predict their relationship satisfaction. In contrast, self-expansion, self-adulteration, self-contraction, and anxious attachment levels significantly predict their level of evaluating the quality of alternatives. Self-expansion, self-contraction, self-adulteration, anxious attachment, and avoidant attachment significantly predict relationship investment, whereas self-expansion, self-contraction, self-adulteration, and avoidant attachment significantly predict commitment. Moreover, males have significantly higher levels of relationship satisfaction and relationship investment than females.

Recommendations

The relationship satisfaction subscale is mainly emphasized in the studies examining relationship stability. However, relationship satisfaction itself cannot determine or guarantee relationship stability (Le & Agnew, 2003; Rusbult et al., 1986). Therefore, it may be helpful for future research to address different variables in further studies to understand relationship stability better. According to Morgan and Shaver (1999), to understand romantic relationships, individuals' attachment styles should first be understood. In this line, it may be helpful to examine attachment styles, which have an essential place in an individual's life, in detail with different research designs.

Furthermore, it may be suggested for future research to include partners' attachment styles as a couple to understand relationship stability.

It is evident that some individuals want to stay in a romantic relationship even though they are not satisfied with the relationship, have yet to make a significant investment, have a low level of commitment, and have a low level of evaluating the quality of alternatives. On the other hand, some individuals want to end a romantic relationship even though they are satisfied with the relationship, made significant investments in the relationship, have a high level of commitment, and have a low level of evaluating the quality of alternatives. In the context of counseling, addressing the individual's decision to end the relationship or not may be very important for a healthy romantic relationship. Therefore, further studies on establishing healthy romantic relationships, one of the most important developmental tasks of adulthood, and terminating romantic relationships, which is often thought to be unhealthy for the individual, may be helpful for psychological counselors' works and practices related the romantic relationship process. In addition, developing intervention studies to prevent the negative self-change experienced by the individual during a romantic relationship might be beneficial in terms of helping individuals gain awareness about the process of self-change and establish healthier relationships. The intervention program, for instance, could be aimed at making individuals gain awareness of negative self-change in a relationship. This awareness could help individuals evaluate themselves and their relationships from a better perspective. In this regard, the program might focus on improving individuals' emotional competencies. Practical communication skills help individuals respond to emotional changes in a healthier way. It also has the potential to teach individuals healthy relationship skills and strategies, which could increase the individual's ability to cope with challenges they face in their relationship. Conducting studies to strengthen individuals' social support networks might help them receive the support they may need in the case of a negative self-change. Moreover, studies on the individual's personal development may help reverse the negative self-change processes and thus affect the individual's decision to end an unhealthy romantic relationship. Such studies may also increase the individual's self-confidence and contribute to developing a more positive perception of the self-concept.

Creating psychoeducation groups or developing intervention programs for couple therapies that address self-change in pre-marital counseling and couple therapies may be beneficial for young people to establish and maintain healthier romantic relationships. Intervention programs developed in this context might help individuals gain practical communication skills. In turn, having healthy communication could enable couples to share their feelings and understand each other. Education and therapies may provide couples with skills necessary to cope with stress and manage problems effectively. This can help them deal with potential difficulties emerging in the relationship more effectively. Activities aimed at strengthening the individual’s sense of self-concept could also help couples improve each other. As a result, individuals could get satisfaction from the relationship, invest in it, and show commitment.

Acknowledgements or Notes

This article is derived from Ayşegül Özsolak’s master’s thesis entitled "Attachment and self-change as predictors of romantic relationship stability in university students", conducted under the supervision of Prof. Meliha Tuzgöl Dost, Ph.D. and Assoc. Prof. Seval Kizildağ Şahin, Ph.D.

Authors Contribution Rate

All authors contributed equally to the completion of the work.

Ethical Approval

Ethical permission for this research (20.12.2021-E-35853172-300-00001927807) was obtained from Hacettepe University Institute of Educational Sciences.

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 508-524 Article Type: Research Article

Investigation of Middle School Students' Model of Astronomy Events and Information Sources of Incorrect Model

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Abstract
The purpose of this study is to reveal middle school students' model understanding and information sources of incorrect model related to basic astronomy topics included in the Turkish middle school science curriculum. The study is a descriptive study focusing on qualitative data. The sample of the study includes 197 students (aged 12-13) attending eighth grade in seven schools in a city in northeastern Türkiye. Data for the study was collected using the "Astronomy Models and Source Information Form." In this study, descriptive analysis was used as one of the qualitative data analysis methods. Findings indicate that the majority of students possess the incorrect model understanding concerning subjects such as "Solar Eclipse," "Lunar Eclipse," "The Phases of the Moon," "Formation of Seasons," and "Formation of Night and Day," which are part of the middle school science curriculum. The findings also show that teachers and textbooks came to the fore as sources of information in the incorrect model.

Keywords: Astronomy education, Model, Source of information, Science education

Citation
Inaltekin, T. & Akbaba, U. (2024). Investigation of middle school students' model of astronomy events and ınformation sources of ıncorrect model. *International Journal of Contemporary Educational Research*, *11*(4), 508-524. https://doi.org/10.52380/ijcer.2024.11.4.680

Received	31.06.2024
Accepted	06.11.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	ijceroffice@gmail.com
Grant Support	The author(s) acknowledge that they received no external funding in support of this research.

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Introduction

Astronomical events have been among the most significant phenomena that have piqued human curiosity throughout history. Evoking a sense of wonder and awe through its accepted concepts and questions (De Leo-Winkler et al., 2016). The shapes and sizes of the Earth, Sun, and Moon have captivated the imagination of humanity throughout recorded history (Bryce & Blown, 2013). Astronomy, due to its capacity to spark curiosity in anyone regardless of age, culture, or general inclination toward science, is often regarded as a gateway science. It possesses a grandeur and mystique, intertwined with mythology, philosophy, and religion, while being connected to all disciplines (Salimpour & Fitzgerald, 2022). Astronomy education is prominent not only for its inherent value in terms of scientific knowledge but also as a catalyst that promotes 'the encouragement of scientific instruction through approaches focused on experimentation and observation of natural phenomena (Bryce & Blown, 2012).

Astronomy education can be considered a challenging field of instruction due to its incorporation of numerous intricate and abstract concepts (Önal & Önal, 2021; Yair et al., 2003). Cole et al. (2018) state that "astronomical phenomena involve the ability to imagine objects from different perspectives and to track the movement of objects in multidimensional space." Therefore, students require in-depth insights to articulate their thoughts about these apparent motions (Bekaert et al., 2022). Individuals must employ models related to the positions and movements of celestial bodies to comprehend various aspects of astronomy, explain and make predictions based on observations (Plummer et al., 2011). Starting from elementary school, visuals in textbooks particularly stand out in shaping students' knowledge of astronomy. In addition to this, other scientific publications, web pages, planetariums, and science centers, as well as parents, friends, teachers, and their own daily experiences can serve as sources that influence students' model understanding of astronomical events. As a result of advancements in science, books, the internet, television, and newspapers have become increasingly prominent as sources of information for learners of all ages studying fundamental topics in astronomy (Venville et al., 2012).

In recent years, the international literature contains a large number of studies examining students' understanding of astronomical phenomena. A review of the relevant literature reveals a strong focus on studies designed to enhance students' academic performance in astronomy. Researchers have explored the effectiveness of various methods and techniques, including augmented reality, computer-assisted astronomy instruction, argumentation-based teaching methods, interactive technology, activity-based learning, and computer-aided teaching. These studies examine their impact on students' academic achievement, attitudes toward astronomy, and overall interest in the subject (Mykoliuk et al., 2020; Önal & Önal, 2021; Shaikh et al., 2020; Sahin & Akbaba, 2018; Timur et al., 2020). It is seen that a significant number of these studies are aimed at revealing students' non-scientific understandings of astronomical phenomena (Azizah et al., 2022; Cardinot & Fairfield, 2021; Gali, 2021). In addition, it is understood that there are many studies examining students' model conceptions of astronomy events at various grade levels (Blown & Bryce, 2017; Blown & Bryce, 2020; Cole et al., 2015). However, in recent years, it has been observed that studies focusing on secondary school students' ideas about basic astronomical phenomena and the sources of their incorrect models, which are the representations of these ideas, have been quite limited in Türkiye. These limited number of studies only aimed to reveal middle school students' understanding of certain astronomical phenomena (such as the phases of the Moon, the solar system) (Babaoğlu & Babaoğlu, 2020; Babaoğlu & Keleş, 2017; Baybars & Çil, 2019). In the related literature, the insufficiency of studies examining the sources of knowledge on which students' understanding of models in astronomy is based is evident. It can be said that revealing students' understanding of models and their sources of knowledge with the same research will make important contributions to the development of astronomy teaching efforts in understanding the supporting phenomena that shape students' scientific and non-scientific understandings. In this context, this study focuses on determining students' modelling conceptions of basic astronomy topics in the Türkiye middle school (5th-8th grade) science curriculum from their perspectives and the knowledge sources of their incorrect modelling. The first reason for adopting this approach is the interconnected nature of basic astronomical phenomena. Another reason is the need to investigate in more depth whether the weaknesses in students' understanding of astronomical models are concentrated in a particular area. In this way, a significant contribution can be made to the general literature on the improvement of astronomy teaching in basic education. This may also provide critical information for the correction of inhibitors to students' effective learning of astronomy topics.

Examining students' model conceptions of astronomy at the primary and secondary school levels and identifying the phenomena that lead to the formation of incorrect model conceptions can be valuable in terms of helping to plan effective astronomy teaching, especially in the early stages of education. Existing studies in Türkiye largely focus on a single astronomical event (the phases of the Moon). In contrast, this study adopts a more general perspective and aims to reveal students' model conceptions and the sources of information of their incorrect modelling conceptions for all basic astronomical phenomena in the secondary school curriculum. In this context, the following research questions guide the study:

(1) What are the model understandings of students concerning the astronomy topics found in the middle school science curriculum?
(2) What are the sources of students' incorrect model knowledge related to astronomical events?

Students' Reasoning About Astronomy Events and Student-Generated Model Representations

Astronomical concepts are often abstract and require three-dimensional thinking, making it difficult to learn and grasp fundamental astronomy concepts correctly (Yu, 2005). Astronomical representations range from diagrams, maps, and 3D models to various data-driven visualizations like computer simulations (Plummer, 2014; Salimpour et al., 2021). Creating and questioning model representations are integral parts of the epistemic practices of science, and this is of vital importance in astronomy (Salimpour & Fitzgerald, 2022; Tytler et al., 2013). Students primarily interact with scientific representations like pictures and diagrams, which are often found in textbooks and used as teaching materials (Rivet & Kastens, 2012). Based on these academic representations, students form their own interpretations and create their own representations (Gallegos-Cazares et al., 2022).

In many cases, other sources, such as science books and television programs, influence the development of these representations (Bryce & Blown, 2013). Padalker and Ramadas (2008) state that teaching astronomy requires students to develop spatial visualisation skills, including the ability to imagine spatial forms and movements such as translation and rotation. Carefully planned activities using models as an important part of pedagogy can enhance these skills (Hubber & Tytler, 2017; Lelliot & Rollnick, 2010). It is common practice to use models in lessons to explain the shape of the Earth and the formation of day and night (Gallegos-Cazares et al., 2022). While these representations may be engaging for students, they do not guarantee comprehension and can pose difficulties during interpretation by generating confusion and misunderstandings (Galano et al., 2018; Gallegos-Cazares et al., 2022). Bielik et al. (2021) state that models provide explanations and predictions of phenomena and are used by scientists as evidence to support or refute alternative models. Given its complex and non-intuitive sequence of spatial and temporal concepts, astronomy relies heavily on model representations to make these concepts concrete (Salimpour & Fitzgerald, 2022). It is known that learning astronomy with model-supported applications contributes greatly to student success (Hubber & Tytler, 2017). Astronomy models can take various forms, such as drawings, mechanical systems, simulations, software applications, or a system of rules for mathematical manipulations (Pundak et al., 2017). Studies theorize the significance of drawings as a means to reveal visual maps of concepts in an individual's mind, either explicitly or implicitly (Buck Bracey, 2018). Many studies in astronomy education have utilized student drawings to reveal incorrect learning (Bryce & Blown, 2013; Bryce & Blown, 2021; Hubber & Tytler, 2017; Vosniadou & Brewer, 1992). Because it can be said that the most important way in which students represent their understanding of models related to astronomy is drawings.

Research on Children's Astronomical Phenomena

Research on elementary and middle school students' understanding of basic astronomy topics typically focuses on students' knowledge regarding the structure of the Earth, Sun, and Moon (Ahmed & Kurnaz, 2021; Bryce & Blown, 2013; Jelinek, 2021), their rotational movements, (Bekaert et al., 2022; Galano et al., 2018; Vosniadou & Skopeliti, 2017; Vosniadou et al., 2004), and their understanding of solar and lunar eclipses (Brown & Brown, 2017; Chewoh & Sarwanto, 2021; Karslı & Patan, 2016; Wilhelm et al., 2022), and moon phases (Åberg-Bengtsson et al., 2017; Cabe Trundle et al., 2010; Chastenay & Riopel, 2020; Cole et al., 2015; Wilhelm, 2014; Wilhelm et al., 2015). Only a limited number of studies have focused on the topics of the formation of day and night (Fleer, 1997; Frède, 2019; Gallegos-Cázares et al., 2022; Tao et al., 2012; Vosniadou & Brewer, 1994; Vosniadou & Skopeliti, 2017) and the occurrence of seasons (Roald & Mikalson, 2001; Sung & Oh, 2018; Tsai & Chang, 2005). Additionally, other studies have examined the alternative conceptions that students hold about fundamental topics in astronomy (Gali, 2021; Slater et al., 2018; Trundle et al., 2007; Turkmen, 2017; Vosnidou et al., 2004). Recent research focuses on comparing the astronomical understanding of primary and middle school students across different geographies (Blown & Bryce, 2020; Blown & Bryce, 2017; Bryce & Blown, 2012; Bryce & Blown, 2021; Tao et al., 2013; Venville et al., 2012). Similarly, the findings of numerous studies conducted with primary and middle school students indicate weaknesses in their foundational understanding of the structure and movements of the Earth, Sun, and Moon (Akkas Baysal et al., 2022; Bekaert et al., 2022; Calderón-Canales et al., 2013; Dankenbring & Capobianco, 2016; Kurnaz & Değermenci, 2012; Vosniadou & Brewer, 1994).

In a recent key study on astronomy topics, Blown and Bryce (2020) sought to understand how students in China and New Zealand interpret the sources of their astronomical knowledge, using drawings as a method. This study

revealed that students held diverse knowledge structures, merging scientific notions with everyday beliefs about astronomy. Additionally, everyday experiences and ideas acquired early in life, often supported by family, have a significant impact on students' understanding of astronomy. Blown and Bryce (2017), involving 539 students from New Zealand and China, the researchers examined students' comprehension of dynamic astronomical concepts like day and night. In this study, the focus was on students' illustrative models and explanations related to the Earth, the Sun, and the Moon. The research also investigated the prevalence and character of animistic thought and metaphorical language in students' conceptualizations. The findings reveal how children transition between everyday and scientific language in both directions and how they employ imagery in their conceptualizations. The study indicates that the scientific understanding of students in this area cannot be accurately predicted solely by looking at formal scientific expressions and vocabulary.

Methodology

Research Design

This study is a descriptive study focusing on qualitative data. In this study, we evaluated the knowledge about model and information sources of incorrect model related to astronomical events of 8th-grade middle school students in Türkiye based on a descriptive review. Descriptive research "sets out to depict and interpret what is" (Cohen & Manion, 1989, p. 70). Therefore, this study provides an extensive evaluation of students' perceptions of astronomical events, their knowledge sources, and the efficiency of the methods used to convey this information.

Participants

The participants consisted of 197 students (112 females and 85 males) aged 13-14, attending the eighth grade in seven different middle schools in a city in the northeastern part of Türkiye. In Türkiye, students begin to learn about basic astronomy topics academically from the third grade of middle school and continue to cover all the essential topics under the subject area of "Earth and Universe" by the time they reach the 8th grade. Hence, 8th graders were considered the most suitable group to determine what knowledge they have acquired about basic astronomy topics.

Data sources and collection

The data for this study was collected in the first week of June 2022. The "Astronomy Models and Source Information Form" was administered to the students. The form consists of sections that ask students to draw models and identify their sources of information for five fundamental astronomical events: "Solar eclipse," "Lunar eclipse," "The phases of the moon," "Formation of the seasons," and "Formation of night and day." This tool was prepared after reviewing studies in the relevant literature on student understanding of astronomy topics (Blown & Bryce, 2020; Blown & Bryce, 2022; Bryce & Blown, 2013) and consulting with experts in the field. While preparing this information form, for content validity, it was submitted to the review of educators, one of whom was a science teacher at the university where the researchers worked and the other was a science teacher at a school affiliated with the Ministry of Education and had been teaching astronomy education courses for many years. These experts provided feedback on the suitability of the prepared information form for the students and the language used. In these evaluations, some parts of the first version of the prepared information form were asked to be revised again. In this context, the necessary arrangements were made and the information form to be applied was made ready. In research conducted at the middle school level, drawing is the most intensive and important data collection technique for revealing students' model understanding of astronomy topics in this age group. Therefore, a drawing task was included in the initial section of the data collection tool. Arthurs et al. (2020) state that "drawing is a universal process skill that is widely used by scientists to develop concepts on a variety of topics, communicate ideas, and advance scientific thinking within their disciplines." In addition, students were added as a second section under each drawing task a question asking to identify the source of their models of astronomical events (Q. Describe who or where you learned the model you drew from?). The primary motivation for obtaining this second data source is to identify the information sources leading to inaccuracies in students' astronomical model and to make improvements in this area in the future.

Data collection tool was administered to participating students in a single session. Two researchers participated in the process of data collection. These researchers had several meetings with the science teachers at the schools where the data was collected in order to determine suitable timings for the data collection process. In Türkiye, the 8th grade is particularly stressful for both students and parents, as students are required to take a challenging high school transition exam at the end of the year. Hence, the academic workload and stress levels of students are particularly high at this grade level, especially during the spring term (Bayar & Gürlek, 2022; Bozkurt, 2019). A

timeframe that would not interfere with the students' regular school lessons and exam preparation was established. The final week of the school term, which is generally quieter in terms of educational activities, was specifically chosen for data collection. During this week, both researchers collected data on the same days at different schools, in collaboration with science teachers.

Ethical Approval

Ethical permission (19.10.2020-43) was obtained from Kafkas University Social Sciences Ethics Committee for this research.

Data analyses

In this study, descriptive analysis was used as one of the qualitative data analysis methods. Descriptive analysis is to summarise the content of a qualitative data with words or a short expression. In descriptive analysis, the researcher is provided with an organised idea of the study by categorising the data at a simple level (Saldaña, 2021). In order to conduct both visual and textual content analyses concerning five different astronomical events, we prepared a categorical system for drawing was employed. In preparing this categorical system, researchers reviewed textbooks and web pages about the scientific representation of five different astronomical events ("Solar Eclipse," "Lunar Eclipse," "the phases of the moon," "formation of the seasons," and "formation of night and day"). As a result of these evaluations, the primary codes for correct model and incorrect model based on the drawings related to the examined astronomical events were determined. In addition, while preparing the categorical system for the analysis, scientifically incomplete drawings were included in the definition of incorrect model. Taking into account the possibility that some students may not possess any model knowledge for certain astronomical events, a “No Model Representation” category has also been incorporated into the categorical system. In this context, the prepared categorical system comprises three categories based on the scientific appropriateness of the model: "Correct Model," "Incorrect Model," and "No Model Representation". The categorical system is shown in Table 1. In addition, a descriptive coding technique was used to analyze the students' responses concerning the sources of their incorrect model information. Researchers, in order to analyze the students' explanations regarding the sources of their incorrect models, initially extracted preliminary codes from some students' responses and subsequently established a provisional coding table based on these findings. This table was subsequently expanded through the examination of other students' responses, culminating in the final descriptive code table. This descriptive coding table comprises eight sub-codes (teachers, textbooks, science books/journals, websites, television, parents, friends, and planetarium/science museums). All of the students' statements regarding the sources of their incorrect models of astronomical events were analyzed according to this coding table, and the frequency of the expressed codes was quantified in terms of student numbers and percentages. Some of the students' statements contained multiple codes. Therefore, the coders quantified these statements to represent multiple codes. In order to ensure inter-rater reliability, two researchers initially coded the same data from 20% of the students (40 out of 197 participants). An 88% agreement rate was achieved between the two coders (Cohen's Kappa = .87). This result can be considered as a strong coding agreement and attests to the reliability of the coders (McHugh, 2012).

Table 1. Categorization system for student drawing related to astronomical events

Astronomical Event	Model Category		
	Correct Model	Incorrect Model	No Model Representation
Solar eclipse	The model contains complete and accurate alignment in its visual/ symbolic, and verbal aspects. The drawn model correctly represents the scientific structure. The positioning and relative sizing of the Earth, Sun, and Moon (representing the Moon coming between Earth and the Sun and blocking the Sun's light) are correct. The moon's shadow falling on Earth and the resulting darkening of that region is represented. Both total and partial shadow, as well as total and	The model does not exhibit complete and accurate alignment in terms of visual/symbolic and verbal representations. The model contains many errors. It is a non-scientific drawing. Positions of the Earth, Sun, and Moon are incorrect. The representation of total and partial shadow and the total and partial eclipse is either incorrect or absent.	

	partial eclipses, are accurately depicted.		
Lunar eclipse	The model contains complete and accurate alignment in its visual/ symbolic, and verbal aspects. The drawn model correctly represents the scientific structure. It correctly depicts the scientifically accurate positioning and relative sizing of the Earth, Sun, and Moon (with Earth between the Sun and the Moon). The Earth's shadow falling on the Moon is depicted. The representation of the total and partial shadow, and the total and partial eclipse are accurately represented in the drawing.	The model does not exhibit complete and accurate alignment in terms of visual/symbolic and verbal representations. The model contains many errors. It is a non-scientific drawing. There are inaccuracies in the positioning of Earth, Sun, and the Moon in the drawn model. The representation of total and partial shadow, and the total and partial eclipse is either incorrect or absent.	There is a drawing, but it doesn't represent astronomical concepts or there's no drawing at all.
The phases of the moon	The model contains complete and accurate alignment in its visual/ symbolic, and verbal aspects. The drawn model correctly represents the scientific structure. It accurately represents the positions and relative sizes of the Earth, Sun, and Moon. All eight phases of the Moon (4 main and 4 intermediate phases) are accurately represented. The representation of the Moon's orbit around Earth and its resulting illumination of specific areas on the Moon's surface due to this orbital motion of the Sun has been accurately depicted in the drawing.	The model does not exhibit complete and accurate alignment in terms of visual/symbolic and verbal representations. The model contains many errors. It is a non-scientific drawing. There are inaccuracies in the positioning of Earth, Sun, and the Moon in the drawn model. The representation of the main and intermediate phases of the moon is either incorrect or incomplete.	
Formation of the seasons	The model contains complete and accurate alignment in its visual/ symbolic, and verbal aspects. The drawn model correctly represents the scientific structure. The representation of the main and intermediate phases of the moon is either incorrect or incomplete. The rotation of Earth around the Sun and its own axis has been accurately depicted in the drawing The model particularly illustrates Earth's tilt at a specific angle relative to the Sun, resulting in varying angles of radiation and the formation of different seasons throughout the year.	The model does not exhibit complete and accurate alignment in terms of visual/symbolic and verbal representations. The model contains many errors. It is a non-scientific drawing. The positioning of the Sun and Earth is incorrect. The model does not depict Earth's tilt at a certain angle relative to the Sun and the resulting variation in radiation angles, which leads to the formation of different seasons throughout the year.	
Formation of night and day	The model contains complete and accurate alignment in its visual/ symbolic, and verbal aspects. The drawn model correctly represents the scientific structure. The model accurately represents the positions and relative sizes of the Earth and Sun.	The model does not exhibit complete and accurate alignment in terms of visual/symbolic and verbal representations. The model contains many errors. It is a non-scientific drawing. The	

	Earth's rotation around the Sun and on its own axis is correctly depicted. The model correctly illustrates that the side of Earth facing the Sun experiences daylight, while the side not facing the Sun remains dark, representing nighttime.	positioning of the Sun and Earth is incorrect. It does not correctly depict that one side of Earth faces the Sun and is in daylight while the other side is in darkness.

Findings

This section includes the findings related to students' model knowledge about astronomical events and information sources of the incorrect model.

The Findings Related to Model Knowledge on Astronomical Events (Solar eclipse, lunar eclipse, phases of the moon, seasons, day and night)

Figure 1 presents the analysis findings related to students' model knowledge of astronomical events.

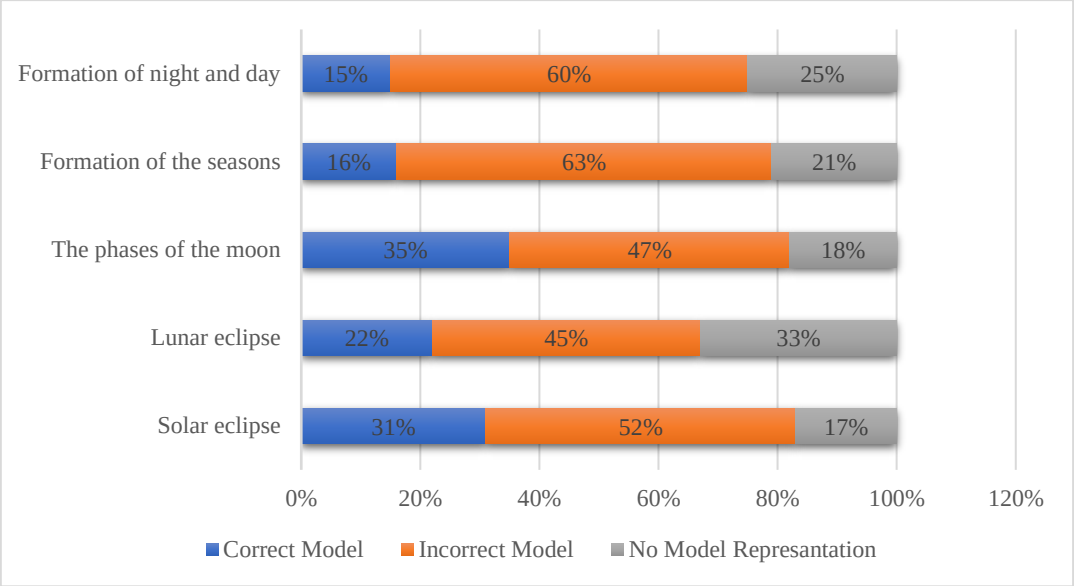


Figure 1. The distribution of students' level of model knowledge about astronomy events

The findings of the analysis of the students' drawings of astronomical phenomena showed that they mostly had "incorrect model knowledge" in the subjects of "Formation of seasons" (63%; n=124) and "Formation of day and night" (60%; n=119) (see Figure 1). In both subject areas, it is understood that nearly two-thirds of the 197 participating students have incorrect model knowledge. Additionally, students have been found to have incorrect model knowledge in almost half of the cases for "The Phases of the Moon" (47%; n=93), "Lunar Eclipse" (45%; n=89), and "Solar Eclipse" (52%; n=102). A significant number of students have “no model representation” in all the examined astronomical events. Specifically, more students do not represent the astronomical event related to the "Lunar Eclipse" (33%; n=64) in their models. However, students have the most “correct model knowledge” in the area of "The phases of the moon" (35%; n=68) among all the astronomical events. Student drawing examples related to model knowledge are shown in Figure 2.

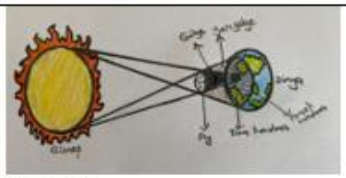
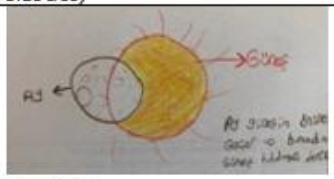
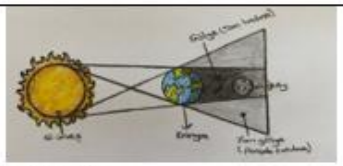
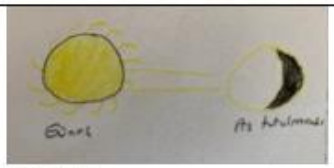
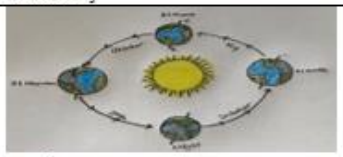
Astronomy Event	Correct Model (Scientific Model)	Incorrect Model (Alternative Model)
Solar eclipse	 Student$_{17}$	 Student$_{65}$
Lunar eclipse	 Student$_{17}$	 Student$_{41}$
The phases of the moon	 Student$_{9}$	 Student$_{71}$
Formation of the seasons	 Student$_{33}$	 Student$_{162}$
Formation of night and day	 Student$_{122}$	 Student$_{156}$

Figure 2. Examples of drawings corresponding to correct models, incorrect models, and models that do not represent astronomical events

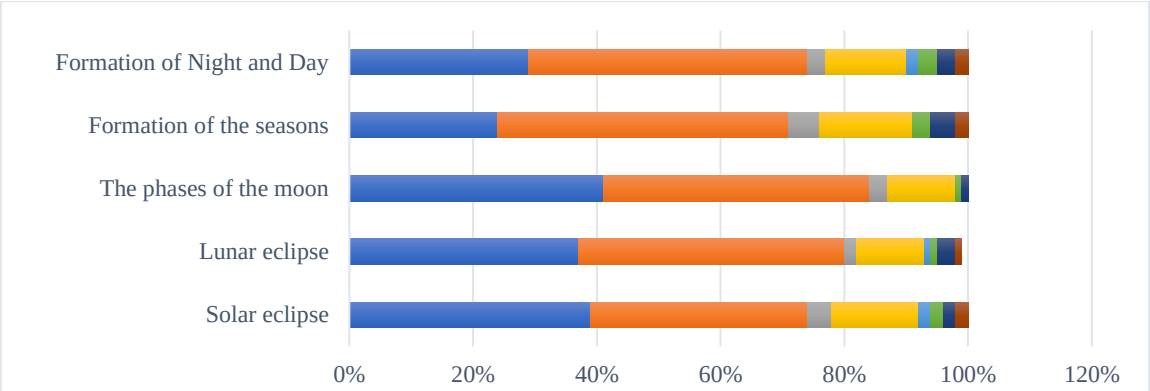
Examining the erroneous models created by students regarding astronomical events in Figure 2, it was observed that Student S65's model representation of a solar eclipse lacks the inclusion of Earth and exhibits difficulties in accurately positioning the Sun, Moon, and Earth. Notably, their model reflects a problematic understanding, as it portrays the Moon inside the Sun. Since the reference point in the model drawn by the student is the Earth, it is normal that the Earth is not included in the model. Considering that it reflects the perceived movement, the model can be accepted as correct according to the point it looks at, but the student who develops spatial thinking ability should have gained the ability to look at this phenomenon from outside the Earth. In the case of the erroneous model depicting a lunar eclipse, student S41's portrayal omitted the Earth from the model, and they struggled to accurately depict the positioning of the Sun, Earth, and the Moon. Instead of illustrating Earth's shadow falling onto the Moon, they depicted one side of the Moon as illuminated and the other as dark. Furthermore, neither of these students incorporated any representations of total and partial eclipses or the formation of total and partial shadows in their drawings. In the inaccurate model of the phases of the Moon, student S71 encountered difficulties in visually, symbolically, and verbally conveying the phases of the Moon with precision. Their drawing revealed notable deficiencies. In the student's model, the positioning of the Sun and the Moon is partially accurate, however, Earth is not included in this arrangement. Additionally, the four main and four intermediate phases of the Moon are not accurately represented in the student's drawing. Regarding the erroneous model of the astronomical event of the formation of seasons, in student S162's model, there is a lack of visual, symbolic, and verbal alignment. In this student's drawing, Earth is represented in six different positions around the Sun.

Consequently, this particularly fails to depict Earth's tilted position relative to the Sun, which results in the formation of different angles of radiation and, in turn, the occurrence of four distinct seasons throughout the year. Hence, the student's model indicates significant inaccuracies. Finally, concerning the erroneous model of the formation of night and day, in student S156's representation, they illustrate Earth's orbit around the Sun, yet they

omit Earth's rotation on its axis in their model, resulting in an inaccurate representation. Furthermore, their drawing does not depict the transition from day to night, where the side of Earth facing the Sun experiences daylight while the opposite side remains in darkness, signifying nighttime. Therefore, the model lacks a scientifically accurate representation. We can say that S17's Solar and Lunar eclipse models were internalised by the students and drawn as a result of complete learning or based on memorizing the visuals in the textbooks. In this sense, it is really important to determine what students think about the models they draw in order to have a deeper understanding in the interpretation of the models. However, since the main purpose of this study was to describe students' understanding of models, this was not included.

The Findings Related to Sources of Incorrect Model Knowledge on Astronomical Events

The findings of the analysis of the source of this knowledge of the students who drew incorrect models are given in Figure 3.



	Solar eclipse	Lunar eclipse	The phases of the moon	Formation of the seasons	Formation of Night and Day
Teachers	39%	37%	41%	24%	29%
Textbooks	35%	43%	43%	47%	45%
Science Books/Journals	4%	2%	3%	5%	3%
Website	14%	11%	11%	15%	13%
Television	2%	1%	0%	0%	2%
Parents	2%	1%	1%	3%	3%
Friends	2%	3%	1%	4%	3%
Planetarium/Science Museum	2%	1%	0%	2%	2%

Figure 3. The distribution of students' incorrect model knowledge sources on astronomy events

The results of the analysis showed that textbooks (47%) and teachers (24%) were the main sources of students' incorrect model knowledge on the topic of "Formation of seasons." Similarly, textbooks (45%) and teachers (29%) emerged as the main sources of students' incorrect model knowledge in the topic "The formation of day and night" (see Figure 3). Additionally, students seem to attribute their incorrect model of all astronomical events to websites as a third source of information. It has also been revealed that a small number of students attribute their incorrect model of astronomical events to sources such as science books/magazines, family members, friends, television, and planetariums/science museums. Sample excerpts from the students' answers regarding the model information sources are given in Figure 4.

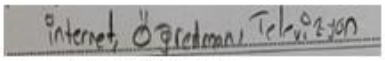
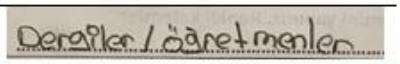
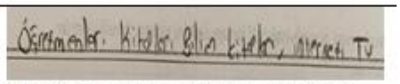
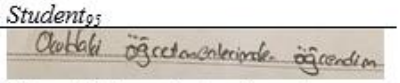
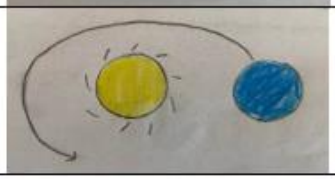
Astronomy events	Incorrect Model	Evidence from Student Responses Regarding the Source of the Model's Information
Solar eclipse		 Internet, teacher, TV *Student*$_{26}$
Lunar eclipse		 Journals, teachers *Student*$_{9}$
The phases of the moon		 Teachers, science books, internet, TV *Student*$_{95}$
Formation of the seasons		 I learnt it from the teacher at school. *Student*$_{137}$
Formation of night and day		 Teachers, books, textbooks *Student*$_{190}$

Figure 4. Examples of students' responses regarding the source of their incorrect model

Looking at Figure 4, it can be seen that students who drew the incorrect model frequently stated their teachers and textbooks as the source of this model information. However, it should be noted that all students get their basic information from these two sources. This research showed that while some of the students in the same class were drawing accurate models on astronomy subjects, some were not able to do so. The purpose of interpreting the finding here is not to judge that the source of information in incorrect models is the teacher and textbooks, but only to describe the student's expression in this direction. Therefore, it is clear that these student expressions and understandings of the model need more in-depth examination, which is not the subject of this research.

Discussion and Conclusion

This study focused on the diagrammatic description of eighth-grade students' model understandings of astronomical events ("Solar eclipse", "Lunar eclipse", "phases of the moon", "formation of seasons" and "formation of day and night") that they have learnt during the middle school period and the identification of the knowledge sources of students with incorrect model knowledge. The findings revealed that a significant portion of students held the incorrect model and no model representation about astronomical events. Notably, students exhibited the highest level of incorrect model in topics related to the "Formation of the seasons" and "Formation of night and day." Considering the importance of early education in helping students grasp fundamental astronomy topics, based on these findings, that middle school science classes may not be placing sufficient emphasis on model-based learning activities, and this aspect is overlooked. Astronomy topics, like many abstract subjects in the field of science, can be learned incorrectly during early education, such as in primary and middle school. When incorrect model about astronomy concepts is established at an early stage, they tend to persist into later periods, hindering the acquisition of more complex astronomy knowledge in the future. Therefore, it is crucial to provide students, especially at the early stages of their education, with concrete and visual representations of astronomy events. One of the most effective methods for achieving this is through hands-on model activities, where students can create visual representations of astronomy concepts using drawings, clay, and various materials (Joolingen et al., 2015). Today, in most secondary schools in Türkiye, astronomy education is largely provided through traditional teaching, that is, through oral explanation. Many of these trainings are far from model-based applications and involve only presenting visuals of astronomy concepts and events in textbooks or various software

programs. It can be said that the efforts to have students draw or prepare models are very limited because many teachers reported that they cannot spare time for such studies due to their busy schedules. This study revealed that many students lack a model-based knowledge base to support their accurate understanding of astronomical phenomena.

The findings indicate that there is a deficiency in activities that could help students grasp the fundamental factors in the "Formation of seasons," such as the positioning of the Earth and the Sun, the Earth's rotation around the Sun, and its axial tilt, all of which can be represented through model. It is also necessary to combine models with students' concrete experiences. Therefore, we need to create a way to connect the model to students' lives and real experiences in teaching. To address this issue and ensure that students fully comprehend the reasons behind the formation of seasons, it is essential for them to grasp the central role of the relationship between the Sun and the Earth in this phenomenon. To facilitate this understanding, model activities can be employed that focus on a Sun-centered perspective and incorporate the concept of Earth's axial tilt along with relative dimensions. Especially, the failure of teachers to exclude the factor of distance (the Earth's distance from the Sun) in their model and their inability to accurately convey to students the Earth's rotational and orbital periods within a Sun-centered model can be expressed as the most crucial factor contributing to the lack of comprehension regarding the topic of seasons. Furthermore, students should be informed that variations in the distance between the Earth and the Sun do not significantly influence “the formation of seasons.” It has been stated that only when these concepts have firmly established the influence of the Earth's tilt on day length and temperature values on Earth can be introduced to students (Slater et al., 2018). This study identified that many students aren't aware that the temperature in certain regions of the Earth changes depending on the angle at which sunlight strikes the Earth due to the Earth's orbital motion around the Sun. Moreover, it was determined that many students in this study did not have the knowledge that the temperature values in certain regions of the Earth will change according to the angle of the sun's rays hitting the Earth during the Earth's orbit around the Sun. It can be argued that in order to make full sense of the relationships in such phenomena, it is necessary to learn more about what the learner knows and what they rely on for such understandings. It can be said that although the students knew the effect of the Earth's axis curvature on the formation of the seasons, they did not reflect this factor correctly in their drawings. Despite students knowing that the tilt of the Earth's axis affects the angle of sunlight incidence, they often fail to depict this accurately in drawings. It can be argued that inaccurate model may stem from a student's incomplete or erroneous preconceptions about the definition of seasons. Because cognitive theorists make one of the most important generalizations that students' prior knowledge is highly effective on their learning (Kandemir & Apaydın, 2020). So much so that the newly acquired knowledge of the student is built on his/her prior knowledge, but if the prior knowledge is problematic, learning may result in failure (Ecevit & Şimşek, 2017). Defining seasons as periods with similar average weather conditions could contribute to correct model. Another reason for the gaps in understanding the process of season formation might be the teaching methods and techniques applied. A teaching process that is predominantly lecture-based, teacher-centered, and lacks adequate use of materials may not yield successful outcomes in topics that require three-dimensional and spatial thinking skills. Even if scientific explanations are provided verbally or in written form, they can be quite challenging for students to understand. Therefore, there is a need for different model approaches to explain the formation of seasons in classroom settings. The chances of achieving positive results can increase when these processes are supported with student-centered strategies. Similarly, it can be stated that the incorrect model many students have regarding the "formation of night and day" astronomical phenomenon originates from the lack of classroom exercises that visualize Earth's rotation on its axis, in conjunction with its orbit around the "Solar System".

The second finding of the study indicates that most students point to textbooks and teachers as the source of their incorrect model about the events of the “formation of the seasons” and the “formation of night and day,” which they predominantly understand incorrectly. The study by Blown and Bryce (2020) corroborates the results of this study. The researchers examined the sources of knowledge regarding astronomical phenomena among a broad sample of students in China and New Zealand. As a result of their study, they determined that in both cultures, a significant portion of the students' sources of knowledge were primarily teachers and books. This suggests that the early misconceptions students have about astronomy are significantly shaped through textbooks and by teachers. This outcome emphasizes that teachers and textbooks, considered key elements in the learning process, play a fundamental role in influencing students' misconceived model understandings. However, the fact that 30% of the students had correct models of the astronomy phenomena discussed means that they learned despite the deficiencies in the teachers and books. An issue that needs to be examined in terms of the result obtained here is how teachers and textbooks present astronomy events and why this is meaningful for some students and meaningless for others. This situation requires in-depth examination with a different research topic. Science teachers have an important role in identifying students' incorrect model of astronomical phenomena and providing

the necessary support to eradicate alternative model ideas that deviate from established scientific understanding. To effectively perform this function, teachers must first critically examine their own understanding of the model in relation to astronomical events and adapt it to facilitate student learning. In addition, textbooks have consistently served as a foundational resource for students in science courses. However, current reviews show that many science textbooks have structural defects in their scientific content (Sideri & Skoumios, 2021) and visual representations (Inaltekin & Goksu, 2019), and these negatively affect learning. Alongside their textual content, the visual elements in textbooks—especially when dealing with complex scientific subjects like astronomy—are invaluable in promoting student understanding. Therefore, the correct and pedagogically effective presentation of illustrative drawings, images, and photographs that complement the scientific text is crucial for making textbooks an effective resource for students. Many students intuitively construct incorrect models of astronomical phenomena based on the knowledge and experiences they have gained from various sources in their daily lives. For example, Plummer (2014) found alternative ideas among students that suggest the Sun is blocked by the Moon, causing nighttime darkness. These ideas have emerged as a product of students' intuitive thinking. Moreover, students think outside the teacher or textbooks. As identified in this study, students who have not undergone an effective learning process may hold model understandings that represent the products of their own intuitive thought rather than scientific knowledge. Identifying and rectifying the misconceptions and alternative concepts caused by prior knowledge can be beneficial in this process. In particular, the model related to astronomy topics in science textbooks play a significant role in eliciting alternative model understandings. This is because many teachers rely on ready-made models from these textbooks for their explanations and often choose not to engage students in model activities. Some textbooks may also lack model representations that could support students' scientific understanding of astronomical events. Consequently, these shortcomings will significantly hinder the formation of the student's scientific understanding.

In the 2024 science curriculum, the astronomy units include "Let's Explore Our World" for Grade 4, "Our Neighbors in the Sky and Us" for Grade 5, "Solar System and Eclipses" for Grade 6, "Space Age" for Grade 7, and "Seasons and Climate" for Grade 8. In Grade 4, Unit 3 focuses on estimating the Earth's shape based on scientific observations, illustrating the Earth's layered structure (air sphere, water sphere, stone sphere, living sphere) through modeling, estimating the Earth's rotation and circulation movements by observation, and understanding the phenomena of day and year that result from the Earth’s movements (MoNE, 2024). This unit includes goals related to developing and proposing models to understand the Earth's shape, structure, and movements. Findings indicate that the topic of day and night formation has the second highest number of incorrect models, highlighting the importance of aligning our study with the new program's objectives. In Grade 5, Unit 1 aims to define the structure and rotational motion of the Sun, discuss the properties, phases, and movements of the Moon, and prepare models illustrating these phases. Additionally, students are expected to create models that take into account the volumetric sizes and motions of the Sun, Earth, and Moon (MoNE, 2024). This unit provides essential data for modeling the five events/topics examined in the study, emphasizing spatial and dimensional evaluation of the movements of the Sun, Earth, and Moon, both individually and in relation to one another. This is crucial for promoting effective modeling skills. Grade 6, Unit 1 addresses the solar system and eclipses. In this unit, students will classify the planets in the solar system, create models of the solar system, and develop models for solar and lunar eclipses based on inference (MoNE, 2024). The processes of proposing, creating, and developing models have been emphasized to achieve the targeted outcomes. Grade 7, Unit 1 focuses on space exploration technologies, preparing models for space observations, and generating ideas that will stimulate further research in space studies. This unit also highlights the hierarchical relationship between the concepts of stars, the universe, and galaxies. Modeling is an integral part of developing a space observation tool (MoNE, 2024). Grade 8, Unit 1 covers seasons and climate. It compares the Earth's movement around the Sun, the effects of axial tilt, and the resulting climate and weather events. Defining the Earth's motion around the Sun in the context of axial tilt is identified as a process skill (MoNE, 2024). This skill can be enhanced through modeling activities. Notably, study findings reveal that incorrect modeling was most prevalent in understanding the formation of seasons, underscoring the need for accurate and effective models in teaching. Based on these findings, it can be emphasized that it is appropriate to focus on modeling in the 2024 science program, as incorrect modeling is done in all subjects and modeling knowledge is lacking.

The findings obtained from this study indicate that many students have a weak understanding of basic astronomical events during middle school. These findings point to the need for questioning the quality of teachers and textbooks cited as the cause of these deficiencies in understanding about astronomy events.

Limitations and Recommendations

This research was conducted in a small-scale city in the east of Türkiye. This study can be repeated in other cities to obtain more comprehensive information about the understanding of students at the same education level. The study aimed to examine drawing models related to astronomical events as its data source. Although the researchers wanted to interview some students in order to understand the model drawings representing the students' understanding of astronomical phenomena and the sources of knowledge that the basis of these drawings, they could not do this due to the students' workload and time problems. In-depth interviews could be conducted to examine students' understanding of the models they drew, which would shed more comprehensive light on their mental models of understanding. Science textbooks should be updated to include comprehensible visuals and various activity exercises that will enhance students' modeling understanding of astronomical events. The researchers gave coloring pencils to each of the students for their model drawings. The observation of the researchers showed that this kind of practice motivated the students to participate in the research process. In addition, using only pencils in students' model drawings of astronomy phenomena may not fully reflect their understanding of models. In this study, the data showing that students benefited from textbooks were excluded from the analysis. In such astronomy model drawing studies, in order for students to reflect their own model understanding, an environment independent of the sources that they will copy one-to-one should be created, Sufficient time and appropriate working hours should be determined.

Acknowledgements or Notes
No financial support was received for this work.

Author (s) Contribution Rate
The study was completed with equal contributions from both authors.

Ethical Approval
Ethical permission (19.10.2020-43) was obtained from Kafkas University Social Sciences Ethics Committee for this research.

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 525-536 Article Type: Research Article

An Azerbaijani Adaptation of Tuckman Procrastination Scale: Its Association with Academic Motivation and Self-Efficacy

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Abstract

The aim of this study was to adapt the Tuckman Procrastination Scale for use with Azerbaijani adolescents and explore the relationships between procrastination, academic motivation and self-efficacy. Data were obtained from 718 adolescents in Azerbaijan whose ages ranged from 10 to 18 years (M = 13.61, SD = 1.86) through convenience sampling. As part of the adaptation process, confirmatory factor analysis, criterion-related validity, and reliability analyses were conducted. Furthermore, the study shedding light on the relationships between procrastination and academic motivation and self-efficacy were explored using PROCESS macro mediation analysis. The results obtained from confirmatory factor analysis indicated that factor loading values of three items of the scale is less than 30 and cannot be taken into account. The remaining 13 items of Tuckman Procrastination Scale analyzed and confirmed the unidimensional structure of scale. Internal consistency reliability analysis conducted and the result indicated satisfactory reliability coefficients. Moreover, results demonstrated that procrastination was negatively associated with academic motivation and self-efficacy. Addiction to it, the mediating effect of self-efficacy on the relationship between procrastination and academic self-efficacy was unveiled. These findings suggest that the Azerbaijani version of the Tuckman Procrastination Scale has acceptable psychometric properties.

Keywords: Procrastination, Academic motivation, Self-efficacy, Scale adaptation

Citation

Aliyev, B., Asadov, F., Mammadova, R., Asgerova, N., Isayeva, L., Zalova-Nuriyeva, U. & Rustamov, E (2024). An Azerbaijani Adaptation of Tuckman Procrastination Scale: Its Association with Academic Motivation and Self-Efficacy. *International Journal of Contemporary Educational Research*, *11*(4), 525-536. https://doi.org/10.52380/ijcer.2024.11.4.744

Received	16.10.2024
Accepted	14.12.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The author(s) acknowledge that they received no external funding in support of this research.

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Introduction

Adolescence is a critical stage marked by significant physical development and the maturation of brain functions. During this period, well-being often fluctuates, risk-taking behaviors peak, and mental health issues such as depression may emerge (D.F. Maciejewski et al., 2019). Adolescents are characterized by emotional reactivity, impulsivity, and a strong drive for novelty-seeking. Their underdeveloped self-regulation abilities make it challenging to manage risky behaviors effectively (Willems et al., 2018). The development of self-regulation skills during childhood and adolescence has long-term implications for various aspects of life (Allemand et al., 2019). A key challenge in adolescent behavior, particularly in the context of self-regulation, is their inclination towards procrastination.

The term "procrastination" is derived from two Latin words: "pro," meaning "forward," and "crastinus," meaning "tomorrow." Together, they imply "to put off until tomorrow." Research shows that at least half of all students procrastinate on important tasks such as studying for exams, writing coursework, and completing weekly assignments (Steel, 2007). Academic procrastination occurs when a student delays their work on academic tasks (Rustamov, 2023). Examining the psychological aspects of procrastination reveals issues with self-regulation (Sirois & Pychyl, 2013). Managing attention while progressing toward long-term goals can be particularly challenging for those affected by procrastination.

One study identified a lack of study skills as a major reason for academic procrastination (Grunschel et al., 2013). Poor academic skills make tasks feel more stressful, tedious, and complex, which is closely related to task avoidance (Blunt & Pychyl, 2000). According to the Temporal Motivation Theory (Steel & König, 2006; Gröpel & Steel, 2008), motivation increases with the expectation of the outcome and the value of the goal but decreases over time. The farther away the outcome is and the higher the impulsivity, the greater the likelihood of procrastination. Therefore, if an activity offers rewards in the distant future and impulsivity is high, procrastination is more likely to occur. Sirois (2014) argues that habitual procrastinators start their work at the last minute, leading to physiological stress symptoms (e.g., stomach discomfort, tension, rapid heartbeat). Continuous exposure to such situations can create feelings of guilt and shame (Sirois, 2014), as well as psychological issues like anxiety and depression (Ferrari et al., 1995).

The standard procrastination mechanism generates feelings of guilt and discomfort when a specific task is not completed, while also attempting to compensate by finishing less significant tasks (Pychyl, 2013). According to Bakhtiyar Aliyev (2019), it is still unclear how a person is inspired to do great things, what drives this enthusiasm and motivates them to do even the most difficult tasks, and achieve success. Academic procrastination is particularly prevalent among adolescents and students, significantly impacting various aspects of their lives, especially academic performance (Steel, 2007). The causes and consequences of procrastination are multifaceted and closely related to psychological factors such as motivation, self-efficacy, stress management, and internal control (Schraw et al., 2007).

Research consistently shows a significant link between locus of control and academic procrastination (Zarzycka et al. 2021). Studies indicate that individuals with a lower internal locus of control are more prone to procrastination, while those with a stronger internal locus tend to reduce procrastination by taking responsibility for their actions (Rustamov et al., 2023). Conversely, students with an external locus of control are more likely to procrastinate, as they believe success depends on external factors rather than their own effort.

Motivation and self-efficacy

Motivation and self-efficacy are critical regulators of procrastination. According to Bandura's (1997) theory of self-efficacy, a person's belief in their ability to successfully complete a task influences their willingness to start and persist with it. Students with low self-efficacy are more likely to engage in procrastination because they doubt their ability to overcome challenges. Conversely, students with higher self-efficacy are more persistent and likely to complete tasks on time, leading to better academic outcomes (Rustamov et al., 2023; Bandura, 1997).

The long-term effects of procrastination are often linked to academic failure and emotional distress. Frequent delays create mounting pressure as deadlines approach, increasing anxiety and eroding self-confidence. This cycle can lead to poor academic performance, hindering students from achieving their long-term academic and career goals. Research suggests that students who procrastinate more experience greater emotional problems as academic

demands increase, perpetuating the cycle of procrastination (Tice & Baumeister, 1997). On the other hand, students who procrastinate less and complete their tasks on time tend to achieve higher academic performance. Meeting deadlines fosters greater motivation, increases self-confidence, and promotes a stronger interest in the educational process (Steel & Ferrari, 2013). Developing time management skills not only aids academic pursuits but also contributes to overall success in life.

To reduce academic procrastination, students need to enhance their motivation and time management skills while improving their sense of self-efficacy. Motivational techniques, self-development programs, and strategies that promote self-efficacy can help reduce procrastination and lead to more effective academic outcomes (Schraw et al., 2007). Given the prevalence of procrastination in the academic sphere and its negative impacts, it is essential to have psychometrically sound scales for measurement. Valid questionnaires facilitate the development of high-quality research. The Procrastination Scale was developed to assess the tendency to procrastinate (Tuckman, 1991). Its evaluation plays a significant role in clarifying and addressing this behavior (Tisocco & Liporac, 2021). The measurement of procrastination is crucial for psychological research (Steel, 2007). One of the most widely used scales is Tuckman's Procrastination Scale, which measures procrastination due to low self-regulation. Tuckman notes that procrastination arises from inadequate self-regulation.

Tuckman Procrastination Scale

The Tuckman Procrastination Scale was developed by Tuckman and is extensively used worldwide to measure procrastination among adolescents and school students, examining their academic performance in depth. The Tuckman Procrastination Scale has been adapted in Turkey (Özer & Saçkes, 2013), Spain (C Brando-Garrido & J Montes-Hidalgo, 2020), Brazil (Ana Karla Silva Soares, 2022), and Indonesia (Abdullah Fathur Rasyid, 2023). However, this test has not yet been adapted for Azerbaijan.

Research Objectives

Given the significant impact of the "procrastination" phenomenon on adolescents' academic performance, the main objective of the current study is to adapt the Tuckman Procrastination Scale into Azerbaijani and evaluate its psychometric properties. Furthermore, the study aims to investigate the relationships between procrastination, academic motivation, and self-efficacy.

Method

Participants

Data were gathered through online surveys, employing a convenience sampling approach to reach 718 adolescents from schools in Azerbaijan. Of all the participants, 458 (63.8% of the total sample) participants were females and 260 (36.2% of the total sample) were identified as males whose ages ranged from 10 to 18 years (M = 13.61, SD = 1.86). A considerable proportion of participants expressed satisfaction with their interactions with peers within the school environment, with 65.4% reporting a positive experience. In contrast, 24.1% indicated partial satisfaction, while 6.8% partly dissatisfaction and 3.5% expressed dissatisfaction with their peer relationships. Regarding their interaction with teachers at school, 51.4% of the adolescents participating in the research reported a contentment. 25.1% reported partial satisfation, while 4.7% reported total dissatisfaction for the interaction with their teachers. In terms of perceived success at school, the majority of the participants (63.7%) expressed their happiness and satisfaction while 23% of the adolescents reported partial contentment and 13.3% of them reported dissatisfaction about their results at school. Detailed information is demonstrated in Table 1.

Ethics

The study was conducted in strict adherence to the ethical principles established in the Helsinki Declaration of 1975, as revised in 2000. Prior to the initiation of the research, ethical approval was granted by the Ethics Committee of the Psychology Scientific Research Institute in Baku, Azerbaijan. This study adhered to ethical guidelines established in Helsinki Declaration of 1975, as revised in 2000 and was approved by the Ethics Committee of the Psychology Scientific Research Institute in Baku, Azerbaijan (Approval number: T-323).

Table 1. Descriptive information of the participants

	Frequency	%
Gender		
Female	458	63.8
Male	260	36.2
Peer relationship		
Satisfied	366	51.0
Partly satisfied	173	24.1
Moderate	105	14.6
Partly dissatisfied	49	6.8
Dissatisfied	25	3.5
Interaction with teacher		
Satisfied	369	51.4
Partly satisfied	180	25.1
Moderate	106	14.8
Partly dissatisfied	29	4.0
Dissatisfied	34	4.7
Perceived success at school		
Satisfied	457	63.7
Partly satisfied	165	23.0
Dissatisfied	96	13.3

Measures

The Tuckman Procrastination Scale was developed by Bruce W. Tuckman (1991). There are 16 items in this scale (e.g., I get stuck in neutral even though I know how important it is to get started). The Tuckman Procrastination Scale assesses procrastination using a 4 point Likert scale. (1= Strongly disagree and 4= Strongly agree) . These scores reflect higher levels of procrastination. Cronbach's alpha was 86 for the tuckman procrastination scale.

The Academic Motivation Scale was designed by Robert J. Vallerand (1989). There are 28 items in this scale (e.g., I go to school because it gives me pleasure to see that I can successfully complete difficult activities in class). The Academic Motivation Scale assesses hope using a 7 point Likert scale. (1= definitely false and 7=definitely true) . The Academic Motivation Scale scores reflect higher levels of trait motivation. Cronbach's alpha were ranked between 0.62 and 0.91 motivation scale.

The General Self-Efficacy Scale was developed by Ralf Schwarzer and Matthias Jerusalem (1979). There are 10 items in this scale (e.g.,I can remain calm when facing difficulties because I can rely on my coping abilities). The General Self-Efficacy Scale using 4 point Likert scale (1= Not at all true and 4= Exactly true). This scores reflect higher levels of general self-efficacy. Cronbach's alpha for the General Self-Efficacy Scale was between .76 and .90.

Data analysis

The aim of the present study was to evaluate the psychometric properties of the Tuckman Procrastination Scale, including its structural validity, reliability, criterion-related validity, and predictive validity. Confirmatory Factor Analysis (CFA) with the use of maximum likelihood estimation was utilized to assess the structure of the Tuckman Procrastination Scale. In-depth analysis carried out on numerous goodness-of-fit indices, which include Chi-square ($\chi 2$) to the degree of freedom (df) ratio (supposed to be less than 5), the Comparative Fit Index (CFI), the Incremental Fit Index (IFI), the Normed Fit Index (NFI), Relative Fit Index (RFI) and the Root Mean Square Error

of Approximation (RMSEA). In order to determine scale's internal consistency, Cronbach's α, McDonald's omega, and Guttmann's lambda coefficients were calculated. For the purpose of criterion-related validity, associations between the Tuckman Procrastionation Scale-Azerbaijan and academic motivation and academic self-efficacy were examined by using correlation analysis. Finally, to examine the mediating role of academic self-efficacy in the relationship between procrastination and academic motivation, the PROCESS macro developed by Hayes (2018), was employed to compute the mediation model.

Results and Discussion

To assess the normality of the Tuckman Procrastination dataset, both skewness and kurtosis were examined. The skewness value was determined as 0.221, while the kurtosis value was determined as-0.289. According to Kline (skewness between -2 and +2) and West et al. (Kurtosis between -3 and +3) skewness and kurtosis values of Tuckman Procrastination Scale were within the acceptable ranges for normality. These findings validate the symmetrical distribution of the variables, thus demonstrating their compliance with the normality criteria.

Prior to conducting the exploratory factor analysis to test the factor structures, item-total correlations were assessed to evaluate the alignment of the scale items with other scales. The correlation scores of the fourth ("I delay making tough decisions"), seventh ("I put the necessary time into even boring tasks, like studying") and 14th items ("I always finish important jobs with time to spare") with the other items was found to be below 0.30. Alongside these, results revealed that the 14th item of the scale has a negative correlation with several other items, though this reverse item was recoded. Notably, the reliability coefficient improved when these items were removed from the scale.

Confirmatory Factor Analysis (CFA) was carried out to examine the factor structure of the Tuckman Procrastionation Scale-Azerbaijan version. Results obtained from CFA demonstrated that three items have a factor loadings less than 30. Conclusively, 4th, 7th and the 14th items of the Tuckman Procrastination Scale could not be taken into account and removed from the scale.

Factor loading values of the remaining 13 items of scale which were taken into consideration, are presented in Figure 1. The scale was found to have a unidimensional factor structure consistent with its original design. As stated by Figure 1. factor loadings of items varied between .423 and .674. Factor loadings of .60 or higher are considered "high," while values ranging from .30 to .59 are classified as "medium," and may be taken into account when deciding whether to exclude a variable (Kline, 1994).

Numerous statistical fit indices used to assess model fit: χ^2 (65, N=718) =292.9, CFI = .877, IFI = .873, NFI = .873, RFI = .826, and RMSEA-0.063. These indices indicate that the hypothesized model aligns well with the empirical data, supporting the validity of the Tuckman Procrastination Scale-Azerbaijan's structure. The unidimensional factor model of the 13-item scale explained 31.207% of the total variance, with standardized factor loadings spanning from 0.424 to 0.674.

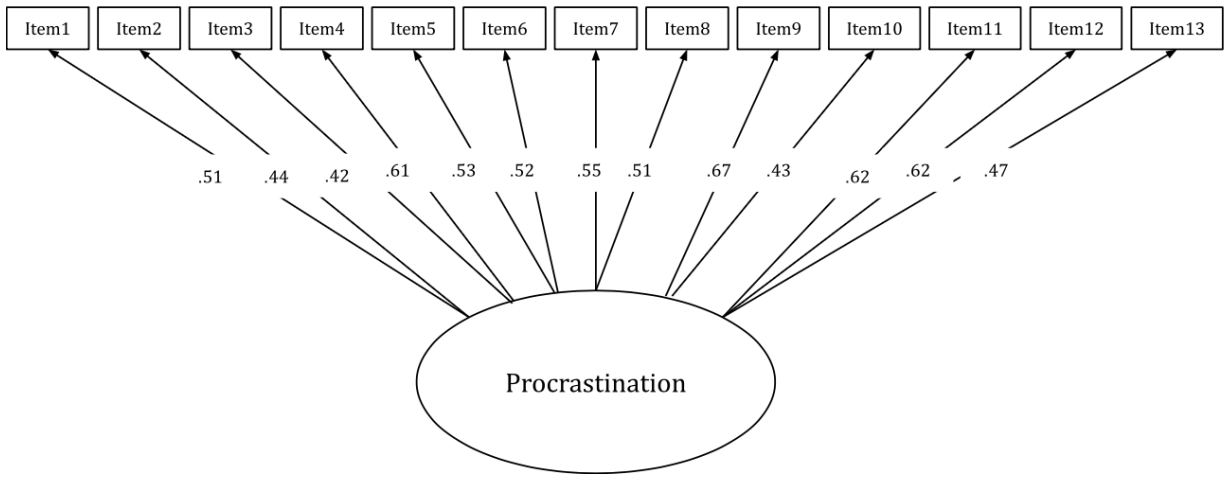

Figure 1. Structure validity of the Azerbaijani Tuckman Procrastination Scale

Subsequent to the verification of the scale's structural integrity, Item Response Theory (IRT) analysis was performed. Obtained results illustrated that the discrimination parameter (α) values ranged from 0.712-1.577. In accordance with Baker's framework, 2 items were categorized as having limited discriminative ability, while other 11 items continued to be categorized as moderate. These findings demonstrate that 11 items have a good discriminative power to distinguish different levels of procrastination.

Table 2. IRT results for the Tuckman Procrastination Scale

Item	a coefficient	SE	Confidence interval	z	p>|z|
I needlessly delay finishing jobs, even when they're important. *Mən lazımsız yerə işləri bitirməyi gecikdirirəm, hətta onlar vacib olsa belə*	1.120038	.1009584	.9221634-1.317913	11.09	0.001
I postpone starting in on things I don't like to do *Sevmədiyim işlərə başlamağı təxirə salıram*	.7128776	.0891387	.5381689-.8875863	8.00	0.001
When I have a delay, I wait till the last minute *Bir şeyi gecikdirdikdə son dəqiqəyə qədər gözləyirəm*	.6459104	.0845725	.4801514-.8116695	7.64	0.001
I keep putting off improving my work habits *İş görmə vərdişlərimi təkmilləşdirməyi daima təxirə salıram*	1.419928	.1160456	1.192483-1.647374	12.24	0.001
I manage to find an excuse for not doing something *Nəyisə etməmək üçün bir bəhanə tapmağı bacarıram*	1.291915	.1097818	1.076746-1.507083	11.77	0.001
I am an incurable time waster *Mən düzəlmə ehtimalı olmayan bir zaman israfçısıyam*	1.292886	.1163567	1.064831-1.520941	11.11	0.001
I'm a time waster now but I can't seem to do anything about it *Mən indi vaxt itirirəm, amma bununla bağlı heç nə edə bilmirəm*	1.334488	.1109123	1.117104-1.551872	12.03	0.001
When something's too tough to tackle, I believe in postponing it *Nəyisə həll etmək çox çətin olduqda, onu təxirə salmağa inanıram*	1.22863	.105597	1.021664-1.435596	11.64	0.001
I promise myself I'll do something and then drag my feet *Özümə bir şey edəcəyimə söz verirəm amma sonra onu etməyə həvəsim olmur*	1.546863	.123725	1.304366-1.789359	12.50	0.001
Whenever I make a plan of action, I follow it *Nə vaxt fəaliyyət planı qursam, ona əməl edirəm*	1.027127	.1021007	.8270133-1.22724	10.06	0.001
Even though I hate myself if I don't get started, it doesn't get me going *Bir işə başlamadığım üçün özümə nifrət etsəm də, bu yenə də məni hərəkətə keçirmir*	1.577583	.1241858	1.334183-1.820983	12.70	0.001

I get stuck in neutral even though I know how important it is to get started *Başlamağın nə qədər vacib olduğunu bilsəm də, neytral vəziyyətdə qalıram*	1.519101	.1203147	1.283289-1.754914	12.63	0.001
Putting something off until tomorrow is not the way I do it *Bu günün işini sabaha qoymaq mənim tərzim deyil*	1.199488	.1091541	.98555-1.413426	10.99	0.001

Internal consistency reliability of Tuckman Procrastination Scale was evaluated utilizing three distinct coefficients: Cronbach's alpha (α), McDonald's omega (ω), and Guttmann's lambda (λ6). Cronbach's alpha coefficient produced a value of 0.814, indicating the scale's strong reliability. Additionally, the McDonald's omega coefficient also demonstrated commendable reliability with a value of 0.812, while Guttmann's lambda coefficient yielded a value of 0.814.

Table 3. Relationship of the Tuckman Procrastination with the variables

Variable	**Correlation with Tuckman Procrastination**		**95% Confidence Interval**	
	r	**p**	**LL**	**UL**
Self-efficacy	-0.424	<0.001	-0.483	-0.362
Motivation	-0.293	<0.001	-0.359	-0.224

Regarding criterion-related validity, the analysis identified several correlations with the Tuckman Procrastination. Results on table 3. illustrated that procrastination has negative correlations with academic motivation ($r = -.293$, $p < .001$), and academic self-efficacy ($r = -.424$, $p < .001$).

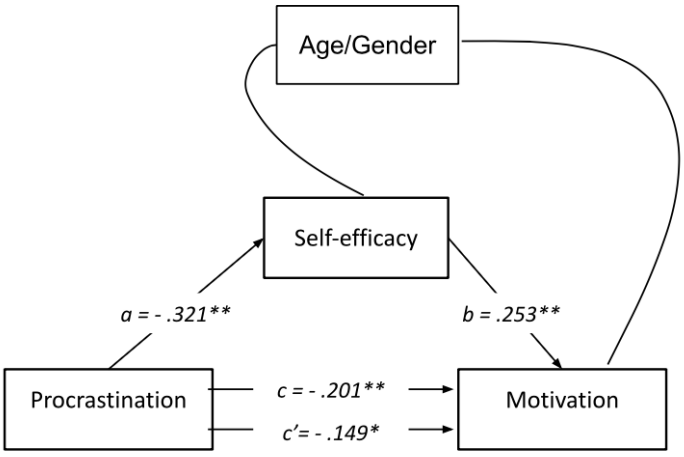

Figure 2. Predictive validity of Tuckman Procrastination Scale

Predictive validity analysis was conducted to reveal whether academic self-efficacy performs as a mediational variable in the association between procrastination and academic motivation. To evaluate the mediation effect of self-efficacy, as demonstrated Figure 2. Bootstrap studies were carried out. Obtained results illustrate that self-efficacy performs a mediating function in the relationship between procrastination and academic motivation. The Bootstrap coefficient was estimated at-.0193, with a 95% confidence interval spanning from -.193 to -.117. Furthermore, results displayed a significant association between procrastination and self-efficacy ($\beta = -0.321$, $p < .001$) and revealed a direct link between 2 variables. Additionally, association between procrastination and motivation ($\beta = .201$, $p < .001$) revealed as well.

Procrastination is a multifaceted behavior that cannot be merely defined as the intentional postponement of task completion, as it also involves the perception that such delays are unnecessary or avoidable, in addition to the

individual's intention to defer responsibility (Munda et al., 2024). Given the prevalence of procrastination in the academic sphere and its negative impacts, it is essential to have psychometrically sound scales for measurement. The Tuckman Procrastination Scale is extensively used worldwide to measure procrastination among adolescents and school students, examining their academic performance in depth. The research assessed the psychometric properties of scale in Azerbaijani students. Therefore, the primary aim of the present study is to adapt the Tuckman Procrastination Scale to Azerbaijani, to assess its psychometric properties. Additionally, examination of the relationship between procrastination, academic motivation and self-efficacy is another purpose of the study.

In present study, structure validity of the Tuckman Procrastination Scale was examined through a confirmatory factor analysis (CFA). The psychometric findings of analysis revealed that three items of TPS showed factor loading values below .30 and TPS-Azerbaijan has different structure compared to the original version of scale. Analysis demonstrated that unidimensional 13 items of the scale displayed satisfactory results regarding internal consistency and reliability and TES-Azerbaijan enables us to accurately measure individuals' levels of procrastination. During the adaptation process, specific features of the Azerbaijani language and culture were carefully considered, ensuring that the scale is suitable for use in the local context.

The Item Response Theory (IRT) analysis was conducted to evaluate the reliability of all items and examine their fit to the model. For the Azerbaijani version of the Tuckman Procrastination Scale, the item discrimination indices were found to be above 1.0, which, according to Baker (2001), indicates strong discriminative power. The results revealed that only two items had discrimination values below 1.0, while the remaining 12 items exhibited values above 1.0, demonstrating exceptionally high discriminative ability. Overall, the IRT findings suggest that the items in the Azerbaijani version of the Tuckman Procrastination Scale are appropriately calibrated in terms of item difficulty.

Tuckman Procrastination Scale, consisting of 13 items, was subjected to psychometric testing using various methods and samples. Several analyses were examined to evaluate the internal consistency of the Tuckman Procrastination Scale. According to Nunnally and Bernstein (1994), a Cronbach's alpha value above 0.70 is considered acceptable. Obtained results displayed that internal consistency of TPS was above 0.70. In other words, Cronbach's alpha, McDonald's Omega and Gutmann's Lambda analyses were performed to evaluate internal consistency. The findings revealed Cronbach's alpha was precisely .814, McDonald's Omega was .812, and Gutmann's Lambda was calculated to be .814 in this study.

In terms of criterion-related validity, the relationship between procrastination, academic motivation and self-efficacy was investigated. Acquired findings indicated negative correlation between procrastination and self-efficacy. Low self-esteem increases the likelihood of procrastination, as students doubt their ability to succeed and it generates school-related problems (e.g., low grades) and stress-related physical discomfort (Liu et al., 2020; Ge et al., 2018). The emotional consequences of procrastination, including anxiety and stress, create a negative feedback loop that further lowers academic performance (Rustamov et al., 2023; Ziegler & Opdenakker, 2018; Przepiorka et al., 2019). Findings also showed that procrastination negatively correlates with motivation (Oram, 2021; Steel & König, 2006). Higher levels of motivation are often associated with lower levels of procrastination. Motivation is positively influenced by the anticipated outcome and the perceived value of the goal, yet it tends to diminish over time. As the expected outcome becomes more distant and impulsivity increases, the likelihood of procrastination rises (Gröpel & Steel, 2008).

As with any research, this study also has certain limitations. The first limitation is that the participants were exclusively students living in Baku and surrounding districts. Studies conducted on students with different demographic characteristics in various geographical regions and schools may yield different results. Therefore, the findings of this study may not be generalizable to participants from other regions. The second limitation is that the majority of the participants were female. In future research, a more balanced gender distribution could lead to more efficient results. Another limitation is that the survey was conducted in only one language, Azerbaijani. This could prevent participation from individuals with language barriers, especially students who speak different languages, thereby limiting the study's generalizability. Finally, the online format of the survey presents additional limitations, as it only includes individuals with internet access, reducing the likelihood of representation for some groups. Although the adaptation of the Procrastination Scale for Azerbaijan makes a significant contribution to the field of educational research, these limitations highlight the need for cautious interpretation of the results.

Conclusion

This study aimed to adapt the Tuckman Procrastination Scale for use within the Azerbaijani context, addressing the need for culturally relevant instruments to assess procrastination behaviors in academic settings and explore its relationship with self-efficacy and academic motivation. The findings indicate that the Tuckman Procrastination Scale is not only suitable for use within the Azerbaijani context but also demonstrates strong psychometric properties, including high validity and reliability. This suggests that the scale is an effective tool for assessing academic procrastination among Azerbaijani students, making it a valuable resource for both researchers and educators in the region. By extending the scale's use in different fields, including psychology, education, and counseling, and by incorporating it into intervention strategies, future research could contribute to a more comprehensive understanding of procrastination behavior. The findings from these studies could help develop culturally sensitive and context-specific interventions that address the root causes of academic procrastination, ultimately leading to more effective strategies for promoting academic achievement and well-being in Azerbaijani students.

Acknowledgements
We appreciate all the participants who willingly took part in this study.

Authors' contributions
BA, ER, UZN, AF, and RM were involved in designing the study. BA, NA, LI, FA, and RM were responsible for organizing the database. ER, UZN, and RM conducted the statistical analysis. BA, ER, AF, RM, NA, and LI wrote the initial draft of the manuscript. All authors contributed to revising the manuscript, reviewed, and approved the final version submitted.

Ethical Approval
This study adhered to ethical guidelines established in Helsinki Declaration of 1975, as revised in 2000 and was approved by the Ethics Committee of the Psychology Scientific Research Institute in Baku, Azerbaijan (Approval number: T-323).

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International Journal of Contemporary Educational Research
Volume 11, Number 4, December 2024, Page 537-555 Article Type: Research Article

Experiences of Primary School Teachers Regarding Individualized Education Programs and Mainstreaming/Integration in Türkiye

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Abstract
This study addressed the experiences of primary school teachers in Türkiye regarding inclusion/integration and Individualized Education Programs (IEP). The study also addressed how mainstreaming/integration and IEPs might impact students without special needs and their parents. This qualitative study adopted a phenomenological research design. The sample consisted of 17 primary teachers recruited using criterion sampling. Data were collected using a semi-structured interview guide and analyzed using inductive content analysis and phenomenological coding. The results indicated that participants expressed the opinion that mainstreaming was not applicable in general education. They also believed that the IEP was unfunctional. They used ready-made IEPs, albeit not actively. They were of the opinion that class sizes and physical conditions of schools were not suitable for mainstreaming education and that they were left alone in the mainstreaming/integration.

Keywords: Individualized education programs, Mainstreaming/integration, Primary teacher, Special education, Phenomenology

Citation
Dayı, E., Toraman, Ç., Özkan-Renk, P. & Öztürk, B. (2024). Experiences of primary school teachers regarding ındividualized education programs and mainstreaming/ıntegration in Türkiye. *International Journal of Contemporary Educational Research*, *11*(4), 537-555. https://doi.org/10.52380/ijcer.2024.11.4.675

Received	02.07.2024
Accepted	28.10.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Ethical Statement	This article was presented in Educongress 2023.
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The authors has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The authors acknowledge that they received no external funding in support of this research.

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Introduction

Education has evolved significantly alongside sociocultural, political, economic, and technological changes over time. As part of this evolution, educators have focused on both typically developing students and students with special needs. In the realm of educating students with special needs, practices initially known as mainstreaming and later as integration in the pertinent literature (Yücesoy Özkan et al., 2021) were formally conceptualized as inclusive education through the Salamanca Statement adopted during the World Conference on Special Needs Education organized by UNESCO in 1994 (Tonegawa, 2022). Inclusive education is a journey, not a destination (Runswick-Cole, 2011). International conferences, including the Global Education Meeting and the Brussels Declaration in 2018, have declared that the primary mission of inclusive education is to ensure that the right to a safe, quality education throughout life is a universal entitlement for all individuals (Florian, 2019).

Building on these global efforts toward inclusive education, Türkiye has developed its own regulations that shape the educational practices for students with special needs. The principles of educational activities for these students are outlined in the Regulation on Special Education Services (RSES) (Ministry of National Education, 2018) under the category of "Mainstreaming/Integration Educational Activities (MIEAs)." Therefore, Turkish researchers use the term "mainstreaming/integration education" instead of inclusive education (Çağlar, 2012). Mainstreaming/Integration Educational Activities" are defined as forms of education that encompass both full-time schooling with typically developing peers and part-time education within special education classes. These activities are designed to facilitate interaction with individuals of diverse abilities and educational backgrounds while enabling students with special needs to achieve their educational objectives at the highest possible level. According to data from the Ministry of National Education (MoNe) for the academic year 2022-2023, a total of 384,250 students with special needs are currently receiving education through MIEAs across all levels of education in Türkiye. This indicates a commitment to inclusive education practices and providing educational opportunities to students with special needs.

In addition to the emphasis on inclusive practices, it is also a legal obligation in Türkiye, as it is in many countries worldwide, to prepare Individualized Education Plans (IEPs) for students with special needs. This requirement extends to those participating in MIEAs and other educational settings. IEPs are a critical component of special education and inclusive education practices, as they outline the specific goals, support services, and accommodations tailored to meet each student's unique needs. These IEPs ensure that students receive an appropriate and inclusive education, further reflecting the commitment to providing equal educational opportunities to all students, regardless of their abilities or disabilities (Smith & Brownell, 1995; Yell et al., 2013). In addition to the legal obligation to prepare IEPs, Türkiye has established a process to ensure their effective development and implementation. This process involves the establishment of an IEP development unit (MoNe, 2018), typically led by the school principal or vice principal, and comprising various stakeholders, including parents or guardians, classroom teachers, guidance counselors, other subject teachers, and students. Furthermore, guidance and research centers (GRCs) provide the necessary support for the establishment and functioning of an IEP unit. These GRCs play a crucial role in facilitating the development and implementation of IEPs for students with special needs, offering expertise, resources, and guidance to schools and educators in creating effective IEPs that address the unique requirements of each student. This support helps ensure that students with special needs receive the necessary accommodations and services to succeed in their educational journeys within the inclusive education framework in Türkiye (MoNe, 2018).

Building on this foundation, the most significant responsibility of an IEP development unit established at a school, especially when a student with special needs is placed through a GRC, is to not only prepare the student's IEP but also to oversee the implementation process. The IEP development unit prepares an IEP for students with special needs by assessing their performance level, establishing long and short-term goals, selecting teaching methods and materials, defining start and end dates for each short-term goal, and facilitating a personalized educational plan to meet their unique needs and objectives. Additionally, the IEP development unit finalizes the IEP by specifying the support services (such as support rooms, physiotherapy, speech and language therapy, psychological counseling, etc.) that students with special needs will receive, ensuring a comprehensive plan for their educational and developmental needs (Kargın, 2007). It is essential for all stakeholders to collaborate to ensure that an IEP is both educationally appropriate and legally sound. Because one of the most important factors in the success of mainstreaming, which includes the preparation and implementation of IEP, is cooperation (Salend, 1998). This collaborative effort helps create a comprehensive and legally compliant IEP that meets the unique educational needs of students with special needs (Christle & Yell, 2010; Pilhaja & Holst, 2013; Stroggilos & Xanthacou, 2006; Yell et al., 2013).

Numerous researchers have investigated teachers' views of IEPs and MIEAs. Studies indicate that teachers often feel they do not collaborate effectively with their colleagues or parents during the IEP process (MacLeod et. al., 2017; Stroggilos & Xanthacou, 2006). Additionally, teachers report gaps in their knowledge of preparing IEPs (Kartika et al., 2018; Mereoiu et. al., 2018). Research also shows that teachers need to develop professional skills to implement IEP processes (Bhroin & King, 2019; Lee-Tarver, 2006; Timothy & Agbenyega, 2018).

In the Turkish context, similar challenges have been identified, reinforcing global concerns about IEP processes. Turkish researchers have documented that classroom teachers have negative views of MIEAs (Burunsuz & İnce, 2020; Sadioğlu et. al., 2013). A key factor contributing to these negative perceptions is that many teachers use ready-made IEP plans (Burunsuz & İnce, 2020), due to the difficulty they face in preparing their own plans (Söğüt & Deniz, 2018). Moreover, many schools do not have formal IEP units (Özan & Dolunay Sarıca, 2021), and the lack of time and resources available for IEP implementation (Batu et. al., 2018; Deniz & Çoban, 2019; Ersoy et. al., 2021) create significant barriers. Compounding these issues, many teachers do not know how to prepare IEPs (Çıkılı et. al., 2020; Değirmenci Kurt & Tomul, 2019; Evyapan, 2020; Gündüz & Zorluoğlu, 2023; Ünal, 2010), and cooperation among IEP unit stakeholders remains insufficient (Baran, 2021; Batu et al., 2018; Yener & Dayı, 2021).

These challenges underscore the vital role that general education teachers play in the inclusive education of students with special needs, particularly in the context of MIEAs. They have a significant responsibility to create a supportive and inclusive learning environment and to help those students achieve their educational objectives. There are two critical steps in ensuring positive outcomes for students with special needs. The first step involves the correct and effective management of the IEP preparation process, while the second step is the active use of the IEP during the implementation phase. Properly prepared IEPs are fundamental to the success of students with special needs. Involving educators, specialists, parents, and students in the IEP development process ensures that the plan is comprehensive and tailored to the unique needs and strengths of the student (Barnard-Brak & Lechtenberger, 2010).

Given these challenges and the important role teachers play, this study had two objectives: (1) providing insights into the real-world practices, challenges, and perspectives of classroom teachers involved in the preparation and implementation of IEPs and (2) addressing the perspectives and views of typically developing students and their parents regarding the implementation of IEPs tailored to students with special needs in their classrooms.

Method

This qualitative study adopted a phenomenological research design to seek answers to the questions of how classroom teachers are involved in the preparation and implementation of IEPs tailored to the needs of their students with special needs and what typically developing students and their parents think about the implementation of IEPs. Phenomenology focuses on uncovering the reality found in individuals' lived experiences (Moustakas, 1994). Rather than accepting concepts at face value, phenomenology encourages questioning what we know. It suggests we approach familiar ideas with fresh curiosity, as if we were outsiders examining them for the first time. In this process, phenomenological sociologists explore how people interpret their social reality when cultural concepts are set aside or "bracketed," as in Husserl's concept of epoché (Creswell, 2013). A key question in these studies is: "How do we organize our experiences to create a shared understanding of the world?" (Wallace & Wolf, 1995).
Phenomenological research aims to reveal the common meaning behind people's experiences of a concept or phenomenon (Creswell, 2013). This approach assumes that people's experiences can be analyzed, that these are conscious experiences (van Manen, 2016), and that the focus should be on understanding the shared essence of these experiences (Miles, Huberman & Saldaña, 2014; Moustakas, 1994).

Participants

The sample consisted of 17 primary teachers recruited using criterion sampling, which is used to specifically select participants or cases based on predetermined criteria or characteristics that are relevant to the research question or study objectives (Miles et. al., 2014). The inclusion criteria were (1) being a primary school classroom teacher, (2) having inclusive students, (3) volunteering, and (4) giving consent for audio recording.
Participants were recruited until data saturation was reached, following a process where researchers conducted an interview, transcribed it verbatim, coded the data, confirmed the coding process, and then interviewed the second participant. They followed the same procedure for each participant. They terminated recruitment once data

saturation was achieved (Merriam & Tisdell, 2016). In other words, they noticed that new interviews were no longer providing substantially new insights or information. At this point, they had a comprehensive understanding of the phenomenon and therefore deemed further interviews unnecessary.

Data Collection Tools

Data were collected using a semi-structured interview guide with flexible questions developed by the researchers through a literature review and examination of legal texts related to "The Ministry of National Education Special Education Services." The initial guide featured eight main questions and probe questions, which were refined based on feedback from three experts in qualitative research and special education. The researchers further revised the interview guide after a pilot study involving two primary teachers. Based on the pilot study results, the final interview guide comprised ten main questions and probe questions (Merriam, 2018).

Data Collection

The study was approved by the Ethics Committee of Gazi University (E-77082166-604.01.02-548721). All teachers were briefed about the research purpose and procedure. Informed consent was obtained from all participants. The interviews were held one by one. An interview was transcribed and analyzed before the next one was conducted. Participants were recruited until data saturation was achieved. Each interview lasted 15 to 37 minutes, with an average of 23 minutes.

Researchers' Role

This research was conducted by a team of four researchers, including one who serves as a special education academic at a state university in Türkiye, another who holds an academic position at a state university in Türkiye, and two researchers currently pursuing their Ph.D. degrees in special education with master's qualifications. Providing information about the characteristics and qualifications of the researchers in a qualitative research report is a valuable practice. It helps readers understand the backgrounds, expertise, and perspectives of the researchers conducting the study. This transparency can enhance the credibility and trustworthiness of the research findings and provide context for readers to interpret the study's outcomes and conclusions. It is important to establish the researchers' qualifications and potential biases, if any, as it contributes to the overall transparency and rigor of the research (Creswell, 2013; Marshall & Rossman, 2016).

The specialized training of the researchers in the field of special education is an asset as it provides them with the expertise and knowledge to think prescriptively about educational practices, the development of IEPs, and their preparation and implementation in alignment with students' unique characteristics. The researchers' perspective that teaching is a professional occupation primarily rooted in knowledge and skills with less emphasis on emotion is an important aspect to consider when evaluating the research. This perspective can influence their approach to the study, their interpretation of findings, and the recommendations they propose. Readers should take into account the researchers' perspective and how it might shape the research process and outcomes.

Data Analysis

In this research, an inductive content analysis method was employed. Inductive content analysis involves directly deriving themes and categories from the dataset, allowing patterns and insights to emerge from the data itself. The steps of phenomenological data analysis developed by Moustakas were followed (Creswell, 2013; Moustakas, 1994). First, the researchers developed their unique definition of the concept of "experience" to adopt a phenomenological approach to explore phenomena (mainstreaming, IEPs, and support rooms). This process involved capturing and interpreting the lived experiences of individuals involved in these educational contexts to construct a nuanced understanding of what it means to navigate and participate in such systems. This approach allows the researchers to offer a rich and context-specific definition of "experience" as it relates to the phenomena under investigation. The researchers recorded and transcribed all statements in the interviews and then analyzed them based on the assumption that each statement was of equal value. The researchers removed other repetitive, irrelevant, and unrelated statements from the data list. Following their data analysis process, they directed their

attention to a list of statements that were closely linked to the phenomenon they were investigating. They associated and clustered these statements into meaning units or themes. Themes in qualitative research are often exemplified through what can be described as the "textures of the experience" or textural descriptions. These are narratives or descriptions provided by participants that convey their perceptions, thoughts, feelings, and experiences related to a particular phenomenon. The researchers combined individual textural descriptions and arrived at composite textural descriptions. They combined the textural descriptions of the meanings of experience with structural descriptions. At this stage, the researchers prepared narratives with textural descriptions of the "what" and structural descriptions of the "how." They arrived at a composite description of the phenomenon from the combined textural and structural descriptions. Finally, they arrived at the essence of these experiences.

To assess the reliability of the expert opinions received during the external evaluation of the analyzed data, the researchers conducted an internal consistency calculation using the Krippendorff Alpha coefficient. The resulting coefficient was .739, indicating a high level of consistency among the expert opinions. This suggests that the expert assessments were generally in agreement, enhancing the trustworthiness of the external evaluation process in terms of consistency (Krippendorff, 2004).

Trustworthiness, Credibility, and Transferability

In this study, the researchers took several steps to uphold data reliability. They scheduled individual appointments with each participant, provided a comprehensive briefing on the research purpose and procedure, and obtained informed consent. Additionally, they sought renewed consent for audio recording when initiating recordings. Each researcher thoroughly analyzed each interview before moving on to the next one. Furthermore, the researchers engaged in collaborative discussions and consensus-building regarding their findings (Creswell, 2012). These practices contribute to the study's trustworthiness and the reliability of its data.

The researchers performed participant verification for credibility (Merriam & Tisdell, 2016). They completed the analysis and produced findings. Before writing up the findings, they reached out again to two of the participants and sought their views on whether the data and the meanings reflected their experiences. They also consulted three experts who are academics working in the field of educational sciences and have previously conducted qualitative research. The researchers asked the experts to check the data and the findings to ensure peer debriefing (Creswell & Miller, 2000; Lincoln & Guba, 1985). Lastly, the researchers used direct quotes from all participants to provide an accurate and coherent picture of their views (Christensen et. al., 2014).

Results

The data were grouped under four cores: (1) We do stuff that does not really make sense, (2) we are professionals, (3) we are conscientious, and (4) we have been left to our own devices. This section presents the findings.

We Do Stuff That Does Not Really Make Sense

The first core was, "We do stuff that does not really make sense." Figure 1 summarizes the core with an image.

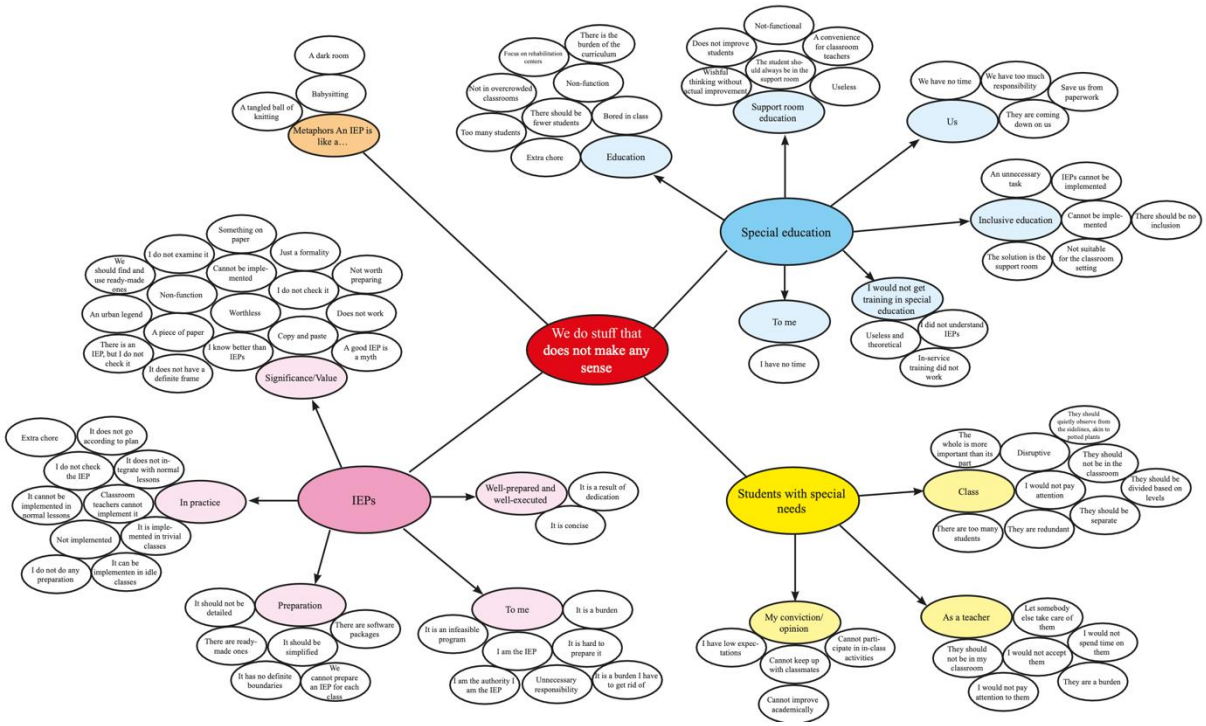

Figure 1. We do stuff that does not really make sense.

In the realm of special education, teachers often find themselves entangled in numerous tasks and obligations associated with various facets of education, including support room education, mainstreaming, and specialized training. While some teachers receive training in special education, these training experiences may vary, with some occurring during their university education and others provided as in-service training throughout their professional careers. However, there is a perception that certain training programs tend to be overly theoretical and lack practical relevance, leading to the perception that they are a waste of time as they fail to address the practical needs of teachers in the field of special education.

One of the participant teachers expressed their perspective on inclusion activities in special education, asserting that they consider such activities not only a waste of time but also impractical. They argue that the typical classroom environment is not conducive to inclusive education, and as a result, these practices should not be implemented. Additionally, the participant highlighted the issue of IEP implementation, suggesting that this is another challenge faced in the field of special education. In their view, the solution lies in providing education exclusively within the support room setting:
"I don't think having an inclusion class makes sense. Instead, we should have dedicated classes where we can really put the program into action. I'm talking about separate classes, like those support rooms, where you can properly carry out the IEP."

Trying to implement special education in overcrowded classrooms is just not feasible. Some see it as a futile effort that only adds more stress to teachers who are already grappling with the regular curriculum. Moreover, inclusive students in these crowded classrooms may end up feeling unengaged. Instead, authorities should prioritize special education and rehabilitation centers over public schools and classroom teachers. Here is how the participant voiced her perspective:
"Those special needs students, they're basically just hanging out in regular classrooms. They're copying what the teacher puts on the board or trying to keep up with their buddy's notes. It's like they're there as duplicates, not really learning anything."

Support room education in special education can be boiled down to "wishful thinking without actual improvement." It does not really help students make progress and seems to be flawed and ineffective. However, it does offer some relief to classroom teachers. Some argue that inclusive students should always receive their education in these rooms.

Participants have their unique viewpoints on the circumstances of students with special needs in the classroom and their own roles as teachers. They tend to keep their expectations low for students with special needs due to their struggles in keeping pace with classmates, participating in class activities, and achieving academic progress. Some participants expressed a desire for these students to be placed in a different class with specialized care. They feel that these students can be challenging for teachers to manage and may not be readily accepted in the regular classroom setting.

Some participants feel that students with special needs create overcrowding and disruptions in the classroom, suggesting that they shouldn't be in the regular classroom. They believe that there are just too many students in one class and propose that students should be grouped by their skill levels. Furthermore, they argue that students with special needs should be separated from the regular class, emphasizing the importance of the whole class over the needs of one student. If transferring them to other classes is impossible, they envision a scenario where these students quietly observe from the sidelines, akin to potted plants. This perspective is described by one of the participants as follows:
"You know, I think students with special needs should be in a different classroom."

Participants find it challenging to prepare and carry out IEPs and view this task as a heavy burden on their shoulders. Participants see themselves as the authority of knowledge. They find it a waste of time preparing IEPs because, to them, the teacher is the IEP. A well-prepared or implemented IEP is a short and concise program that requires dedication. A participant described this situation as follows:
"How about we just jot down those IEPs on paper and lighten the load on ourselves."

Participants should not be required to provide elaborate IEPs. In fact, there is software accessible to assist teachers in crafting IEPs. Moreover, ready-made IEPs can be located in various sources. The parameters of an IEP are not distinctly defined. Furthermore, it is not obligatory to create an IEP for every subject.

Implementing IEPs within the regular teaching routine presents significant challenges. Integrating them into lessons is a demanding task that increases teachers' workloads. Participants, in general, are not inclined to use IEPs as the basis for their teaching due to the associated difficulties. They believe that IEPs are more suitable for implementation in support room education or within special education and rehabilitation centers. If there's a need for their application, it is suggested that they may be more feasible for less critical subjects or during free periods. This sentiment was articulated by the participant teacher as follows:
"Well, we don't have to use IEPs in every single class, but we can definitely use them in subjects like art, music, or gym."

What is the significance or value of IEPs for the participants? A well-crafted IEP is often seen as a mythical concept. Some participants questioned the worth of preparing IEPs, considering them nothing more than a cut-and-paste exercise and mere procedural documents. IEPs that exist solely on paper hold little value for the participants. They often disregard IEPs, viewing them as dysfunctional and impractical. In summary, to some, an IEP appears to be nothing more than a piece of paper and a myth. For them, it may be more practical to locate pre-made IEPs and put them to use. This perspective was expressed by one of the participants as follows:
"Honestly, I barely have time to put those plans into action. And you know what? Even if the IEP looks good on paper, with all those numbers and charts, we just check the boxes."

Participants were prompted to share their metaphors for IEPs. They likened them to the act of babysitting students. They also compared IEPs to a dark room filled with uncertainties or a tangled ball of knitting.

We Are Professionals

The second core was, "We are professionals." Figure 2 summarizes the core with a tree of meanings.

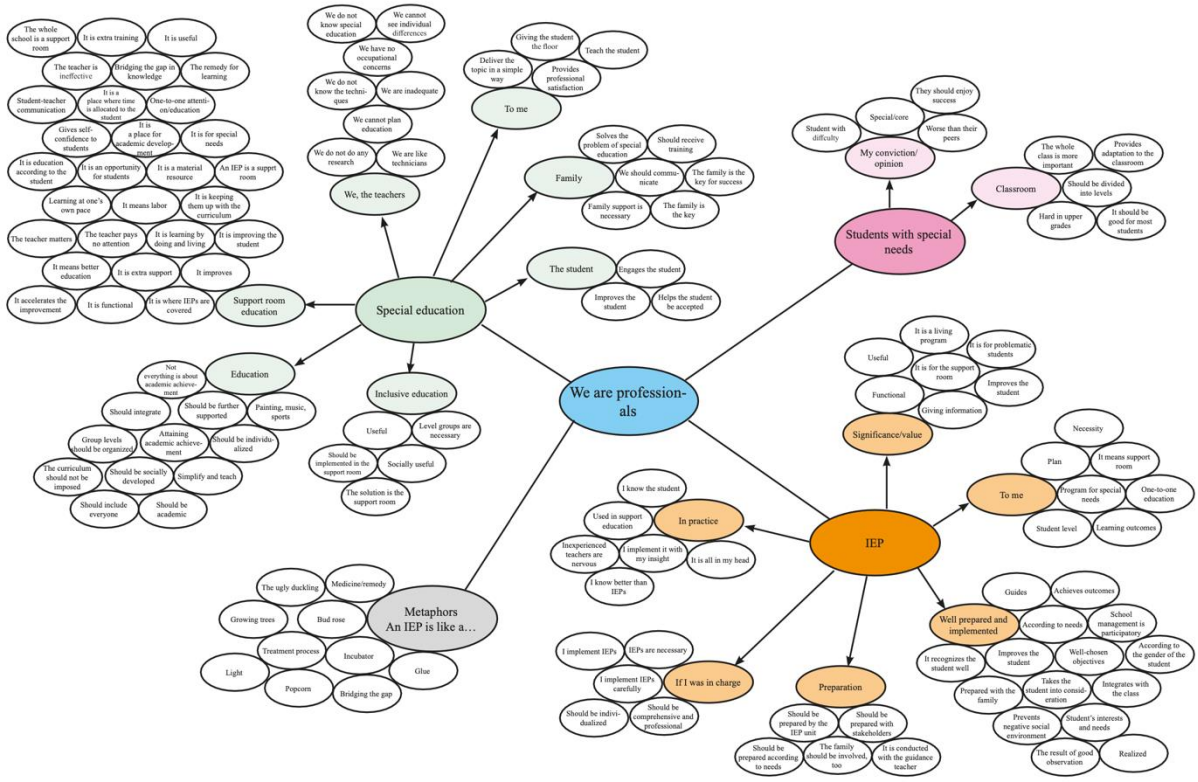

Figure 2. We are professionals.

Participants showcased their professional expertise in the realm of IEP preparation and implementation and provided insights into how well-constructed IEPs make sense to them. They also articulated how they would handle the implementation of IEPs if they were in positions of authority. Their interpretations of IEP application within their professional roles can be summarized as follows: IEPs utilized in support education are perceived as less significant because the teachers themselves have intimate knowledge of their students. Furthermore, everything that could be documented in IEPs is already ingrained in teachers' minds. Only inexperienced educators might feel anxious about executing IEPs. Experienced teachers rely on their own expertise to guide their teaching, believing they understand their students better than what IEPs can capture. If these teachers were in positions of authority, they would ensure that IEPs were meticulously crafted and executed programs tailored as closely as possible to each student's unique needs. This perspective was articulated by two participants in the following manner:
"I know my students better than IEPs. I don't think it's right to rely solely on those documents."
"I don't constantly refer to IEPs. I already have a good grasp of what my students need."

IEPs should be developed by specialized IEP units involving stakeholders like parents and guidance counselors to ensure customization based on specific needs. Well-prepared IEPs, which are effective when put into practice, should be needs-oriented, offering guidance and facilitating students in reaching their learning objectives. A quality IEP, capable of enhancing a student's progress, should be clearly defined, feature carefully selected learning goals, consider the student's individuality, be gender-sensitive, and be prepared collaboratively with the family. Successful implementation of well-crafted IEPs results from diligent observation, promotes a positive social environment, and facilitates the student's integration into the classroom.

For professionals like the participants, IEPs hold practical value as dynamic programs. They serve as essential blueprints, offering insights into students' proficiency levels. These plans are intended for support room education, specifically designed for students with special needs. IEPs represent educational achievements and signify individualized learning opportunities, particularly in the context of support room instruction.

Students with special needs, while facing challenges, each possess unique qualities and deserve the opportunity to thrive. However, when considering the entire class, the collective needs of the class take precedence. Therefore, it suffices for students with special needs to integrate into the class. In fact, it might be reasonable to group them by

proficiency levels. As grade levels advance, the challenges for students with special needs in the classroom tend to intensify. One of the participants articulated this perspective as follows:
I don't teach based on IEPs; it's not really feasible for me. I mean, I've got 30 students to handle. There's a curriculum I need to cover, and it's the same for all of them. Plus, those three students in inclusive education have their own unique needs and abilities. I don't really have the opportunity to provide individual tutoring in the classroom, and it's just not practical. Once you start down that road, there's no end to it."

According to the participants, special education plays a vital role in fostering the acceptance, inclusion, and overall development of students within the classroom. Parents of students in special education hold a crucial position. Maintaining open communication with them is essential. Their support is invaluable because collaboration with them is imperative for success. Therefore, it is essential to educate and inform parents about special education. From a professional standpoint, some teachers offering special education may not adequately recognize individual differences, lack research initiatives, possess limited knowledge of special education and its techniques, and may experience certain shortcomings. Teachers who do not actively engage in professional growth may approach their roles more mechanically, akin to technicians, and may struggle with educational planning.

For the participants, support rooms are a pervasive resource throughout the school and serve as valuable assets. They function as a remedy for addressing learning gaps and offer opportunities for additional education to bridge knowledge deficits. Support rooms foster meaningful teacher-student interactions and enable educators to dedicate personalized, one-on-one instruction to their students. These rooms play a pivotal role in boosting the self-confidence and academic performance of students with special needs. They serve as functional supplemental classrooms, creating a hands-on learning environment that accommodates individual learning paces and facilitates curriculum catch-up. Support rooms are the designated spaces for processing IEPs. However, it is crucial to note that teachers responsible for support room education are not very effective. Some view it solely as a means of financial gain.

In the realm of special education, it is crucial to avoid exclusively prioritizing academic success and imposing rigid curricula. Instead, special education should aim to simplify and facilitate learning. Nevertheless, it is evident that some teachers tend to place excessive emphasis on academic achievements. Special education should provide additional support, foster inclusivity, and place a strong emphasis on students' social development. Additionally, grouping students according to their proficiency levels can be beneficial. While inclusion education holds value, it may be more effectively implemented within the support room setting.

Participants were asked to express their metaphors for IEPs. They viewed IEPs as medications, remedies, light, and treatment. The metaphorical power of IEPs in the eyes of participants is striking. IEPs are seen as transformative tools, turning students from "ugly ducklings into swans." Students are likened to budding roses or popcorn kernels, symbolizing their potential for growth and development. IEPs are compared to glue, highlighting their role in binding students to their classmates and the classroom community. They are viewed as gap-closers, bridging the divide between students with special needs and their peers, and even as "incubators" that breathe new life into their educational journeys.

We Are Conscientious

The third core was, “We are conscientious.” Figure 3 summarizes the third core with an image.

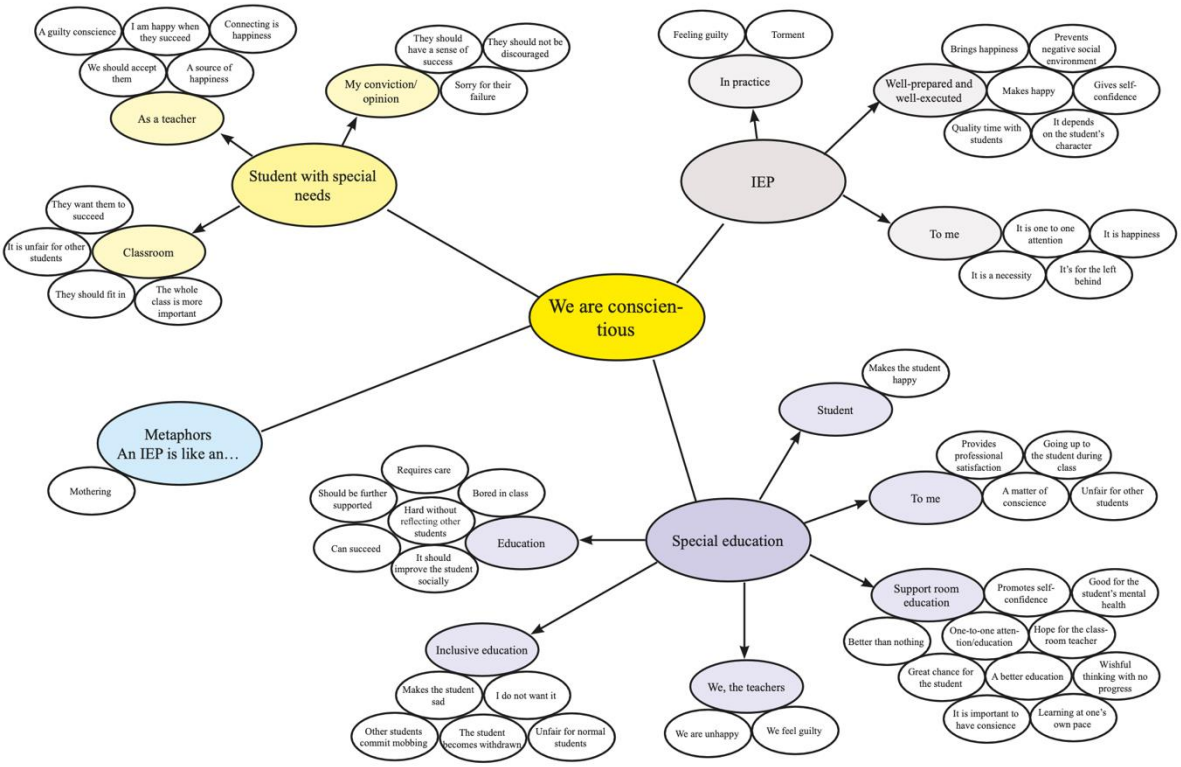

Figure 3. We are conscientious.

Conscientious teachers may experience guilt when they are unable to implement IEPs. For these educators, IEPs are regarded as essential and synonymous with providing personalized attention. Executing IEPs for students who are struggling academically brings them joy. A well-prepared and effectively executed IEP not only translates to valuable one-on-one time with the student but also fosters the student's self-confidence, bringing intrinsic happiness. A successful IEP should be tailored to the student's individual characteristics and work to mitigate negative social influences.

For conscientious teachers, special education brings happiness to students and is an act of conscience that provides professional satisfaction. However, it can be perceived as unfair to other students. Support room education, characterized by individualized attention, has a positive impact on students' self-confidence and psychological well-being. It offers one-on-one education and support, ultimately resulting in better educational outcomes for the student. This approach presents a significant opportunity for the student's growth. A conscientious teacher should prioritize the student's needs and ensure they learn at their own pace. The support room becomes a beacon of hope for both the teacher and the student. In a traditional classroom setting, it can be challenging to implement Individualized Education Programs (IEPs) and see significant improvements in the student's progress. One of the participants expressed this situation in the following words:
"I treat them as if they were my own children. I really want to see them progress. There's a difference in how someone with a child and someone without a child interacts with children, you know."

Conscientious teachers may experience feelings of guilt and dissatisfaction regarding special education practices. In reality, inclusive education can sometimes be viewed as compromising the rights of typically developing children in the classroom, leading to discomfort among students with special needs who may experience bullying. This is one of the reasons I am not in favor of mainstreaming. Special education should ideally provide additional support, be delivered with care, and aim to foster social development in students with special needs. While this goal is attainable, it is undeniably challenging. Implementing special education effectively while considering the needs of both typically developing students and those with special needs can be demanding. As a result, students with special needs might feel disengaged in a mainstream classroom setting. One of the participants articulated this situation with the following words:

"I used to provide a different exam paper for my student with special needs, but then the other students started asking why he got a different paper. So, I switched to giving him the same paper but with accommodations. Then, my student with special needs started questioning, 'Why am I being tested differently? Why is my paper different?' It made me wonder if he fully understands his differences. I mean, some students are aware of their differences, while others may not be. It varies from student to student…"

For conscientious teachers, it is essential that students with special needs are not discouraged and are given opportunities for a sense of accomplishment. However, they may also be saddened by the challenges they face in addressing the diverse needs of their students in the classroom. Personally, I have a strong sense of responsibility and feel a sense of guilt at times when I have students with special needs in my class. Nonetheless, I find joy in connecting with them and witnessing their achievements. We must wholeheartedly accept and support them. It's worth noting that their classmates also want to see students with special needs succeed. However, we must also consider the overall dynamics of the class. Some might argue that having students with special needs in the class can be perceived as unfair to other students. Consequently, there is a belief that students with special needs should adapt and integrate into the classroom environment.

Participants were asked to provide metaphors for IEPs. They likened the implementation of IEPs to the act of mothering.

We Have Been Left to Our Own Devices

The fourth core was, "We have been left to our own devices." Figure 4 summarizes the fourth core with an image.

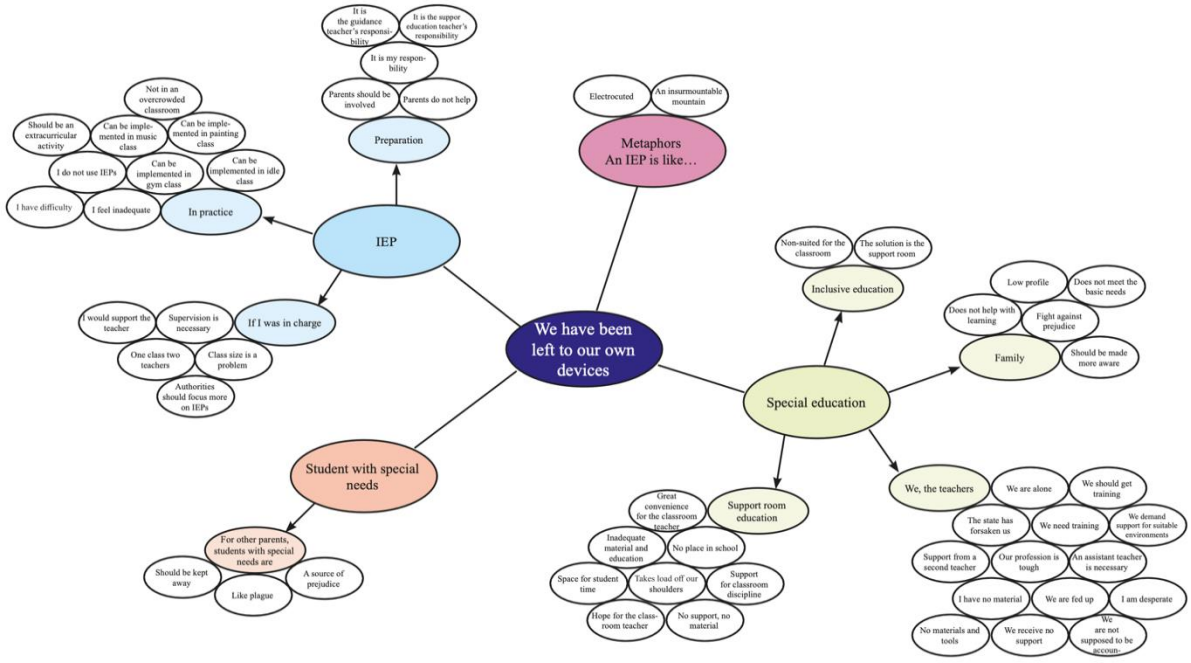

Figure 4. We have been left to our own devices.

According to teachers who feel isolated in their efforts, mainstreaming practices in special education are often deemed unsuitable for the classroom environment. They believe that the solution to the challenges posed by special education lies in support room education. In the realm of special education, there is a perception that parents are not sufficiently involved in assisting their children and may not even meet their basic needs. Typically, parents of students with special needs maintain a low profile, harbor prejudices regarding the special education their children receive, and may require increased awareness and understanding.

In the context of special education, teachers are left unattended by the state. They need a suitable environment, materials, tools, and equipment, and the support of a second teacher. Teachers working in an already difficult profession need training in special education. As with everything else, teachers alone should not be held

accountable for special education. Support room education in special education is a relief and hope for the classroom teacher, taking the burden off the classroom teacher. The school does not allocate space for support room education, and even if space is allocated, there are inadequate materials and training. To summarize, support room education can be explained as "no support, no materials." One of the participants described the situation in the following words:
"Our classrooms are inadequate and overcrowded. We need extra teachers to support us."

For participants who often are left to their own devices, students with special needs can become a source of conflict with parents of typically developing students. Parents of typically developing students may hold biases against students with special needs, view them negatively, and express a desire to keep them separate from their own children. One of the participants described this situation as follows:
"I often witness this attitude from parents; it's as if they see these children as a problem, and I've encountered this sentiment consistently. They question why a child with special needs is in our class, fearing that they might negatively impact our children."

In the realm of special education, the responsibility for preparing Individualized Education Programs (IEPs) typically falls upon teachers, counselors, and support room educators. While parents should ideally be involved and supportive in the IEP preparation process, this is often not the case. Implementing IEPs within overcrowded classrooms can be challenging, but opportunities exist outside of regular class hours, such as during extracurricular activities, art, music, physical education, and sports classes. Free periods also offer a chance to work on IEPs. However, teachers face significant difficulties in implementing IEPs. They are often stretched thin and unable to handle every aspect of the process. If teachers were given more authority in special education and IEP implementation, they could ensure the proper preparation and execution of IEPs. Additionally, reducing class sizes to manageable levels, providing support to teachers, and ensuring the presence of two teachers in a classroom simultaneously would be beneficial. Effective supervision is crucial, and teachers should not be left to handle everything on their own. Two participants articulated this situation with the following words:
"To make IEPs truly effective and beneficial, I believe teachers need more support, better training, and greater encouragement to prepare and implement them."
"The classroom teacher often feels isolated and overwhelmed."

Participants were asked to develop metaphors for IEPs. Participants who felt left alone likened IEPs to insurmountable mountains. They also stated that having students with special needs in their classrooms was like an electric shock.

Discussion and Conclusion

This study focused on three aspects of IEPs. First, it addressed what primary teachers thought about students with special needs included in MIEA. Second, it analyzed IEP preparation and execution processes. Third, it examined what typically developing students and their parents thought about students with special needs and IEPs. Our results pointed to four common cores regarding our participants' views and perspectives: (1) We do stuff that does not really make sense, (2) we are professionals, (3) we are conscientious, and (4) we have been left to our own devices.

As for the first core, "We do stuff that does not really make sense," our participants received in-service training in special education either during their undergraduate education or in their professional careers. However, they viewed these courses as unimportant and unnecessary since they did not seem to enhance their theoretical and professional growth, which is consistent with the literature (Berkant & Atılgan, 2017; Burunsuz & İnce, 2020). Çıkılı et al. (2020) discovered that the challenges faced by teachers in IEP preparation do not vary based on whether they have undergone in-service training or not. This implies that both the special education courses these teachers attend during their undergraduate education and the in-service training they receive in their professional careers may not be effectively serving their intended purposes. This causes teachers to see in-service training programs as a waste of time. General education teachers receive information about special education and IEP through the "special education and inclusion" course during their undergraduate education, which is their pre-service period. Aydın and Yılmaz (2024) state that the courses taken in their study have limitations in affecting the knowledge levels of pre-service teachers on IEP and special education. In the literature, in order for this course given in undergraduate programs to be effective, it is recommended that general education teacher candidates be provided with the opportunity to practice in schools where MIEAs are conducted (Aydın & Yılmaz, 2024; Çekiç et al.,

2024; Karabulut, 2023). In terms of teachers' service period, in-service trainings are utilized to ensure the professional development of teachers related to special education and inclusion. In Türkiye, in-service trainings are organized by MoNE in the form of face-to-face or online seminars or courses (Korukluoğlu & Gürol, 2023). However, it is stated that these methods are not effective because they do not include practice and feedback (Bümen et al., 2012). In the literature, practices that include monitoring and feedback are recommended instead of traditional in-service trainings.One of these is providing mentoring support from experienced teachers (Aktan, 2023).Another professional development support is coaching and counseling practices (Tekin İftar et al., 2018).In line with the recommendations, it is thought that teachers can gain knowledge and skills on MIEAs by increasing the effectiveness of practices in both pre-service and in-service periods.

Our participants hold the belief that MIEAs are generally not suitable for implementation in regular education classrooms. From their perspective, IEPs are more suitable for implementation in support rooms rather than general education classrooms. General education teachers often perceive support rooms as spaces where students with special needs are relocated from the regular classroom environment. This perception may stem from viewing students with special needs as academically challenging and potentially burdensome, leading to the belief that they are not on par with their peers in terms of academic abilities. On the other hand, general education teachers find it challenging to implement IEPs in their classrooms due to concerns about overcrowding and inadequate resources. As a result, they perceive that students with special needs are simply biding their time in general education classrooms without receiving the individualized support they require. Teachers engage in the paperwork required to prepare IEPs even when they believe these plans are ineffective, leading them to feel that they are doing stuff that does not really make sense. Research also shows that teachers believe that general education classrooms are ill-suited for students with special needs because they are inadequate and overcrowded (Akcan, 2013; Baran, 2021; Berkant & Atılgan, 2017; Burunsuz & İnce, 2020; Deniz & Çoban, 2019; Güzel, 2014; Söğüt & Deniz, 2018; Yılmaz & Batu, 2016).

The objective of MIEAs is not solely to bring students with special needs to the same academic level as their peers but rather to empower these students to attain their educational objectives at the highest possible level (MoNe, 2018). According to this statement, teachers should not necessarily anticipate that students with special needs will reach the same academic level as their peers. Instead, the focus is on helping these students achieve their educational goals to the best of their abilities. Teachers are likely to have negative connotations for students with special needs because they do not know this. On the other hand, teachers often state that MIEAs are not feasible because their classrooms are overcrowded (more than 30 students). According to Article 23, paragraph "ğ" in RSES (MoNe, 2006), schools should arrange class sizes in MIEA classrooms to ensure that they do not exceed 25 students when there are two students with special needs and 35 students when there is one student with special needs. However, the current RSES (MoNe, 2018) does not specify any recommendations regarding the number of students in MIEA classrooms. In Italy, the first country in Europe to adopt MIEAs, mainstreaming classes are organized for no more than 20 students (Anastasiou et. al., 2015). Performing MIEAs in overcrowded classrooms can be challenging for teachers. Therefore, it becomes important to establish class size guidelines for MIEAs through legal regulations to ensure optimal learning conditions for both teachers and students.

As for the second core, “We are professionals,” teachers often recognize that IEPs are essential for addressing the needs of students with special needs. However, they do not stick to IEPs during their lectures because they believe that they already know their students with special needs very well. Research also shows that while teachers think IEPs are necessary, they rarely stick to them during their lectures (Alan & Aksoy, 2023; Anilan & Kayacan, 2015; Güzel, 2014; Kozikoğlu & Albayrak, 2022). Teachers think that support room teachers are responsible for implementing IEPs. They noted that support education rooms in schools can be any available space, such as the vice principal's office or the library, which is repurposed for this use. Participants noted that the rooms used as support education spaces were not arranged in accordance with the guidelines outlined in RSES (MoNe, 2018). Participants pointed out that support education room teachers are not chosen based on whether they have undergone in-service training on MIEAs, as outlined in MoNe (2017). Instead, volunteer teachers are typically assigned to these roles. Participants also expressed that support education room teachers may lack the necessary expertise in special education due to financial constraints and resource limitations. Researchers have also reported similar findings. First, some schools have no support education rooms (Yazarkan, 2020). Second, some schools have support education rooms, but they lack the necessary equipment and sources (Filik, 2019; Kaptan, 2019; Yazıcıoğu, 2020). Third, support room teachers are volunteers, not teachers who have received professional in-service training in MIEAs (Yazçayır, 2020).

According to the data obtained from the research, some of the class teachers used ready-made IEPs without any care, while others prepared the IEPs either on their own or with guidance teachers. IEPs are crucial components of MIEAs. Crafting an IEP from scratch is not merely a matter of meeting legal requirements but also about

formulating effective special education plans tailored to the needs of students with special needs (Christle & Yell, 2010). IEPs should not be “cookie cutters” with pre-defined objectives solely based on students' age and disability categories. Instead, they should be individualized to meet the unique needs of each student. Participants expressed that they did not have the time to prepare IEPs because they had too much responsibility. This situation can be explained by the fact that the necessary committee for preparing IEPs in schools (MoNe, 2018) was not convened, classroom teachers were left alone to prepare IEPs, they were in an environment devoid of collaboration and teamwork (MoNe, 2018), and therefore the workload was left entirely to them. In other words, they receive no assistance or support from their colleagues, which is consistent with the literature (Batu et al., 2018; Çıkılı et al., 2020; Değirmenci Kurt & Tomul, 2019; Şahin & Gürler, 2018; Yener & Dayı, 2021).

Regarding the third core principle, "We are conscientious," participants conveyed feelings of guilt for various reasons. Firstly, they acknowledged that they do not consistently incorporate IEPs into their teaching. Secondly, they observed that typically developing students and their parents sometimes develop negative attitudes towards students with special needs. Thirdly, they recognized that students with special needs may experience feelings of inadequacy due to difficulties in keeping up with their classmates. Participants express a strong desire to witness progress in students with special needs, but they also feel a sense of sadness and frustration because they believe they are unable to provide the necessary assistance and support to facilitate that progress. Similarly, in the study conducted by Sadioğlu et al. (2013), participants reported that they believed that it would be more beneficial for students with special needs to receive education in separate classes with their peers who have similar academic levels and needs. Our results show that teachers cannot always take into account individual differences among students in their lessons because they are not familiar with special teaching techniques used in special education. In order to eliminate the lack of knowledge of classroom teachers, in-service training can be provided, and necessary support services such as consultancy, which are also included in legal regulations, can be provided so that teachers can consistently include IEPs in their teaching. When this is achieved, it is thought that the anxiety that participants stated that students with special needs may experience feelings of inadequacy due to difficulty in keeping up with their classmates will be eliminated, and it will be possible for normally developing students and their parents to develop positive attitudes towards students with special needs.

Our participants expressed the belief that parents of both typically developing students and students with special needs have limited awareness, which can make it challenging for them to effectively implement MIEAs. This finding is consistent with those reported by earlier studies (Baran, 2021; Burunsuz & İnce, 2020; Değirmenci Kurt & Tomul, 2019). Teachers have a responsibility to proactively engage with parents of both typically developing students and students with special needs to provide them with information regarding MIEAs (Yılmaz et al., 2021).

However, unfortunately, it is seen in the findings of this research that both teachers and teachers have limited knowledge about MIEAs. Therefore, in this process, counselors who are legally responsible according to the Guidance and Psychological Counseling Service Regulation (MoNe, 2020) will be able to pave the way for teachers to effectively implement MIEAs by conducting informative interviews with parents, students, and teachers and working in collaboration.

Regarding the fourth code, “We have been left to our own devices,” participants stated that their classrooms were overcrowded and lacked the necessary equipment and materials. They acknowledged their responsibility to cover all aspects of the curriculum for typically developing students while also adjusting their teaching methods to accommodate the specific needs and requirements of students with special needs. They also noted that parents of students with special needs displayed indifference and a lack of support. Additionally, they noted that students with special needs were not evenly distributed, with some classrooms having more than two students with special needs. Teachers prepare IEPs alone or together with guidance counselors. IEP unit stakeholders do not attend the meetings, which are not held anyway. Furthermore, participants expressed feelings of inadequacy due to perceived gaps in their knowledge of IEP processes. They mentioned that they often handle IEP preparation, implementation, evaluation, and monitoring independently, without access to guidance or support. This lack of resources and assistance left them with unanswered questions regarding MIEAs. There is also a lack of cooperation with special education institutions that provide support services. Participants believe that one solution is to reduce class sizes and, if needed, to have an assistant teacher to support students with special needs. IEPs should be prepared by a team, not by one person (Karaca, 2022). During this process, all participants should adopt long- and short-term goals (Kargın, 2007). However, our results show that that is not the case. Research also shows that teachers believe that they have gaps in their knowledge of IEP processes (Akalın, 2014; Anilan & Kayacan, 2015; Baran, 2021; Batu et al., 2018; Berkant & Atılgan, 2017; Değirmenci Kurt & Tomul, 2019; Demirezen & Akhan, 2016; Deniz & Çoban, 2019; Karaca, 2022; Sadioğlu et al., 2013; Şahin, 2017; Ünal, 2010).

According to RSES (MoNe, 2018), each classroom should have an equal number of students with special needs, not exceeding two. The statements of our participants show that school administrations do not act in accordance with the regulations. Research shows that teachers demand effective in-service training in IEPs and MIEAs.

Çıkılı et al., 2020; Evyapan, 2020). Actually, our findings suggest that not only teachers but also all individuals involved in the IEP process have knowledge gaps when it comes to preparing and implementing IEPs. As a result, it appears that comprehensive in-service training is required for all stakeholders involved in the IEP process to ensure a better understanding and effective execution of IEPs.

Our results indicate that teachers choose not to use IEPs, although they believe they are necessary. They think that IEPs and MIEAs cannot be executed in general education classrooms for various reasons. First, they often find themselves burdened with too many responsibilities because the stakeholders of MIEAs do not have a clear understanding of their professional duties and responsibilities. Second, there is no culture of cooperation. Third, teachers are provided with only "education room" and SERC support services. Third, schools have inadequate physical conditions. Fourth, there are no effective and enforceable policies. Fifth, teachers are left to their own devices in the MIEA processes.

Recommendations

Classroom teachers and stakeholders often have inadequate knowledge about MIEAs and IEPs. They may lack a clear understanding of their respective responsibilities in these processes. Therefore, the classroom instruction education departments of universities should enrich the content of existing courses related to special education and provide teacher candidates with the opportunity to practice the courses in classes where MIEA is conducted. In addition, it is recommended that in-service training practices that include monitoring and feedback, such as mentoring, coaching, and consultancy, be carried out for teachers, parents, and school administration so that all stakeholders in schools know their roles and can effectively conduct MIEAs. Governments should introduce legal regulations for counseling, instructional coaching, cooperative teaching, itinerant teaching, and shadow teaching practices within the support education activities. This phenomenological study was conducted with primary teachers. Researchers should conduct similar studies with teachers in different branches and school types. They should also use different research methods to recruit more teachers.

Acknowledgements or Notes
The authors received no financial support for the research and/or authorship of this article

Authors Contribution Rate
Authors contributed equally.

Ethical Approval
Ethical permission (date: 30/12/2022, number: E-77082166-604.01.02-548721) was obtained from Gazi University Ethics Committee for this research.

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International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 556-570 Article Type: Research Article

Negotiating Pedagogic Researcher Identity by Two College English Teachers in China: A Social Network Perspective

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Abstract
Scholarship of Teaching and Learning (SoTL) or pedagogic research (PedR) has become an international movement that encourages academics to use research-informed approaches to understand and enhance their teaching. However, the definition and understanding of SoTL/ PedR have been ambiguous, impacting career progression, orientation of scholarship activities and academics' perception of undertaking such activities. This article adopts social network perspective to understand the SoTL/PedR experiences of two academics with a focus on teaching ---College English (CE) teachers working at a Chinese tertiary institution as they navigate their identities in a higher education (HE) context that attempts to promote SoTL/PedR. An integrated framework for understanding identity in individual social network of practice (INoP) is used to examine the complex nature of identity negotiation. Multiple networks and communities are identified. The juxtaposition of ties and communities reflects the complexity of PedR discourse, in which the stratification of knowledge and power relations sustain the boundaries of networks or communities. Two participants experienced complexity of subjectivities and negotiated a range of positions, e.g., CE teacher versus 'more professional' English Major (EM) teacher, pedagogic researcher versus 'real' researcher, educational researcher versus 'superb' disciplinary researcher. The article also discerns a collective subordination of CE teachers' joint endeavors of researching their teaching practice to dominant research discourse. The study contributes to our insights into cultivating practice-oriented, problem solving-focused, research-informed PedR communities and networks characterized by recognition, trust, and respect.

Keywords: Professional identity, Social network analysis, Pedagogic research, Scholarship of teaching and learning, Teaching-oriented academics

Citation
Zeng, W. & Fickel, L. (2024). Negotiating pedagogic researcher identity by two College English teachers in China: A social network perspective. *International Journal of Contemporary Educational Research, 11*(4), 556-570. https://doi.org/10.52380/ijcer.2024.11.4.731

Received	29.09.2024
Accepted	21.12.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	Yes -Turnitin
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The research is supported by China Foreign Language Education Fund Project (ZGWYJYJJ12A154), Southwest University Teaching and Education Reform Research Project (2024JY026) and Chongqing Municipal Social Science Planning Project: Foreign Languages Special Fund (2024WYZX34)

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Introduction

Scholarship of Teaching and Learning (SoTL) has emerged as a global movement encouraging academics to employ research-informed approaches to enhance their teaching practices. This movement serves as a counterbalance to the prevailing emphasis on research productivity in higher education (HE) (Cotton, Miller, & Kneale, 2018; Tierney, 2020; Wint & Nyamapfene, 2022) . SoTL activities are often referred to as pedagogic research (PedR) (Tierney, 2020); therefore, in this study we employ the terms 'SoTL' and 'PedR' interchangeably.

The definition and understanding of SoTL/PedR are complex and multifaceted, a phenomenon Godbold, Matthews, and Gannaway (2024) term as 'supercomplexity.' This supercomplexity manifests in various ways, including differing perceptions and evaluations of scholarly work, particularly concerning the boundaries between SoTL/PedR and traditional research. More significantly, the ambiguous definition of SoTL/PedR has led to disparities in the recognition and valuation of diverse scholarly contributions (Smith & Walker, 2021), creating tensions between traditional and teaching-focused academics and impacting career progression, scholarly orientations, and perceptions of SoTL/PedR practitioners.

The supercomplexity of SoTL/PedR is partly rooted in power dynamics within academia and the differential valuation of different academic career paths. Several studies have sought to clarify this debate and promote a more equitable academic culture to enhance the value and quality of SoTL/PedR and encourage greater engagement from teaching-oriented academics. For example, Godbold et al. (2024) explored this issue in Australian universities, while Smith and Walker (2021) focused on the British context. Previous research has examined teaching-oriented academics in various disciplines, such as business schools (Nagy, 2011) and engineering education (Wint & Nyamapfene, 2022). This study contributes to the existing body of knowledge by focusing on teaching-oriented academics in the Chinese context, where the higher education is becoming a world powerhouse. We use an integrated framework for understanding identity within 'individual networks of practice' (INoP) (Zappa-Hollman & Duff, 2015) to illuminate power dynamics in the field of SoTL/PedR. Specifically, we conduct a case study of two College English (CE) teachers—Ruby and Lisa—examining their PedR practices within their social-interactional landscapes and how they construct and mobilize subject positions through their subjective interpretations of social relationships. Through social network analysis, we investigate how power relations in SoTL/PedR discourses are maintained and how Ruby and Nana utilize different positioning of the self to conform to the hierarchy of these discourses.

SoTL/PedR in the Knowledge Regime of HE Context

According to Boyer (1990), teaching scholarship is categorized as one among four forms of scholarship—discovery, integration, application, and teaching—which, despite their interconnections, has led to an enduring implicit hierarchy, particularly affecting the relationship between teaching scholarship and knowledge discovery scholarship. The scholarship of teaching is considered secondary to the scholarship of discovering knowledge. On the top of this hierarchy is the standardized excellence in the form of publications in influential journals and research content geared toward the priorities of funding bodies (Hamann, 2016; Lee, Pham, & Gu, 2013; Moed, 2008).

Seeking to enhance the status of SoTL/PedR, scholars often encounter a number of dilemmas. One such dilemma is the 'relevance gap,' which refers to the tension between scientific rigor and practical utility (McIntyre, 2005). On the one hand, to be impactful, research should be rigorous and theoretically informed; on the other hand, the theoretical nature of research can make it difficult to apply in the context of teaching, which is a fundamentally practical activity (Cochran-Smith, 2005; Evans, Howson, Forsythe, & Edwards, 2020). Therefore, SoTL research is perceived as undermining the credibility of disciplinary research, as Canning and Masika (2022) note that the SoTL encompasses studies lacking theoretical foundations and engagement with established scholarly work.

Another key challenge for promoting SoTL /PedR is the absence of a clear and widely accepted understanding of their definitions and scope. It can refer to a range of activities, such as personal exploration to acquire personal knowledge, collaborative efforts to acquire local knowledge to inform a group, or publishing findings to inform a wider audience (Ashwin & Trigwell, 2004). The lack of coherence has made it difficult to evaluate and assess PedR, as there are no established norms or standards for its evaluation (Bennett, Roberts, Ananthram, & Broughton, 2018). There is no consensus on what are appropriate outlets for sharing PedR, or how to enhance the credibility of this research from a methodological standpoint (Felten, 2013). The lack of consensus regarding the conceptualization and communication of PedR exacerbates its marginalization within the academy (Cotton et al., 2018), reinforces the hierarchy of knowledge and perpetuates the notion that PedR is somehow inferior to other forms of research (Smith & Walker, 2021).

The uncertainty in understanding SoTL/PedR leads to tensions in tertiary institutions' attitudes towards

SoTL/PedR. Despite the universal recognition of the benefits of SoTL/PedR, tertiary institutions are often found to provide limited support to such activities (Zeng & Fickel, 2021); In institutions where SoTL is explicitly integrated into the framework of institutional research plans, publications on impactful journals remain as the dominant measurement for assessing SoTL (Simmons, Eady, Scharff, & Gregory, 2021; Smith & Walker, 2021). As for academics with a focus on teaching who are engaged in SoTL, the two-tier system within the academy is actually reinforced by the incorporation of research-centric measurement, creating boundaried careers for education focused academics due to the lack of access to financial and collegial support for doing SoTL (Smith & Walker, 2021).

SoTL/PedR in China's HE Context

In 2020, the State Council of China (SCC, 2020) issued a policy aiming to transit the prevailing assessment methods that have prioritized research productivity to a model that recognizes teaching responsibilities as a fundamental component of academics' work. Since then, tertiary institutions have added SoTL/PedR into their evaluation framework of academics. By analyzing several tertiary institutions' teaching evaluation frameworks, it is found that there is a move away from a sole emphasis on accountable research performativity towards a more comprehensive effort to enhance the quality of teaching(Zhao, 2023). However, in practice, institutions continue to depend on traditional research performativity metrics, as teaching scholarship assessments often prove to be vague and superficial(Zhao, 2023). Furthermore, the inclusion of SoTL inadvertently reinforces research performativity as an underlying incentive, driving academics to maximize their research output (Su & Cai 2023).

Like other countries, the challenges in assessing teaching scholarship are largely due to the nuanced and multifaceted nature of teaching practice. The unequal power relations within the HE context of China also play a significant role. In China, universities as state-operated and government-managed are characterized by a strong administrative bureaucracy in which teachers are typically under the authority of various administrative departments. Consequently, the SoTL evaluation, despite its attempt to enhance teaching, often becomes instruments for rewarding or punishing academic staff (Su & Cai, 2023). Teachers seldom participated in teaching assessment activities. Negative emotions are commonly felt by academics in relation to the new evaluation policy such as indifference, confusion, and dissatisfaction. More surprisingly, they have never publicly expressed their discontent (Lu & Zhang, 2021), reflecting power relation's suppression and adaptation of individual emotions.

Therefore, the insights into the lived experiences of academics engaged in SoTL activities can elucidate the supercomplexity of SoTL and help identify strategies to enhance academics' SoTL engagement. Evans et al. (2020) propose that fostering interdisciplinary communities of practice that encompass research, teaching, and professional development teams is pivotal for the cultivation of high-quality SoTL/PedR. This approach is expected to encourage collaborative efforts and exchanges among various stakeholders. Embarking from this, this research uses identity as a lens to understand the complex dynamics at play within academic communities and networks.

Towards an Integrated Framework for Understanding Identity in Individual Social Network of Practice

Identity refers to 'our understanding of who we are and who we think other people Are' (Danielewicz, 2001, p. 10). To obtain a comprehensive understanding of identity, we need to pay attention to both 'identity-in-discourse' and 'identity-in-practice' (Varghese, 2017). As shown in Figure 1, 'identity-in-discourse' emphasizes the role of 'the context and the set of power relations as well as the discourses available to the individual teachers and a community or network of teachers in that particular context' in shaping teachers' identity (Varghese, 2017, p. 46). Discourses delineate the boundaries of knowledge and societal conduct within a specific community, determining what constitutes truth and actuality, and significantly shape an individual's sense of self. The knowledge and power inherent in these discourses provide individuals with a range of possible modes of subjectivity (Weedon, 1997). Weedon (1997) posits that the construction of identity is not uniformly impacted by all discourses, as some hold greater weight and power. It is through the identification with certain subject positions within these discourses that individuals shape their identities. Subject positioning enables individuals to embrace a specific identity and to establish relationships with themselves and others predicated on defined values (Foucault, 2003).

Interactional activities such as social networks are a place where discourse, power relations and identity are at play. Social networks, as networks of social relationships imbued with meaning, are dynamic structures of interpersonal expectations between the self (*ego*) and others (*alter*) (Fuhse, 2009). By defining ties as a specific type of

relationship, such as collaborating on research or designing a teaching plan together, individuals can delineate their networks with certain expectations. The individual's conception of the relationship makes the social dyad between the self and others a dynamic entity, a process that involves the construction of identities and positioning in relation to other actors (Fuhse, 2009; White, 1992).

From the poststructuralist perspective, identity is conceptualized as both an outcome of individuals' positioning within various discourses and a fluid process that emphasizes agency. Agency refers to the ability of individuals to perform actions that have an impact on the social dynamics within which they are imbedded (Layder, 2006, p. 4). In Figure 1, the arrow linking discourse and agency depicts the relationship between identity construction and imposition.

Figure 1. also suggests that the construction of identity is facilitated by practices that allow individuals to cultivate a feeling of affiliation with a specific community, one defined by mutual engagement, joint enterprise and shared repertoire (Wenger, 1998). Basing on Wenger's conceptualization, Zappa-Hollman and Duff (2015) propose the concept of individual networks of practice (INoPs). By replacing community with network, INoP makes it more inclusive of relationships that are either formal or informal, harmonious or conflicting top-down organized or bottom-up developed(Hodkinson & Hodkinson, 2004). Identity is a process of negotiating membership, a process depending on one's ability to contribute to and shape the meanings that are important to the group. The ability to participate is determined by one's access to social capital (Lave & Wenger, 1991) which, according to Lin (2001), refers to 'the resources, knowledge, and information embedded in social relations and social structure that an individual can mobilize when they wish to increase the likelihood of success in purposive action'(Lin, 2001, p. 24). This access is influenced by the structure of an individual's social networks (Curry & Lillis, 2010) and their social position within those networks (Bernstein, 2018) and the broader discursive framework (Fuhse, 2009).

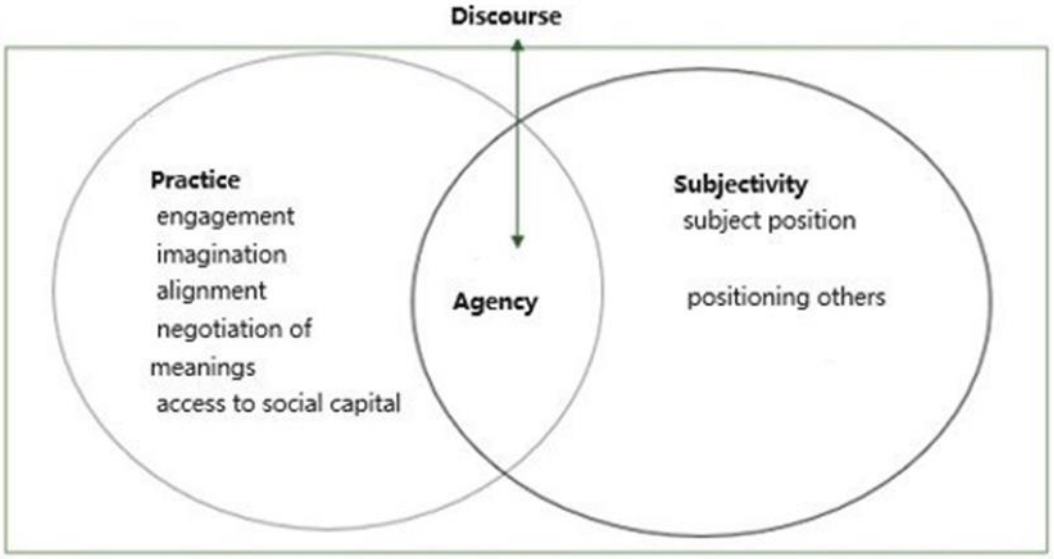

Figure 1. An integrated framework for understanding identity in INoP, adopted from Trent and Shroff (2012)

Informed by the theoretical framework, the study is guided by the research question:

How do teaching-oriented academics in China negotiate their identity as they engage in PedR networking practices within the PedR discourse?

Method

Cases of Ruby and Lisa: Two College English (CE) Teachers

The research is a single-site, multiple-case study, which allows us to delve into the lived experiences of teaching-oriented academics. Case study as a qualitative research method involves an in-depth exploration of a single entity or entities (like an individual, organization, or event) within the real-world context. The choice of case(s) can be based on *intrinsic* or *instrumental purpose* (Stake, 2005). In an intrinsic case study, the case is inherently interesting and significant. The goal is to explore and understand the complexities of the case itself. In this study, the two participants, Ruby and Lisa, are selected based on *intrinsic purpose* for following reasons:

1) they come from the largest group of teaching-oriented academics of China. Ruby and Lisa are CE teachers. CE teachers, also known as public English teachers, instruct undergraduate students on general English skills. CE is a two-year mandatory foundational course for non-English majors. Owing to the public service nature of CE and the high volume of university enrollments, estimated 60,000 CE teachers are engaged in teaching nearly 16 million students (Yang, Shu, & Yin, 2021).

2) CE teaching has been focused on English language training services (Cai, 2013) and CE teachers are typical teaching-oriented academics who are often found to struggle in research performance. Many of them entered the profession with a master's or bachelor's degree (Peng & Gao, 2019). Researchers have identified a number of factors for CE teachers' incompetence in research, such as heavy teaching workloads, lack of research interest, lack of confidence in conducting research, and lack of research skills and interdisciplinary knowledge (Bai & Hudson, 2011).

3) Ruby and Lisa are two participants from the larger study conducted at the field of the Foreign Languages School (FLS) of WX university (WXU) in China. FLS featured a standard organizational structure for foreign language education institutions in China (Peng & Gao, 2019). It comprised two departments focused on English education: Department of English Major (DEM) and Department of College English (DCE), designed to provide instruction to English majors and non-major undergraduates respectively. The DCE stood out as one of the largest CE departments in China, staffed by a workforce of ninety-one CE teachers.

4) Ruby and Lisa represent two types of CE teachers in the DCE: those without a doctorate and those with a doctorate. Ruby, entered the profession in the early 90s. Like most CE teachers, she did not have an advanced degree and had not received systematic research training. Lisa, on the other hand, was a younger CE teacher and was currently pursuing a PhD. As a doctoral degree is now a prerequisite for career progression, many CE teachers are simultaneously working on their doctorate degrees, and Lisa is one of them. These two teachers represent the two common types of CE teachers when it comes to conducting research.

Ruby and Lisa are also chosen based on *instrumental purpose*. According to Stake (2005), the instrumental case study is to choose specific case(s) to understand a broader phenomenon. The case is selected because it can illuminate a particular issue or concept. Ruby and Lisa are chosen for their lack of reciprocity in recognizing each other as PedR ties. Ruby included Lisa in her PedR network, while Lisa did not reciprocate (which means she did not include Ruby in her own network). This lack of reciprocity, according to social network theory, may shed light on the inconsistency in expectations between the two teachers and their conceptions of relational identity (Fuhse, 2009). In this sense, the networking experiences of Ruby and Lisa are instrumental for understanding the broader goal of the study: to understand how CE teachers experience complexity of SoTL/PedR discourse.

Researcher Positionality

As qualitative researchers adopting a poststructuralist perspective, we acknowledge the inherent value-laden nature of this study (Creswell, 2007). The first author, having previously worked as a CE teacher and having longstanding relationships with the participants, brought an insider perspective to the research. This insider position facilitated trust-building, rapport-building, and access to the participants' lives. By working as a team, we also incorporated an outsider perspective to enhance the study's rigor.

We recognize that the participants' experiences were intertwined with the first author's own experiences as a CE teacher and a doctoral student. This dual role created a complex and dynamic research relationship, characterized by both collaboration and power dynamics. As poststructuralist researchers, we view social networks as fluid and ever-changing, rather than static structures. The multiple roles assumed by the first author led to the formation of shifting, temporary research networks, influenced by power relations.

Aligning with the poststructuralist understanding of identity as dynamic, contextual, and relational, we strive to be transparent about our own positions and biases so that readers can make their own interpretations.

Data Collection

Working with the concept of INoP, the study employs social network analysis to collect data on PedR practices and interactions of participants. The participants, as *egos*, draw and report certain kinds of research ties regardless of formal, informal, organizational, or geographic boundaries (Benbow & Lee, 2019).

The participants were given a network mapping task a week before their interviews (see Appendix). According to their perception of the closeness of PedR relationships with different ties, the participants drew their social ties, or *'alters,'* on a concentric circle. After completing the mapping, they received semi-structured interviews with one of the researchers. These interviews delved into the participants' processes of establishing research connections with the individuals they had identified, their modes of interaction, and the reasons behind their placement of names on specific areas of the map. Additionally, the interviews explored the participants' understanding and involvement in PedR, considering that varying perspectives and behaviours could shape the characteristics and structure of their professional networks.

One of our researchers also took on the role of participant observer. she often had informal conversations with Ruby and Lisa, which eventually led to narrative interviews with each of them. These interviews were unstructured and lasted for two to three hours.

Ethical Approval

The study was conducted with full adherence to pertinent ethical considerations and received the approval (Number: 2024JY026) from the Southwest University's Human Research Ethics Committee.

Data Analysis

We began data analysis by sketching out the networks of each participant. The analysis was guided by an array of predefined codes, informed by scholarly literature on social networks. These codes cantered on aspects such as the alter's location (e.g., within a department, school, or extramural network), motivations for tie formation, the perceived significance or insignificance of specific relationships, interaction frequency, and the content of these interactions. Consequently, the analysis identified various networks and communities., such as the CE PedR network, DCE, DEM, and the PhD research community outside of the FLS.

Following this process, thematic analysis was applied to tease out participants' narratives around three overarching themes: 1) *negotiation of membership* within or through multiple networks and communities 2) *discourses* that shape their experiences of nexus of multimembership, which not only refer to 'institutional partitioning of knowledge' but also techniques and practices through which the partitioning of knowledge is formed (Arribas-Ayllon & Walkerdine, 2007, p. 114). 3) *individuals' subjectivities* governed by the discourses, or Ruby's and Lisa's actions and words that reflect how they positioned themselves and constituted themselves as the subject within these discourses (Foucault, 2010).

We then compare and contrast Ruby and Lisa's narratives, focusing on these three thematic strands. Through this comparative analysis, we identify two dominant power relationships within their PedR research experiences: the tension between performance-driven research and PedR, and the conflict between disciplinary research (linguistics/literature) and educational research. We present identity negotiation of Ruby and Lisa in the form of stories as stories are the fundamental way we tell about our lives and configure who we are (Riessman, 2003). Aligning with our poststructuralist stance that aims to give voice to a group that is often silenced or marginalized by dominant discourses (Riessman, 2003), we craft the stories to highlight instances of silence, marginalization, conflict, alienation, and alignment within their narratives, revealing the complex interplay of power and discourse in shaping their PedR experiences.

Networking Stories of Ruby and Lisa

Networking Within Discourses of Performance-driven Research and PedR

Even before the interview, Ruby had constantly told the researcher of her fears that she might not be 'qualified' to be the participant, saying she has not done any research or even ask us to interview teachers in the DEM as EM teachers did 'real' research. After being told that the study was to understand her experience with no judgement of 'good or bad' participant, she then replied, 'Ok, I just hope you could have better data because I actually didn't do research.'

In contrast to her hesitant denial, Ruby drew a large network with dozens of ties (see Figure 2). Sixteen of them were CE colleagues with whom Ruby collaborated during a CE teaching reform. For example, a CE teacher shared the interest with her in teaching pronunciation, so they collaborated in joint-teaching; another CE teacher joined her innovative teaching to experiment with a teaching method. Their cooperations led to publishing two papers on a PedR journal and a speech at a national CE teaching reform conference. After finishing the interview, she said,

'it seems I have done a lot, but actually they are not real research.' Unsurprisingly, Ruby drew these CE colleagues in the secondary circle of her map.

In the closest circle, Ruby drew six alters. These alters, who worked in the other department, EMD, were professors of linguistics or literature. If Ruby had questions in her teaching, she would attend these alters' classes to 'learn their way of teaching.' In response to the question regarding the placement of CE colleagues in the secondary circle despite frequent interactions, Ruby said, 'EM teachers were more *zhuanye*. The research with CE teachers is not real research.' *Zhuanye* in Chinese means professional or disciplinary. By this, Ruby suggested that EM teachers who taught disciplinary courses to English majors and did research in linguistics and literature were more professional.

Ruby's map revealed two networks: a PedR group of CE teachers and a group of EM professors. In the PedR group, Ruby was a full participant: she heavily invested herself in innovative teaching, actively collaborated with colleagues, and the investment and interactions generated a shared repertoire of PedR publications and conference presentations. In contrast, in the group of EM professors, Ruby was an imagined participant. She drew an image of having close research ties with these EM professors, while in practice she had minimal interactions with them and the interactions remained limited to 'attending classes to learn his way of teaching' rather than engaging in collaborative research.

Ruby's hierarchical positioning of the two groups visually echoed the hierarchy of knowledge categorized by dominant research discourse and the distinguishing of individuals who are privileged to possess them (Clark, 1983). EM teachers, who worked in subject-based department and did research in alignment with the dominant research discourse, were positioned at a more important place despite having minimal practical interactions with Ruby. This suggests that Ruby perceived the linguistics/literature knowledge held by EM experts as the legitimate knowledge for solving practical problems in her language teaching, while the knowledge generated from PedR with CE colleagues was positioned as illegitimate or inferior because EM teachers were 'disciplinary and more professional.'

The apparent disparity between Ruby's active participation in the PedR network and the way she positioned the two networks reflects her subjectivation in compliance with the dominant discourses (Foucault, 1988). She constantly described herself as an improper participant in our research and even considered the group of CE teachers as an improper focus of our research. In this sense, the collective endeavors of CE teachers to improve teaching have been made invisible. The conventional discourses of performative knowledge and scientific research have promoted 'ideological subordination'(McIntosh, McKinley, Milligan, & Mikolajewska, 2019) with the individual over the collective. Research has found that the performative discourse of research has created a sharp divide between an elite group of researchers and the invisible rest (Griffiths, 2004), which highlights a small number of individual academics with 'the right stuff' (Stengers, 2018) and invisibilizes the collective PedR work oriented towards 'students, colleagues, or society more widely' (McIntosh et al., 2019, p. 7). This, as demonstrated by our study, divided CE teachers' workplace into a higher-status disciplinary department and a lower-status CE department.

The invisibilization of collective PedR work is also reflected in Lisa's network (see Figure 3). Although she was included in Ruby's network, Lisa did not include Ruby in her own network. As a PhD researcher in education, Lisa wrote her supervisor and other PhD students in the inner circle and a few CE colleagues on the outskirts. This reflects Lisa's full recognition of the dominant research discourse. When asked why she did not include Ruby in her network, Lisa explained in an ambiguous way,

> PhD research is real research and I'm heavily involved in it, so I put my supervisors at the center. As for the PedR done with my CE colleagues, it's also kind of research, although it's different. Therefore, I just randomly wrote a few names of CE colleagues.

The remark suggests that Lisa exhibited a casual attitude towards her PedR ties. The lack of reciprocal recognition reveals the unequal expectations for each other's research resources and reflects the hierarchical division between teaching and research, as well as those between PedR and conventionally recognized research (Fuhse, 2009). This hierarchical divide has had an impact on the relational identities of both Ruby and Lisa. Moreover, the absence of reciprocal recognition suggests that the PedR network of CE teachers lacks a shared understanding of their mutual practice, potentially leading to a lack of trust among themselves (Heinrich, 2017; Zeng & Fickel, 2021).

Both Lisa and Ruby, however, demonstrated resistance to dominant discourses. Lisa was vocal in her opposition to the perception that CE teachers are inferior to EM teachers, advocating strongly for the importance of engaging in PedR. For her, CE teaching, 'an easy job' as generally regarded, was not easy, because engaging CE students with a range of English learning motivation and proficiency levels was a big challenge for every CE teacher. Moreover, 'CE teaching benefits the overall social development', said Lisa, 'because it serves students from every discipline'. Compared with Lisa's explicit advocacy for CE teachers doing PedR, Ruby showed some hesitancy, asking the researcher whether contributing to a prestigious journal constituted the only outlet for PedR. She described her puzzle,

> I don't know how I can write for the high-level publication, but I do have constant reflection (of teaching) and sometimes write papers for pedagogic research journals, just ordinary journals ...I pursue the process of improving my teaching rather than the form.

Lisa's alignment with PedR highlights the social value of this type of research, specifically in regard to 'benefiting overall social development.' Ruby, on the other hand, took a more resigned approach and saw her pursuit of PedR as a personal interest in 'the process' itself. This difference in resistance may be due to the social capital they each had access to through their social networks. Lisa was part of a close-knit research network centered around her PhD study, allowing her to receive strong support and access knowledge favored by dominant research discourse. Ruby, on the other hand, only had a network composed of CE colleagues, and lacked the support or resources of 'real' researchers. Therefore, although both Lisa and Ruby positioned their PedR ties in the secondary circle, Lisa was able to confidently claim her dual researcher identities as a PhD researcher and a pedagogic researcher while Ruby positioned herself and her group as illegitimate researchers.

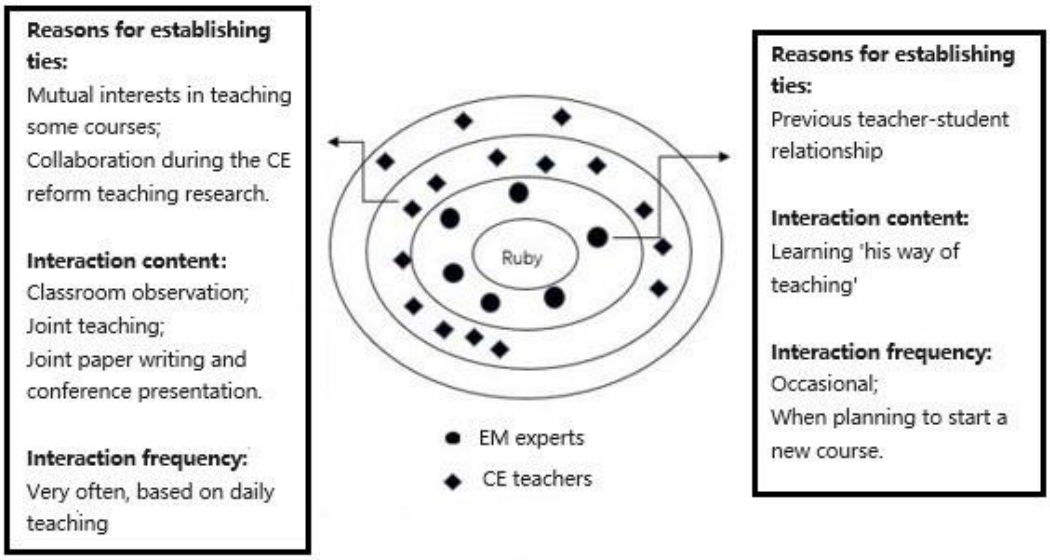

Figure 2. Ruby's individual PedR social network

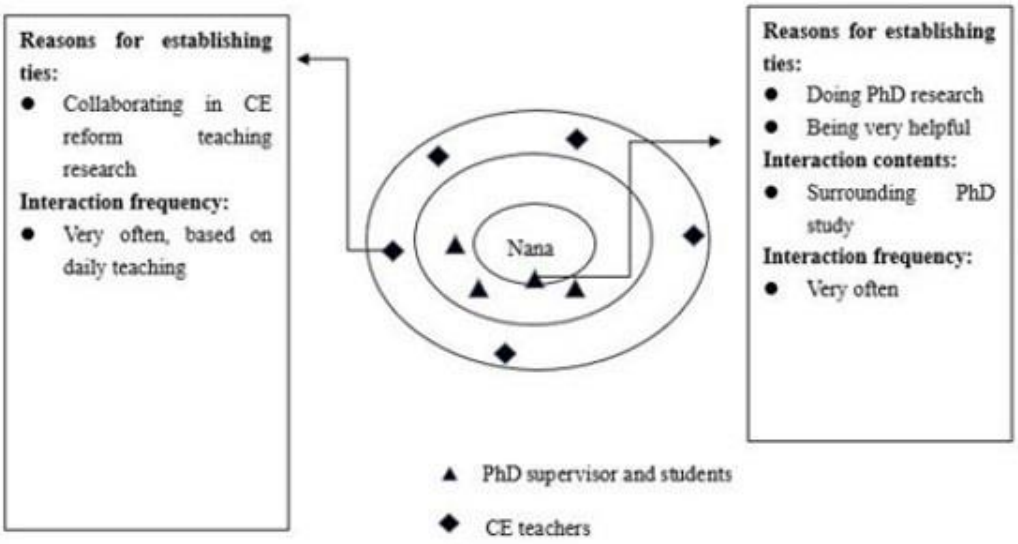

Figure 3. Lisa's individual PedR social network

Networking Within Discourses of Disciplinary Research of Linguistics/literature and Educational Research

Lisa was a PhD candidate at the School of Education (SE) of WXU. She seemed hesitant to go to the FLS for the interview, inviting the researcher to her office at the SE instead, explaining 'I don't feel I belong there. There is no office for us.' This was because the FLS did not provide offices for CE teachers, who typically worked in dispersed buildings across the campus as they taught students from different disciplines.

Lisa's alienation from the FLS was not only due to the spatial separation of CE teachers from the FLS, but also because she was not 'doing *gao da shang*, or superb linguistics research.' Lisa had studied linguistics for her master's degree, but gradually came to find that linguistic research was insufficient to make her a successful teacher. She began to see the importance of pedagogy and educational theory in improving her teaching and decided to pursue a PhD in education at the SE. Presumably, the individuals in her inner circle of research ties were all located at the SE, including her supervisor and other PhD students. Nonetheless, Lisa had severed all research ties with her colleagues at the FLS. Despite the existence of a language teacher education research group within the DEM, which aligned with Lisa's own field, she had never been invited to participate in their activities, because, as she claimed, 'I was doing education.' To illustrate this, Lisa gave additional examples,

> you see, the DEM only wants CE teachers who obtained their doctorate in linguistics or western literature to work there. Those who did their PhD in non-linguistics/literature areas, such as education, psychology, or anthropology, remained in the DCE. It seems that non-linguistics/literature research makes little contribution to them. I don't think it's right. It's not good for language education.

Lisa's networking experience illustrates the presence of various communities including the DCE, DEM, SE, PhD research network, and CE PedR network. Despite being a full participant in the PhD research community, she was denied access to the higher status DEM research group. Due to her failure to negotiate her beliefs on the value of educational research for enhancing teaching and the limitations of purely linguistic research, Lisa experienced alienation from the FLS workplace and found a sense of belonging in the SE community where her views on research were recognized and valued.

Lisa's subjectivity was disciplined by the discourse about the discipline of language education which involves the institutional partitioning of knowledge (Trowler, Saunders, & Bamber, 2012). In China, language education is divided into the disciplines of linguistics or literature according to the country's disciplinary classification scheme (MOE, 1997), and English language education is typically organized within these single disciplines (Han & Wu, 2015). The discourse is prevalent in most language teacher training that still focuses on conventional linguistics-

based discipline concepts (Freeman, 2018; Van Canh, 2018). Lisa's belief that her educational research was inferior to linguistic research reflects her subjection to this disciplinary classification. Similarly, when Ruby explained CE teachers' incompetence in doing research, she mentioned the lack of a specific disciplinary subject to research as a reason, indicating the dominance of linguistics/literature knowledge and its deep-seated effect on CE teachers' subjectivity.

The dominant discourse of linguistics research is not only reflected in disciplinary, curricular, and departmental levels, but also in the boundaries of social networks. The networks of both Ruby and Lisa revealed the closed interactions within CE teachers and the lack of research interactions between DCE and DEM. The fact that Lisa was excluded from the DEM research group illustrates the exclusivity of the higher-status, subject-focused department, which is typically protected by expertise in linguistics and literature. For instance, only individuals who have pursued doctoral studies in these fields are eligible for transfer to the DEM. Those who have not are often confined to the lower-status, public service-oriented department.

Discussion and Conclusion

The PedR networking experiences of Ruby and Lisa reiterate the complexity surrounding SoTL/PedR discourse. Tensions remain between the managerialism of institutions that tend to evaluate teaching scholarship by using a hierarchical structure of refereed journal publications and academics' commitment to improving students learning of which the forms range from reflexive self-evaluation, teaching inquiry, knowledge sharing that is not limited to high-level journal publications, to educational research and subject-based research.

The study shows such plurality does not necessarily lead to inclusivity. The institutional structures inherently incorporate the narrative that distinguishes pedagogic and other research (Cotton et al., 2018). Power relations permeate the various types of knowledge, which are sustained by techniques of membership of networks, communities and interaction among academics. By dividing staff into different departments and using certain knowledge as the gatekeeper of certain group as well as the boundary of interactions, the institution has ensured the production and the transfer of the 'right' knowledge (e.g. linguistics/literature knowledge) in such aspects as the knowledge base of language education research (e.g. linguistics/literature research is the superb research; PedR is not 'real' research), the processes governing language education curriculum design and the methods of language teaching and assessment (e.g. CE teachers as non-linguistics/literature researchers cannot transfer to DEM to teach EM students).

Academics often find themselves constrained within the boundaries of their networks, limiting their access to social capital that could enable them to conduct high quality PedR. High quality PedR requires disciplinary knowledge, pedagogical expertise, and research methodology expertise (Evans et al., 2020). However, the social capital that these academics have access to within their closed PedR network is often seen as inferior to other forms of research, preventing them from effectively negotiating their meaning at the workplace. This inability to negotiate meaning can lead to identity of marginalization (Wenger, 1998) and potentially even disengagement or alienation (Gao & Yuan, 2021), reinforcing the negative perceptions towards PedR and the lower status of the academics undertaking PedR.

Our findings have suggested that teachers were not merely have games of knowledge imposed on them; their words and actions reinforced the division of knowledge through a network of subject positions, ways of subjectivation, and inter-subjectivities. This resulted in a collective subordination of CE teachers' joint efforts of improving teaching to dominant discourses and a lack of recognition and trust within the PedR network due to their contradictory conceptions toward PedR. Despite the enthusiastic promotion of building collaborative PedR communities or transdisciplinary communities (Cotton et al., 2018; Evans et al., 2020; Tierney, 2020), power relations and resulting alignments and oppositions can divide the group and deny the joint efforts to improve teaching, which not only further invisibilizes these academics but also hinders their ability to emancipate themselves through learning from interactions with academics who have advanced knowledge of research theory and methodology.

To create dynamic spaces for professional development for CE teachers, it is important to transform both institutional and disciplinary structures and discourses. This transformation should prioritize dialogism (Han & Wu, 2015), diversity, and even uncertainty (Ellis, 2021) in exploring the knowledge base of language education. It is necessary to foster a collaborative, inclusive and caring environment that engages staff from different departments in dialogue and collaboration. Meanwhile, CE teachers should raise their consciousness of the imposed dominant discourses, develop the necessary critical counter-discourses and oppose subject positions. For example, they should be more assertive in claiming the value of PedR for the development of students and society.

Additionally, they should strive to walk out of their closed group and establish collaborations with disciplinary academics and research experts. By conducting high-quality PedR, CE teachers can gain social capital and claim their own meaning of teaching CE. It may also contribute to the formation of practice-oriented, problem solving-focused, research-informed communities and networks characterized by recognition, trust, and respect.

Our study reveals the potential of incorporating Foucauldian discourse analysis and social network analysis to enhance our understanding of social relationships as technologies for governance and self-subjectification. In this sense, this case study achieves theoretical generalizability and contributes to broader theoretical understanding (Creswell, 2007). However, as a single-site, multiple-case study, the findings may not be generalizable to a wider population of academics. The focus on two specific cases limits the scope of the study and may not capture the full range of experiences and perspectives of teachers engaged in SoTL/PedR. To further understand the issue, future research could consider employing a larger sample size, incorporating a mixed-methods approach, or conducting a longitudinal study to track changes in academics' practices and beliefs over time.

Acknowledgements
The research is supported by China Foreign Language Education Fund Project (ZGWYJYJJ12A154), Southwest University Teaching and Education Reform Research Project (2024JY026) and Chongqing Municipal Social Science Planning Project: Foreign Languages Special Fund (2024WYZX34). We would like to express our sincere gratitude to all participants who generously shared their time and insights for this study. Their valuable contributions are essential to the completion of this research.

Author (s) Contribution Rate
Both authors contributed equally to the completion of the study.

Ethical Approval
The study was conducted with full adherence to pertinent ethical considerations and received the approval (Number: 2024JY026) from the Southwest University's Human Research Ethics Committee.

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Appendix

Imagine yourself positioned at the center of the map (see Figure 4), and please list the names based on the 'significance' of their relationship to your pedagogical research (PedR) work, placing them in the appropriate circle relative to the center.

Your connections may encompass, but are not restricted to, your professional colleagues (from your department, school, and university), as well as personal relationships such as family or friends.

Consider the following questions to assist in identifying these individuals:

- Who influences your approach or perspective towards PedR?
- Whom do you consult when encountering difficulties or when you have innovative ideas of PedR?
- With whom do you prefer to collaborate when submitting a proposal for a PedR research initiative?
- With whom do you share research materials?
- With whom do you prefer to discuss the successes and challenges you encounter in your PedR journey?

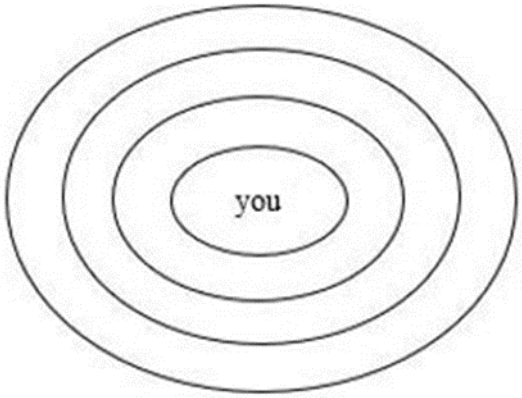

Figure 4. An individual social network map

International Journal of Contemporary Educational Research

Volume 11, Number 4, December 2024, Page 571-589 Article Type: Research Article

The Effect of React Strategy in Augmented Reality-Based Applications on the Problem-Solving Skills of Teacher Candidates

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Abstract
The main purpose of this research is to determine the effect of the REACT strategy in augmented reality applications on the problem-solving skills of teacher candidates. A parallel mixed method, which converges from mixed research designs, was used in the research. The study group of the research consists of 50 teacher candidates studying at the Faculty of Education at Siirt University. The REACT strategy rubric was used as a data collection tool in the quantitative dimension, and a semi-structured interview form, the researcher's and participant's diaries were used in the qualitative dimension. Quantitative data were analyzed with a computer package program and qualitative data were subjected to content analysis with the MAXQDA program. In addition, excerpts were made from stories, researcher's and participant's diaries, and semi-structured interview forms through document analysis, thus diversifying the data. As a result of the research, the problem-solving and critical thinking skills of the participants improved in the REACT strategy used in AR applications. During the experiencing step of the REACT strategy, which consists of interrelated steps, participants encountered problems and received support from their friends to solve these problems.

Keywords: Augment reality, Problem, Problem solving skills, REACT strategy

Citation
Koç-Akran, S. (2024). The Effect of react strategy in augmented reality-based applications on the problem-solving skills of teacher candidates. *International Journal of Contemporary Educational Research, 11*(4), 571-589. https://doi.org/10.52380/ijcer.2024.11.4.749

Received	23.09.2024
Accepted	16.12.2024
Publication	23.12.2024
Peer-Review	Double anonymized - Double Blind
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	editor@ijcer.net
Grant Support	The author(s) acknowledge that they received no external funding in support of this research.

Introduction

Augmented reality and education

Augmented reality (AR) is a technology that allows the combination of 3D virtual objects and real-world entities and real-time interactions (Uysal & Özdemir, 2024), which is seen as a derivative (Erbaş & Demirer, 2015) and extension of virtual reality (Çiloğlu, Yılmaz, Yılmaz & Karaoğlan, 2021). As seen in Figure 1, AR transfers real-world events to a virtual environment and makes them available to the individual.

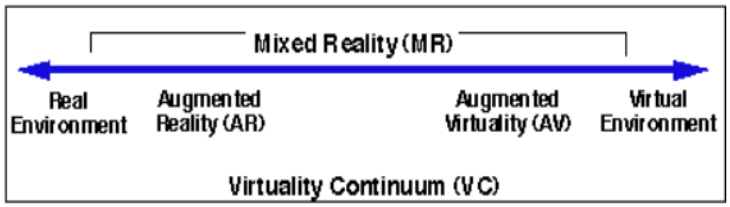


Figure 1. Simplified representation of a "virtuality continuum" (Milgram & Kishino, 1994:3)

The individual gains first-hand experience with augmented reality technology. The individual's interest in the subject increases. Learning by doing occurs (Tomi & Rambli, 2013). It makes the learning process fun. The individual's motivation for the lesson increases. Abstract concepts become concrete. The individual reaches his/her goals more easily with AR applications (Özeren & Top, 2023). The individual has the opportunity to see objects that he/she cannot see in real life and has difficulty reaching. A collaborative learning environment is created (Yoon, Anderson, Park, Elinich, & Lin, 2018). Thus, the individual adapts to real-life situations more easily with AR. All these features can be seen in studies on AR from past to present (Billinghurst and Henrysson, 2009) (See Figure 2).

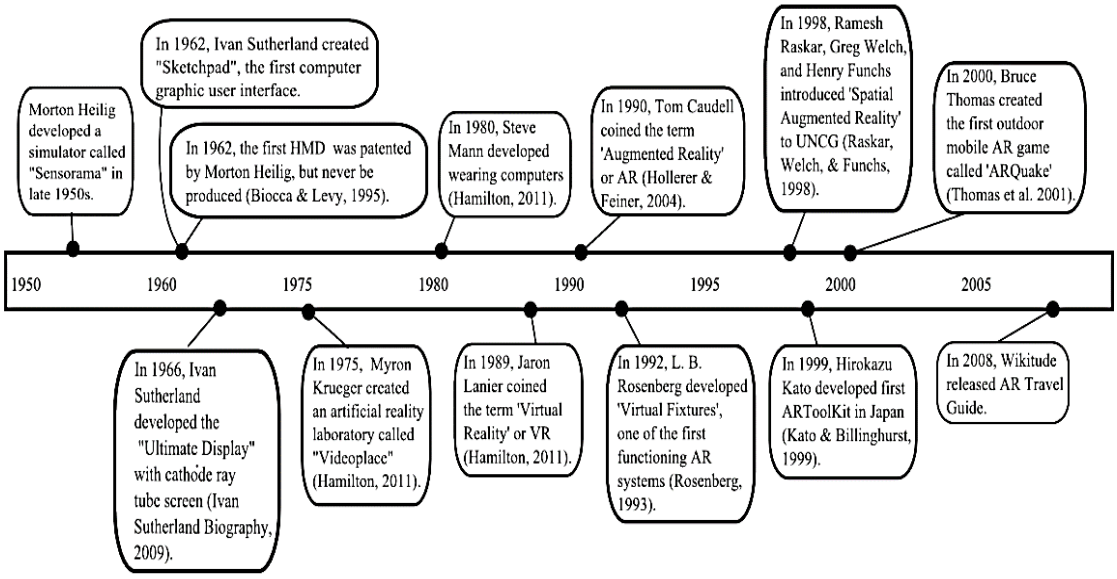


Figure 2. History of AR - a brief timeline (Yuen, Yaoyuneyong & Johnson, 2011:122)

In 1901, thoughts about AR were included in the book "The Master Key" by Frank Baum, author of The Wizard of Oz. Considering AR applications, cinematographer Morton Heilig invented Sensorama, a multi-sensory machine that stimulates the five senses, in 1957. In 1968, Ivan Sutherland designed the first head-mounted viewer, which he called the Sword of Damocles (Turhan, Metin & Ezberci Çevik, 2022). The term augmented reality was first coined by Tom Caudell, a Boeing researcher, in the early 1990s (Lee, 2012). In the mid-1990s, wearable computers were used for mobile AR applications in AR-related studies (Yuen, Yaoyuneyong & Johnson, 2011). In addition to the technologies used in these years, various projects related to AR have attracted attention. For example, Columbia Hardware's MARS project (Billinghurst and Henrysson, 2009) is important work for AR. Besides this, the Aumentaty project developed by the Labhuman laboratory, the BuildAR project developed by the Polytechnic University of Valencia in Spain and the HITLabNZ laboratory at the University of Canterbury in

New Zealand aim to integrate AR applications into the classroom. Similar applications are also found in European Union-funded research projects such as CONNECT (2005-2007), CREATE (2004) and ARiSE (2006-2008). Aurasma, known as an augmented reality platform, is a project called Science Center to Go, which offers a flexible learning environment to the individual (Martín-Gutiérrez, Mora, Añorbe-Díaz & González-Marrero, 2017). Magicbook (Billinghurst, Kato, & Poupyrev, 2001) applications, in which normal textbooks are used as the main interface, pictures are examined in the textbook, and readings are made, are seen as AR studies that attract attention in education.

REACT strategy

Basic skills such as literacy, critical thinking, creativity, and problem-solving are tried to be acquired by the individual in the 21st century with AR applications (Papanastasiou, Drigas, Skianis, Lytras & Papanastasiou, 2019). Individuals who use these skills increase their command of concepts in AR environments (Wibowo, 2023). Nowadays, when concept teaching is considered important, some strategies, such as REACT, are used in educational environments for the individual to explore the concept in depth. The REACT strategy, developed based on the context-based learning approach, was first described in the publication titled "Strategies for Mathematics: Teaching in Context" in the journal Educational Leadership and in two publications titled "Teaching Mathematics Contextually" and "Teaching Contextually" published within CORD (Arıkan, 2019). This strategy was introduced to the scientific world with the studies of Souders and Crawford (Ültay, 2014). REACT strategy, like AR applications, conveys scientific concepts to the student by associating them with daily life (Acar & Yaman, 2011).

The REACT strategy, introduced in the report prepared by Crawford (2001), consists of the steps of Relating, Experiencing, Applying, Cooperating and Transferring (Coştu, 2009). Crawford (2001) states that the first phase of REACT constitutes the heart of constructivism. When learning a new concept, individuals always associate the new concept with the concepts they are familiar with. In AR studies, the student always establishes a relationship between previous information while transferring his/her real-life information to the virtual environment (Özaltun & Kahraman, 2024). In other words, AR makes available virtual objects that are added to or associated with the real world, allowing the individual to see the real world (Azuma, 1997). In the second stage of REACT, there is learning by doing (Çatlıoğlu, 2010). Students come to class with some knowledge from their previous lives. Sometimes this makes the teacher's job difficult. Because while the teacher teaches new information, the student can benefit from past misconceptions. However, with the REACT strategy, the teacher observes the student at this stage and helps him/her make new discoveries with a sense of curiosity (Wahyuni, 2013). The teacher uses hands-on, manipulatives, problem-solving, and laboratory activities in classroom practices in this process, and student success is tried to be increased. For example, it was observed that student success in Mathematics and Science courses, where hands-on learning activities were used, increased by 70% in Mathematics and 40% in Science.

Manipulatives seem to be as effective as hands-on activities in increasing success. Manipulatives are tools used to concretize abstract concepts that are frequently used in mathematics lessons. Some computer programs, such as Geometer's Sketchpad and Cabri, can be given as examples of these tools. The student visualizes the concept, explores it, and answers questions about the concepts with these tools, which are mostly used in mathematics classes. He/she uses problem-solving skills while answering questions. For example, in mathematics class, the concept of ratio is explained by associating it with making fruit juice. Then the teacher asks the class, "How much concentrated fruit puree and water are needed to make fruit juice?" By using problem-solving skills, the student associates relevant information and suggests different solutions (Coştu, 2009). Similar applications and phases are also found in AR. In AR studies, students learn to discover knowledge by using problem-solving skills. Since 2009, The British Museum has been using AR to teach children about the Parthenon gallery. Using their tablets, children can play an augmented reality game called 'A Gift for Athena', which uses sculptures from the museum's collection. Again, AR technology is adapted to the classroom thanks to the Massive Open Online Course, allowing students and teachers to explore the water cycle (Bingöl, 2018).

In the third stage of the REACT strategy, the concepts to be used are introduced. In the application phase, students turn the concepts they have learned into practice through hands-on and problem-solving activities. The aim of the applications is to enable the student to learn the concept more deeply. For this reason, it is expected that their real situations are brought to the classroom environment as much as possible (Abebe, Tafari & Faris, 2024). The fourth phase of the REACT strategy is cooperation. Here, the student manages the process by sharing and communicating with others (Güneş, 2023). The last stage of the REACT strategy is using information outside the classroom (Akgürbüz, 2023). The REACT strategy embodies events/situations as in augmented reality. As Palancı and Turan (2021) state, communication channels are diversified by using virtual tools in augmented reality applications. Similarly, in the REACT strategy, the topics are conveyed by using tools and communication channels are made meaningful with these tools.

Importance of research

It appears that there are international and national studies on the REACT strategy. In these studies, the REACT strategy was associated with different variables. For example, Herlina and Ilmadi (2022) state in their study that the REACT strategy has a significant effect on high-level skills such as problem solving, critical thinking, and creative thinking. In addition, the topics of research associated with the concept of the REACT strategy are listed below:

Concept teaching (Rahayu, 2017; Junedi & Ayu, 2018; Anas & Fitriani, 2018), problem-solving skills (Durotulaila, Masykuri & Mulyani, 2014; Sari, Darhim & Rosjanuardi, 2018), critical thinking skills (Nisa, Lesmono & Bachtiar, 2017; Ihsani, Langitasari & Affifah, 2020), problem-solving, mathematics strategies, self-efficacy (Irjayanti & Heri, 2015; Putri & Santosa, 2015), scientific process skills (Tatlı, 2020),

Ways of reasoning in mathematics class (Pramata Sari & Darhim, 2020; Kurniawati, Andriani & Nendra, 2021), its effect on mathematics skills (Suryaningtyas & Halimah, 2017),

The effect of the GeoGebra-supported REACT Strategy on the understandability of Geometry Concepts (Jelatu & Ardana, 2018) and the effect of GeoGebra software supported REACT strategy on students' mathematical skills (Nurzannah, Muliana, Herizal, Fajriana, & Mursalin, 2021),

Evaluation of applications based on the REACT strategy (Demirtaş Şenel, 2023), investigation of the effect of activities developed according to the REACT strategy (Ültay, 2014),

When looking at the research in general, it can be seen that it is mostly focused on mathematics lessons. The studies consist of qualitative and mixed research. In experimental studies, certain variables have been tried to be revealed in the form of application. In particular, the technological variable was used in only one study. However, in today's 21st century, technological education is the feature that should be taken into consideration the most. The understanding that forms the general perspective of societies with education 5.0 supports this feature. Based on this, augmented reality applications were included in this research, and the participation of prospective teachers, who are the teachers of the future, in research with technological tools was tried to be supported. In the research, the REACT strategy was used in augmented reality application and the effect of the application process on the problem-solving skills of teacher candidates was tried to be determined. The fact that augmented reality application is not used in many studies on the REACT strategy makes this study unique. In other words, no national or international study has been found that uses and associates augmented reality with the REACT strategy.

Purpose of research

What is the effect of the REACT strategy on the problem-solving skills of teacher candidates in augmented reality-based applications?
1.What are the opinions of prospective teachers about AR-based applications?
2.What are the opinions of prospective teachers about the REACT strategy in AR-based applications?

Method

Research model

Convergent Mixed Methods Design was used in the research. In this design, the researcher collects qualitative and quantitative data together. These are analyzed separately, and in the findings section, qualitative and quantitative data support each other (Creswell & Creswell, 2018) (see Figure 3).

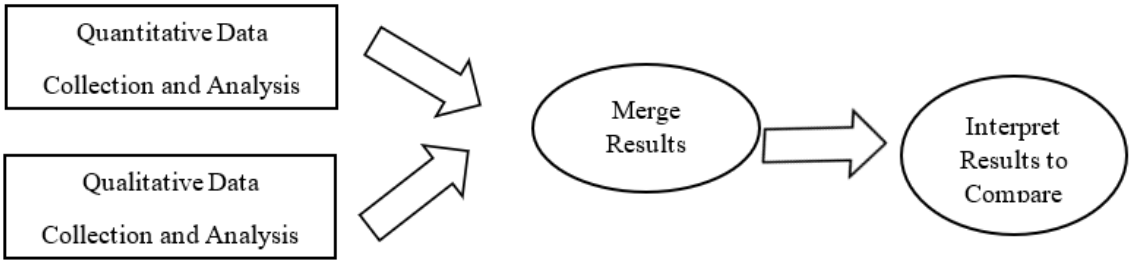


Figure 3. Convergent Mixed Methods Design (Creswell & Creswell, 2018)

If the researcher has limited time, has sufficient knowledge about collecting qualitative and quantitative data, and thinks that qualitative and quantitative data will be explained equally, he/she can use a convergent mixed method design in his/her research. For this reason, the convergent mixed design is seen as a strong design in which both types of data are considered together (Creswell & Plano Clark, 2018).
In the convergent mixed method design, data collection tools such as interviews, documents and observations are used. The qualitative and quantitative data obtained here are analyzed separately. Based on this information, three steps were followed in this research:

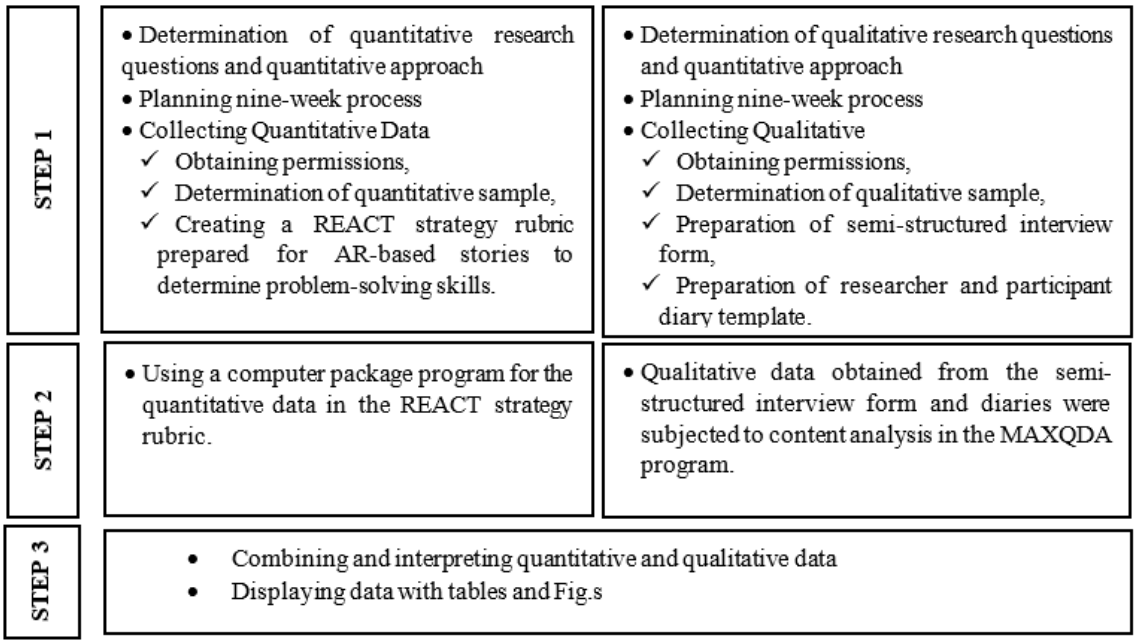


Figure 4. Research design flow chart according to convergent mixed methods design

Before collecting the data, the necessary official permissions were obtained in line with the Siirt University Ethics Committee Decision No. 795 dated 14.03.2024. Then, as seen in Figure 4, experimental procedures were started. 50 students were included in the experimental procedure. In this sample, the Single Group Pre-test - Post-test Design, one of the pre-experimental designs, was applied (see Figure 5).

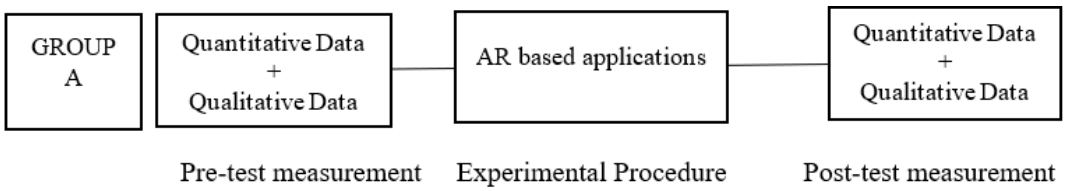


Figure 5. Experimental process suitable for mixed study

As seen in Figure 5, the REACT strategy rubric prepared for AR-based stories (pre-experiment A and post-experiment B form) to determine problem-solving skills in the quantitative dimension was used as pre-test and post-test. During the experimental process, researcher and student diaries and participant studies were included through document analysis. Participant studies consist of AR-based applications. After the experimental

procedure, a semi-structured interview form developed by the researcher was applied to the participants in the qualitative dimension. In these applications, some precautions were taken by the researcher for internal validity. First, the researcher randomly selected the participants. In this way, the distribution of participant characteristics is impartial. Since it was a single-group process, there was no separation of control and experimental groups. In external validity, the researcher limited his/her ideas about the study to the groups to which the results would be generalized. After all these processes, the data were combined and interpreted.

Working group

The study group of the research consists of 50 (66% female and 34% male) teacher candidates studying at the Faculty of Education at Siirt University. 68% are 2nd grade students, 20% are 3rd grade students, and 12% are 4th grade students of the teacher candidates. These classes, 22% are studying in Classroom Teaching, 12% are studying in Elementary Mathematics Teaching, 12% are studying in Turkish Teaching, 8% are studying in Social Science Teaching, 12% are studying in Science Teaching, 12% are studying in English Teaching, and 22% are studying in Guidance and Psychological Counseling.
The activities were carried out in the Drama in Education course. The participants participated in the activities voluntarily and their approval for voluntary participation was obtained. Participants were determined using an easily accessible or convenient sampling method, one of the qualitative research sampling methods. According to Baltacı (2018), it is preferred by researchers as it does not require much cost and can be easily reached by participants. In this study, the researcher chose this sample because he/she used the REACT strategy in augmented reality-based applications in the courses he/she conducted, knew the participant group and could easily reach the participants.

Data collection tools

Quantitative data collection tool

In the research, the REACT strategy rubric prepared for AR-based stories was used to determine the problem-solving skills of the participants in the quantitative dimension. Firstly, two different stories were prepared for the pre-test and post-test. In form A and form B, the problem-solving skills of the participants were tried to be determined within the framework of the REACT strategy. The REACT strategy rubric developed by the researcher was used in the stories to determine both the AR-based applications and the participants' level of skills in the REACT strategy steps. The purpose of the Brookhart (2023) rubric is to determine the individual's performance. Sometimes a written article, sometimes oral communication, and sometimes structured objects are evaluated with this data collection tool. Rubrics are divided into two: analytical and holistic. An analytical rubric was used in this research. The reasons for this are listed below:

✓ Detailed scoring of the Relating, Experiencing, Implementing, Cooperating and Transferring steps of the REACT strategy,
✓ REACT strategy steps are multi-dimensional,
✓ Performance dimensions and levels are observable,
✓ Sufficient time to be used to evaluate performance,
✓ Obtaining more reliable results than holistic,
✓ Being process-oriented,
✓ Determining the participants' weaknesses and strengths

In the study, the steps suggested by Goodrich (2000) were used while developing the REACT strategy rubric. These are as follows: 1) The best and worst performances were determined 2) participant studies were used 3) performance criteria were listed 4) mutually inclusive criteria were not included in the scope of the research. Thus, content validity was tried to be ensured. 5) Performance levels were determined and appropriate scoring was made (such as writing = 3, not writing = 0, giving an example = 5, not being able to give an example = 0, etc.). 6) Applying draft rubric to 15 students who were not included in the main application. The aim here is to determine the suitability of the language and expression for the participant group. 7) Expert opinion was taken. To determine the suitability of the performance criteria for the participant group and the research purpose, the opinions of two experts in the field of Curriculum and Instruction and two Turkish teachers were consulted.

Qualitative data collection tools

As a qualitative data collection tool, a semi-structured interview form developed by the researcher and researcher and participant diaries through document analysis were used. While preparing the semi-structured interview form, the purpose of the research was first taken into consideration. Then a question pool was created. Six questions were prepared for the pilot application. Expert opinion was taken to ensure the suitability of the questions to the participant group and the scope of the research (Curriculum and Instruction Department, Turkish Teacher). After expert opinions, the number of questions was reduced to four as two questions covered the other questions. The final form was applied to a group of 20 participants who participated voluntarily.

Participant and researcher diaries about the process were included throughout the experimental procedure. As it is known, diaries are used in qualitative research. According to Ersoy (2015), diaries are data collection tools used to convey an individual's feelings and thoughts. The individual conveys his/her indecisiveness, observations, feelings and thoughts through diaries. In this study, diaries were used to support quantitative and qualitative data. Direct quotations were made in the diaries using the code "K" for the participant and the code "A" for the researcher.

Analysis of data

A computer package program was used for the data obtained from the REACT strategy rubric prepared for the stories used in the pre-test and post-test. A normality test was performed when analyzing quantitative data. As a result of the normality test (skewness=2,764 and kurtosis=9,609), Wilcoxon Signed Ranks Test was used.
While analyzing qualitative data, the MAXQDA program was used and the data was subjected to content analysis. The following steps were taken into account when analyzing the data in Figure 6.

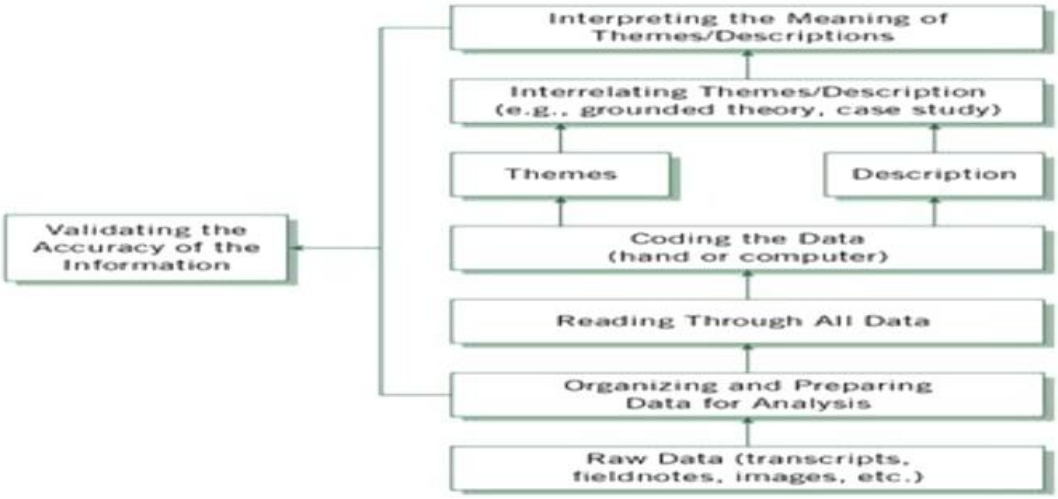


Figure 6. Data Analysis in Qualitative Research (Creswell & Creswell, 2018)

STEP 1: In this research, the data obtained in the semi-structured interview form and diaries were numbered from 1 to 20.
STEP 2: In this stage, data is prepared and organized for analysis. The researcher took the necessary notes within the framework of the general ideas of the participants.
STEP 3: The data in the interview form was read carefully by the researcher and the coding process started. A code list has been created for this. The coding process was first done manually and then transferred to the computer environment.
STEP 4: After the coding process, different and similar codes were classified and collected under certain themes.
STEP 5: Themes are visualized in the MAXQDA program and shown in the findings section.
STEP 6: Images are interpreted in the findings section.
In the nine-week research, the MyWebAR internet interface and the QR codes created on this site were used for AR applications. QR codes created on the internet interface are made available to students through QR code readers on students' phones.

Ensuring validity and reliability

First of all, each criterion was expressed clearly and understandably to ensure validity in the quantitative dimension. For example, the REACT strategy rubric consists of five performance dimensions: Relating,

Experiencing, Applying, Cooperating, and Transferring. In the Relating dimension, certain levels were determined to determine the criterion for feeling/realizing the problem in the story read (Writing three problems = 3 points, Writing two problems = 2 points, Writing one problem = 1, Writing no problems = 0). Secondly, care was taken to ensure that the general structure of each criterion was limited to its own purpose and did not interfere with other criteria for validity. For example, in the Experiencing dimension (writing a scenario with a main character, at least three supporting characters and a location in the story = 5 points) (Showing and explaining the scenarios on the interactive board = 5 points, adding a new main and three supporting characters to the scenario = 4 points, adding at least three objects to the scenario = 3 points, not doing any activity = 0 points). For validity, care was taken to include all characteristics to be measured in the scoring key. The scoring key includes five dimensions and 46 performances. These performances were scored separately throughout the process and AR applications and activities were carried out accordingly. For reliability, consistency was calculated by scoring 46 performances by two different raters (interrater reliability).

Different studies have been conducted on validity and reliability in the qualitative dimension. As Arslan (2022) stated, one of the ways to ensure validity is credibility (internal validity) and transferability (external validity). In the research, long-term interaction was established with the participants regarding credibility. The participant group was observed through diaries and their thoughts were written down. Triangulation was made using quantitative and qualitative data collection tools. Regarding transferability, the whole process was explained in detail and the process was detailed with researcher-student diaries. In reliability, consistency between coders was checked for consistency in the coding process. For this purpose, Miles and Huberman's reliability formula was used and was calculated as .96.

Ethics approval notification

Ethical permission (Date: 14.03.2024-Number: 795) was obtained from Siirt University Ethics Committee for this research.

Results and Discussion

The effect of the REACT strategy in augmented reality-based applications on the problem-solving skills of teacher candidates

The analysis performed to determine the effect of the REACT strategy with AR applications on the problem-solving skills of teacher candidates is included in Table 1.

Table 1. Wilcoxon Signed Rank Test results regarding the problem-solving skill scores of teacher candidates in the REACT strategy in augmented reality-based applications

MEASUREMENT		N	Mean Rank	Sum of Ranks	Z	p
Relating step	Negative Ranks	0	,00	,00	-6,195	0,00
Post-test	Positive Ranks	50	25,50	1275,00		
Pre-test	Ties	0				
	Total	50				
Experiencing step	Negative Ranks	0	,00	,00	-6,180	0,00
Post-test	Positive Ranks	50	25,50	1275,00		
Pre-test	Ties	0				
	Total	50				
Applying step	Negative Ranks	0	,00	,00	-5,860	0,00
Post-test	Positive Ranks	45	23,00	1035,00		
Pre-test	Ties	5				
	Total	50				
Cooperating step	Negative Ranks	0	,00	,00	-6,094	0,00
Post-test	Positive Ranks	48	24,50	1176,00		
Pre-test	Ties	2				
	Total	50				
Transferring step	Negative Ranks	0	,00	,00	-5,618	0,00
Post-test	Positive Ranks	40	20,50	820,00		
Pre-test	Ties	10				
	Total	50				

As seen in Table 1, there is a significant difference between the pre-test and post-test scores of the participants in the problem-solving skills in the REACT strategy steps in the activity studies conducted with AR applications ($p < 0.05$). It was observed that the participants' problem-solving skills scores increased in the relating, experiencing, applying, cooperating and transferring steps of the REACT strategy. In addition, it can be said that there was no increase in the problem-solving skills scores of 0 participants in relating and experiencing, 5 participants in applying, 2 participants in cooperating and 10 participants in transferring. As stated by Keskin and Çam (2018), individuals associate what they have learned with daily life with the REACT strategy. A similar opinion is valid for AR applications. In fact, in the participants' opinions about the AR application, it is stated that AR facilitates learning and concretizes the subject. For the individual, both AR and the REACT strategy provide a meaningful structuring of learning and the development of problem-solving skills. Guntur, Setyaningrum, Retnawati, and Marsigit (2020) touched upon the contributions of AR to problem-solving skills in their study. Although AR applications have positive aspects, their negative aspects were also mentioned in the study. The inadequacy of technological infrastructure in classes is seen as the biggest problem. In solving such problems, individuals again tried to solve them by using their problem-solving skills.

Opinions of teacher candidates on AR-based applications

The opinions that the participants wrote in their diaries on AR applications are shown in Figure 7.

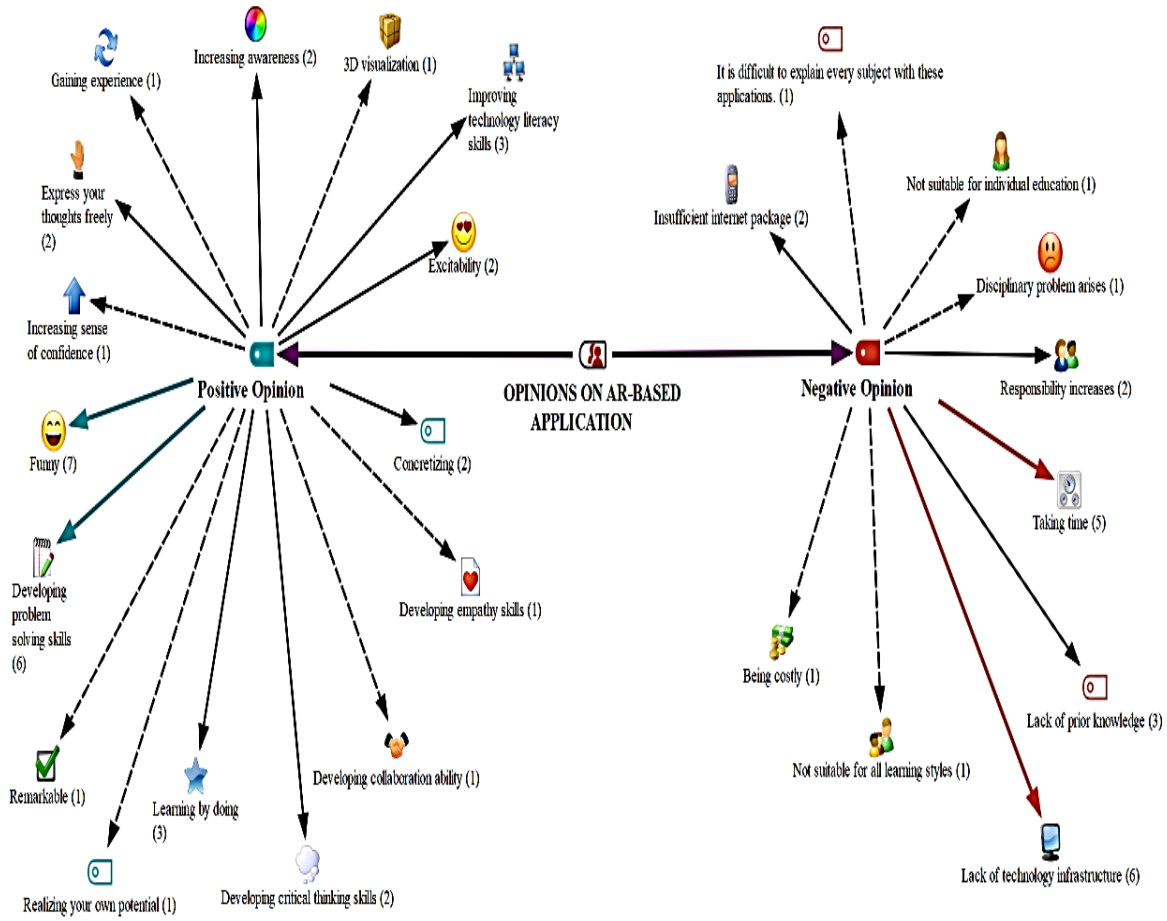


Figure 7. Opinions on AR-based application- Code-Theory Model

As seen in Figure 7, there are positive and negative opinions about the AR application in the diaries of 50 participants. Among the positive opinions, the most emphasized code is entertainment and improving problem-solving skills. Among the negative opinions, the most notable codes are taking time and the lack of technological infrastructure. Some quotes from the participants' positive and negative opinions about the AR application are given below in Figure 8, Figure 9 and Figure 10.

Today was very fun for me. I expressed my opinions for the solution of the problem in the story. I saw the three-dimensional shape of our drama class with the program that I liked the most. (K1-6.05.2024).

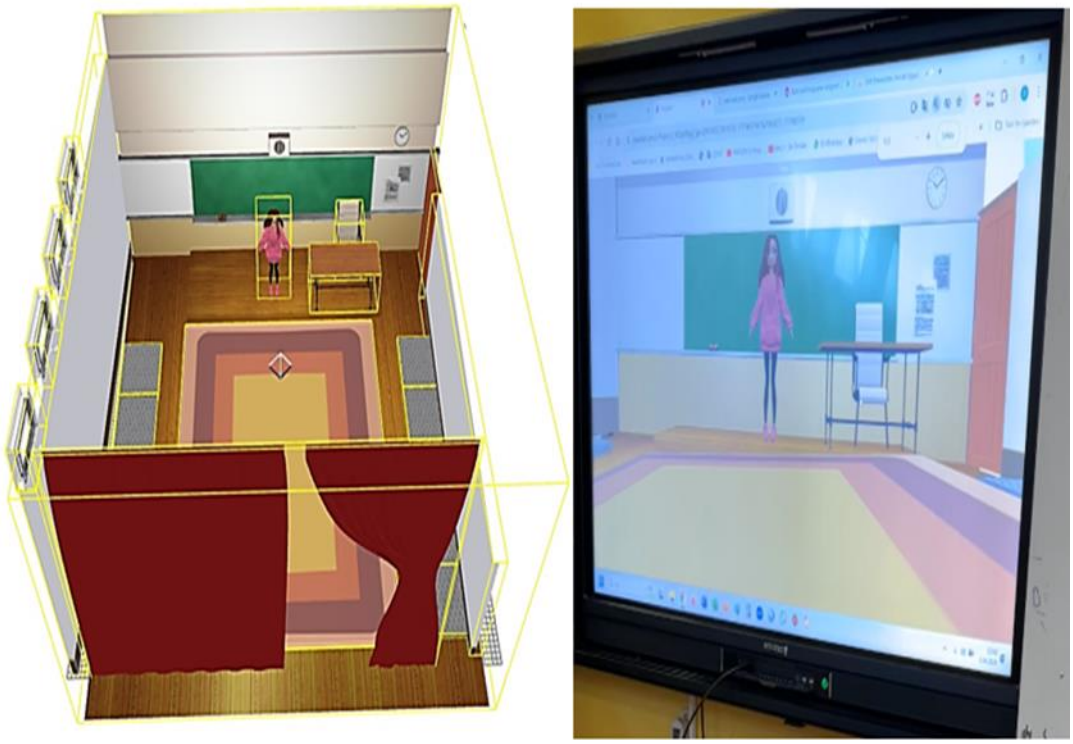


Figure 8. AR-based application

The fact that the lesson is fun and allows me to focus on the subject makes my learning easier. (K5-15.04.2024). .... I added objects in the AR program depending on the story. It was very fun. It was like I was playing a game at home... (K17-14.05.2024).

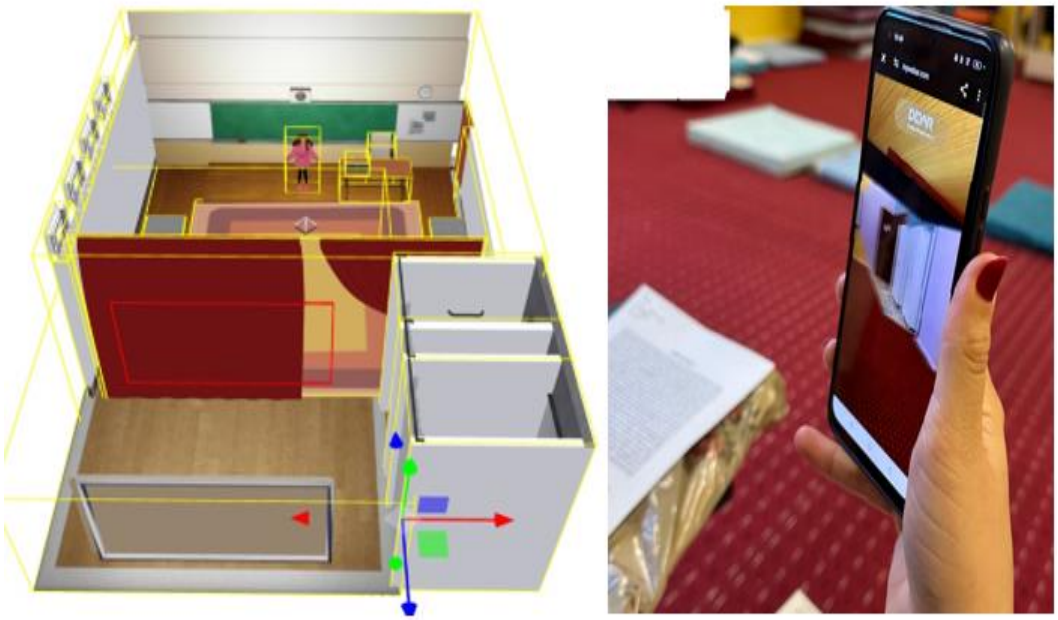


Figure 9. AR-based student application

The contributions of these activities to me are as follows: First, the lesson is fun... (K10-22.05.2024).

.... I suggested a solution related to the place. It takes a lot of time and I think it is a burden for people... (K3-27.05.2024).

The only problem is that it takes time. You need to be very well prepared for these applications. (K13-29.05.2024).
.... You experience problems when you do not have a technological infrastructure. (K19-20.05.2024).

Figure 10. Activity class

The only problem is the lack of technological infrastructure... Our classes are not sufficient in terms of technological infrastructure. (K50-24.04.2024).

In addition to the participants' diaries, quotes were also made from the researcher's diaries.
In the first weeks, students did not have any information about the AR application. Today, I gave general information about the AR application. (A-18.03.2024). Today, I saw that a few students were interested in this concept. They said they had heard about this concept on the internet before. (A-19.03.2024). The students' approaches excited me. I think that participation will increase as their knowledge about what to do increases. (A-20.03.2024). Having a technologically supported lesson for the students increased their motivation for the lesson. This is our second week. However, I noticed that some students were introverted. (A-1.04.2024). Again, on a different day, the application that the students enjoyed the most was the role-playing phase. After the story was read, they performed role-plays based on the story. They even brought their friends from other classes. (A-20.05.2024). (A-20.05.2024) The point that students complain about most is the insufficient technological infrastructure of the classroom. In order to minimize this situation, emphasis was placed on group work. (A-24.05.2024).

Opinions of teacher candidates on AR-based applications

Among the opinions of teacher candidates on the REACT strategy in AR-based applications, the first one is the definition of the REACT strategy. Participants' opinions on the definition are given in Figure 11.

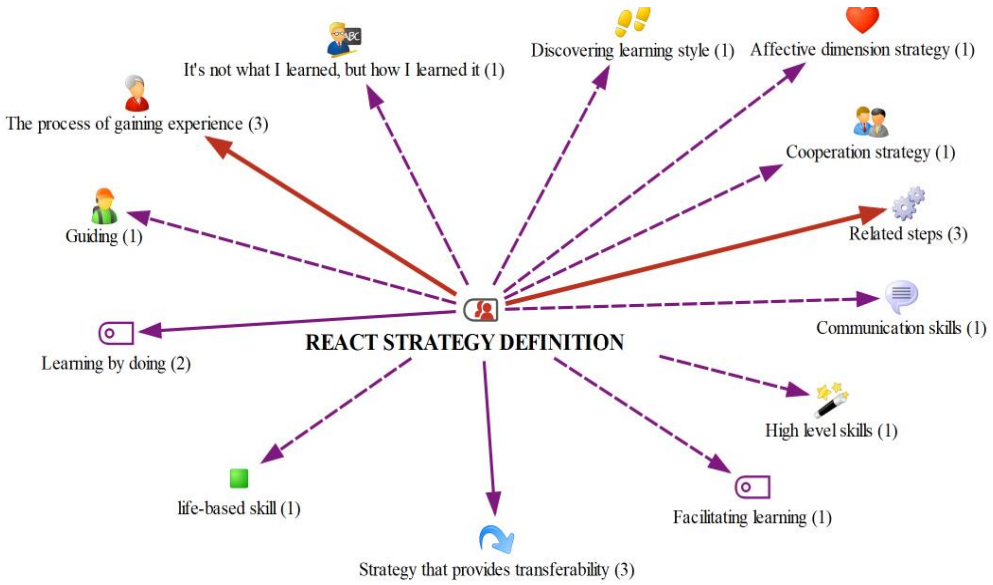


Figure 11. REACT strategy definition- Code-Theory Model

As seen in Figure 11, when defining the REACT strategy, participants mostly emphasized that it is a process consisting of interrelated steps and providing experience to the individual. Some of the participants' opinions are given below.

I think it's like the links of a chain. Each link completes the other (K1).

When it comes to REACT strategy, the first thing that comes to my mind is the interrelated steps (K5).

It's an application that gives people life experience. (K2).

It's a strategy that gives me a lot of experience, and these experiences create meaningful knowledge. (K3).

Herlina and Ilmadi (2022) and Jelatu and Ardana (2018) state in their studies that REACT consists of various steps and that these steps are interconnected. The individual's problem-solving skills develop at each step (Durotulaila, Masykuri & Mulyani, 2014; Keleş, 2019; Suryaningtyas & Halimah, 2017). In addition to problem-solving skills, 21st century skills such as critical thinking are also used (Nisa, Lesmono & Bachtiar, 2017; Ihsani, Langitasari & Affifah, 2020). These skills are used at every step and sometimes higher-level skills are more prominent at certain steps. For example, in the research, participants encountered more problems at the experiencing step Considering the general characteristics of this step, the individual learns by doing and learns various concepts (Durotulaila, Masykuri & Mulyani, 2014; Beştaş, 2022). What is important is for the individual to use their problem-solving skills in solving the REACT stages and the problems encountered in the stages. In this research, participants solved their problems by working collaboratively and getting support from their closed circle.

The second opinion of teacher candidates on the REACT strategy in AR-based applications is the skills developed with AR. Participants' opinions on skills are shown in Figure 12.

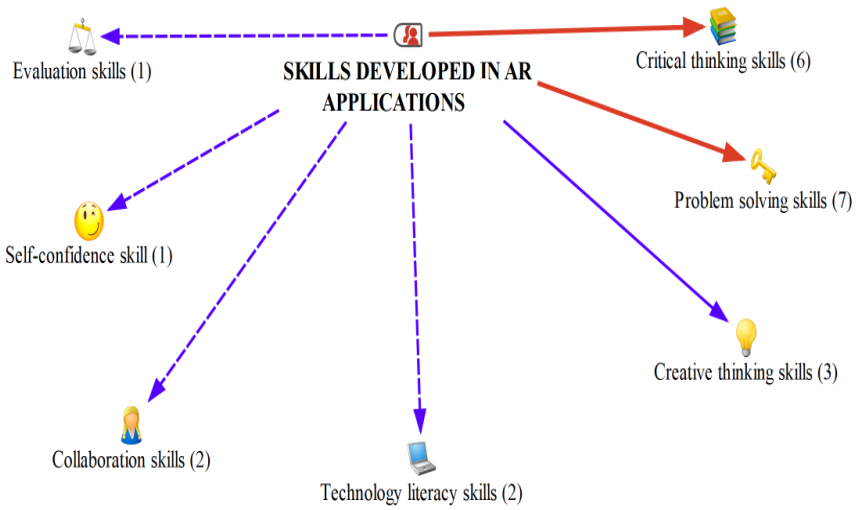
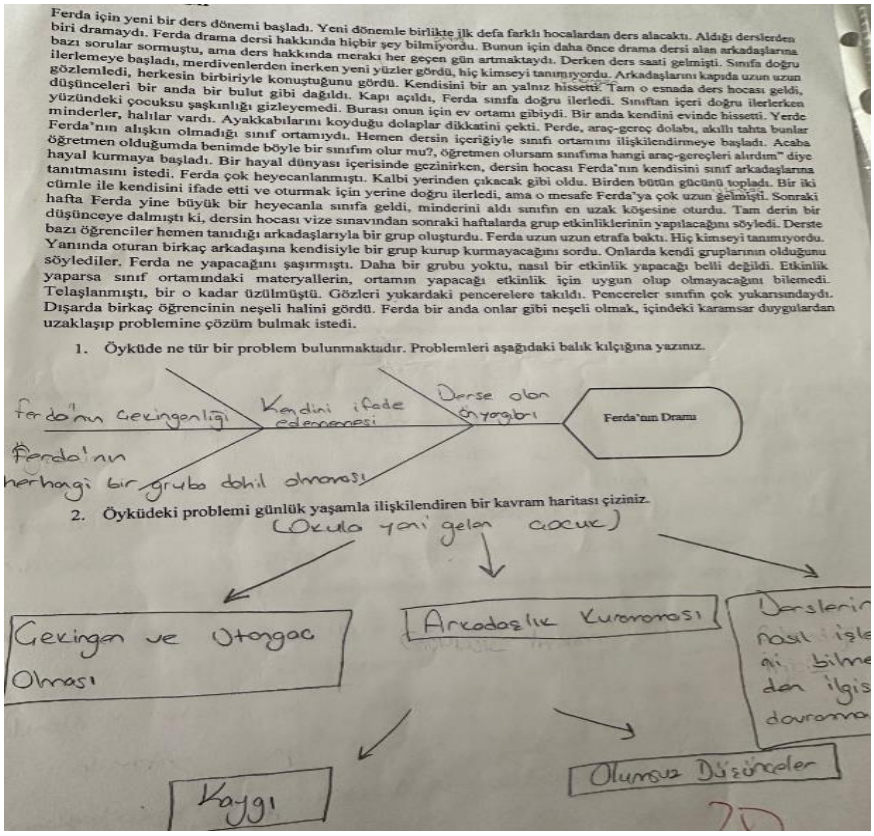


Figure 12. Skills developed in AR application- Code-Theory Model

As seen in Figure 12, the participants' critical thinking and problem-solving skills improved the most with AR applications. Participants' opinions on these two skills are given below Figure 13 and Figure 14.
My critical thinking skills improved the most in discussion groups (K4).


Ferda için yeni bir ders dönemi başladı. Yeni dönemle birlikte ilk defa farklı hocalardan ders alacaktı. Aldığı derslerden biri dramaydı. Ferda drama dersi hakkında hiçbir şey bilmiyordu. Bunun için daha önce drama dersi alan arkadaşlarına bazı sorular sormuştu, ama ders hakkında merakı her geçen gün artmaktaydı. Derken ders saati gelmişti. Sınıfa doğru ilerlemeye başladı, merdivenlerden inerken yeni yüzler gördü, hiç kimseyi tanımıyordu. Arkadaşlarını kapıda uzun uzun gözlemledi, herkesin birbiriyle konuştuğunu gördü. Kendisini bir an yalnız hissetti. Tam o esnada ders hocası geldi, düşünceleri bir anda bir bulut gibi dağıldı. Kapı açıldı, Ferda sınıfa doğru ilerledi. Sınıftan içeri doğru ilerlerken yüzündeki çocuksu şaşkınlığı gizleyemedi. Burası onun için ev ortamı gibiydi. Bir anda kendini evinde hissetti. Yerde minderler, halılar vardı. Ayakkabılarını koyduğu dolaplar dikkatini çekti. Perde, araç-gereç dolabı, akıllı tahta bunlar Ferda'nın alışkın olmadığı sınıf ortamıydı. Hemen dersin içeriğiyle sınıfı ortamını ilişkilendirmeye başladı. Acaba öğretmen olduğumda benimde böyle bir sınıfım olur mu?, öğretmen olursam sınıfıma hangi araç-gereçleri alırdım" diye hayal kurmaya başladı. Bir hayal dünyası içerisinde gezinirken, dersin hocası Ferda'nın kendisini sınıf arkadaşlarına tanıtmasını istedi. Ferda çok heyecanlanmıştı. Kalbi yerinden çıkacak gibi oldu. Birden bütün gücünü topladı. Bir iki cümle ile kendisini ifade etti ve oturmak için yerine doğru ilerledi, ama o mesafe Ferda'ya çok uzun gelmişti. Sonraki hafta Ferda yine büyük bir heyecanla sınıfa geldi, minderini aldı sınıfın en uzak köşesine oturdu. Tam derin bir düşünceye dalmıştı ki, dersin hocası vize sınavından sonraki haftalarda grup etkinliklerinin yapılacağını söyledi. Derste bazı öğrenciler hemen tanıdığı arkadaşlarıyla bir grup oluşturdu. Ferda uzun uzun etrafa baktı. Hiç kimseyi tanımıyordu. Yanında oturan birkaç arkadaşına kendisiyle bir grup kurup kurmayacağını sordu. Onlarda kendi gruplarının olduğunu söylediler. Ferda ne yapacağını şaşırmıştı. Daha bir grubu yoktu, nasıl bir etkinlik yapacağı belli değildi. Etkinlik yaparsa sınıf ortamındaki materyallerin, ortamın yapacağı etkinlik için uygun olup olmayacağını bilemedi. Telaşlanmıştı, bir o kadar üzülmüştü. Gözleri yukardaki pencerelere takıldı. Pencereler sınıfın çok yukarısındaydı. Dışarda birkaç öğrencinin neşeli halini gördü. Ferda bir anda onlar gibi neşeli olmak, içindeki karamsar duygulardan uzaklaşıp problemine çözüm bulmak istedi.

1. Öyküde ne tür bir problem bulunmaktadır. Problemleri aşağıdaki balık kılçığına yazınız.

2. Öyküdeki problemi günlük yaşamla ilişkilendiren bir kavram haritası çiziniz.

Figure 13. Student scenario

I used my critical thinking skills a lot while expressing positive and negative opinions about the subject (K10).
My critical thinking skills improved. This skill of yours improves because you are constantly expressing your opinions about the stories. (K17).

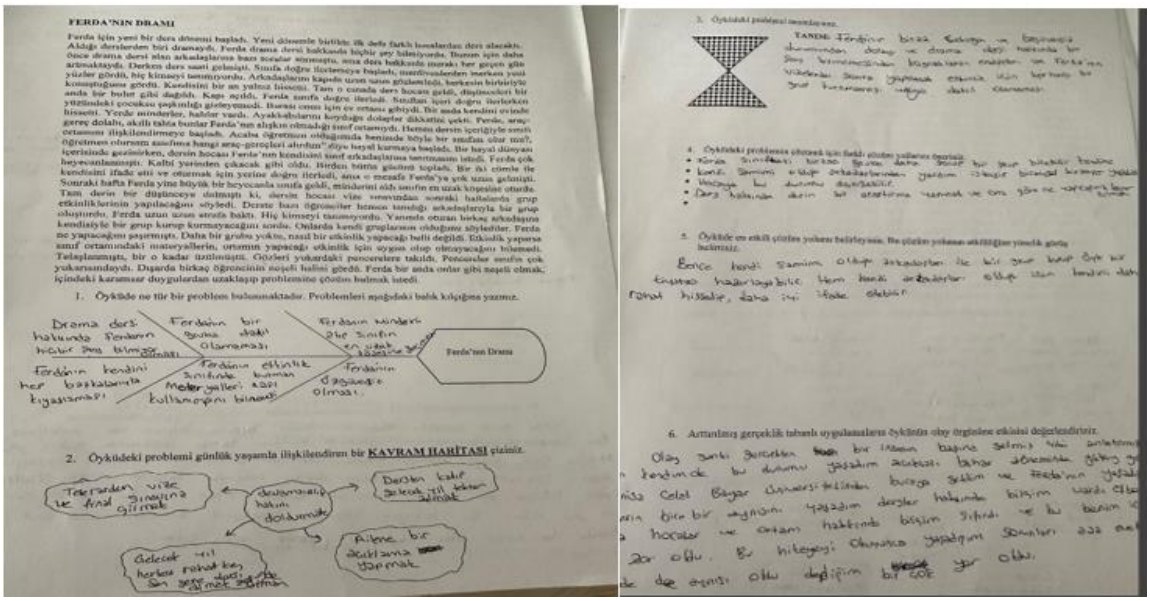


Figure 14. Student scenario

Problems arose at many stages of forming groups and writing scenarios. For this reason, my problem-solving skills improved (K3).

My problem-solving skills improved. Because when we acted without planning, we encountered many problems. You inevitably find solutions to the problems (K14).

I can say this directly. My problem-solving skills improved a lot. Subjects encourage people to learn. There is a problem in every new subject you learn and you use your problem-solving skills to solve this problem (K19).

The third step among the opinions of prospective teachers on the REACT strategy in AR-based applications is the step in which they have the most problems with the REACT strategy. Participants' opinions on the steps are given in Figure 15.

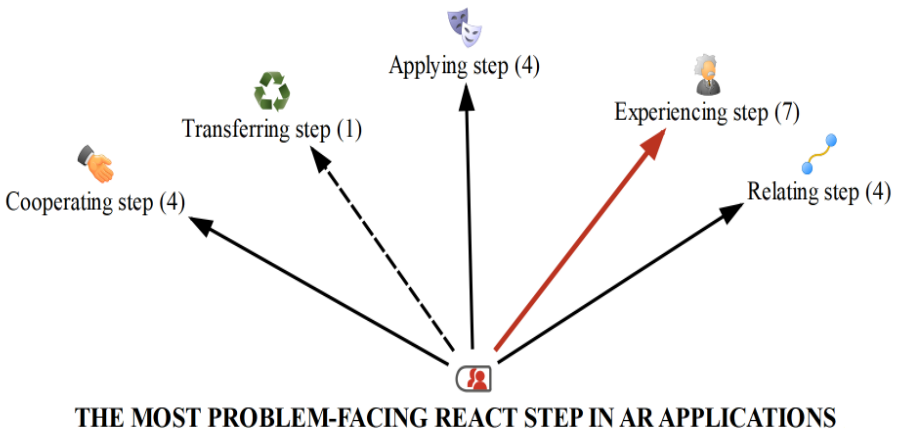


Figure 15. The most problem-facing REACT step in AR applications- Code-Theory Model

As seen in Figure 15, participants experienced more problems in the experiencing step of the REACT strategy. Participants' opinions on these problems are given below.
In the experience phase, I had disagreements with my group mates while writing new scenarios based on the story (K6).

Experience phase. While we were thinking of creating small groups, we created large groups. We wrote a very broad scenario (K12).

Fourth, the participants' opinions on solving the problems they encountered in the REACT strategy steps are shown in Figure 16.

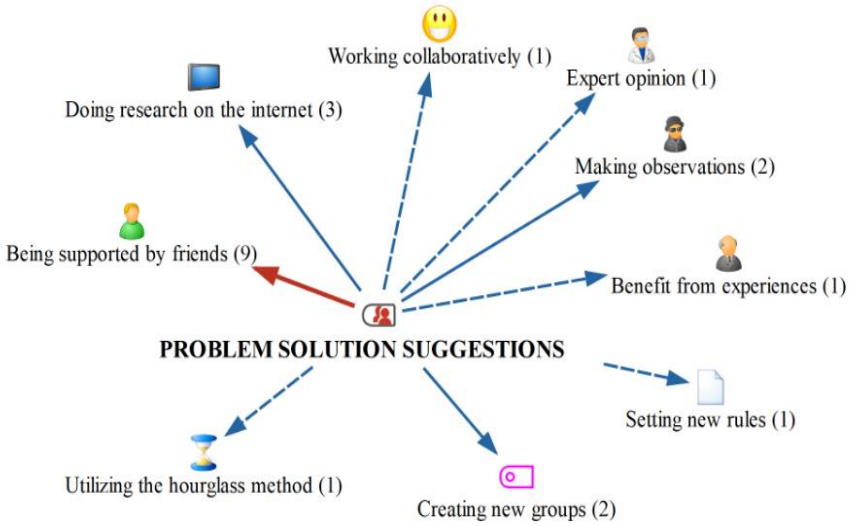


Figure 16. Problem solution suggestions - Code-Theory Model

As seen in Figure 16, the most emphasized solution suggestions for the problems encountered in the REACT strategy steps include the participants getting support from their friends. Participants' opinions on this support are presented below in the form of quotes in Figure 17.

…. I exchanged information with my group mates (K2).

…I got help from my friends outside the class (K5).

Figure 17. Student's group activity

…. Then my friend helped me. Thanks to this help, different events came to my mind (K20).

Conclusion

AR applications were included in the research and the problem-solving skills of the participants were tried to be determined with the REACT strategy used in these applications. As a result of the research, it was seen that the participants defined the problems in the given stories. They related the problems to daily life. Later, in group activities, they wrote new scenarios based on the story. They added new characters and objects to the scenarios that were read. The groups shared their opinions about these characters and objects. They suggested solutions to the existing problems in the opinions. In addition, they tried to find an effective solution by determining their own rules. They worked collaboratively to visualize the effective solutions they found. Finally, they discussed their positive and negative opinions about the plot using the aquarium technique and problem-solving technique. Thus,

the five steps of the REACT strategy were used in AR applications with the activities carried out and the problem-solving skills of the participants were tried to be determined step by step.
In the study, participants define the REACT strategy as a process in which experiences are used and a cycle of interrelated steps. It is seen that AR applications, in which technologies are used extensively within the concept of contemporary education, and the REACT strategy used in these applications make significant contributions to the student's academic development and ability to use technology. In the globalizing world, individuals mostly use problem-solving skills with AR technology, which is used extensively, especially in the field of education. Thus, one of the common points of intersection of AR and REACT strategies is "problem-solving skills". Many studies are needed for this skill to be used more in today's education. Therefore, more studies are needed on the use of both AR and REACT in other courses and which skills students develop. This study focuses on problem solving skills and other studies can be conducted on the development of different skills.

Recommendations

In the study, it was tried to determine the effect of the REACT strategy on the problem-solving skills of teacher candidates in augmented reality applications. Hybrid studies can be carried out for the use of the REACT strategy in different education levels and courses. In these studies, AR applications can be considered and different high-level skills of the participants can be determined.

Author (s) Contribution Rate

There is one sole author (100%), who produced, reviewed and approved the final manuscript.

Ethical Approval

Ethical permission (Date: 14.03.2024-Number: 795) was obtained from Siirt University Ethics Committee for this research.

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