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How Does In-Group Conformity Affect Students' Academic Dishonesty? Study During Online Learning

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Abstract

This study aims to determine the effect of group conformity on academic dishonesty in students of the Faculty of Economics and Business in Banyumas, Indonesia. Technique taking sample study use technique simple random sampling. Participants study totaling 331 students Faculty of Economics and Business in Banyumas, Indonesia. The data collection instrument used a group conformity scale with a reliability coefficient of 0.875 and a scale of academic dishonesty with a reliability coefficient of 0.911. Data analysis in this study used simple regression analysis. This study indicates the effect of group conformity on academic dishonesty in students of the Faculty of Economics and Business in Banyumas, Indonesia. Group conformity becomes essential to note because of its impact on academic dishonesty behavior on campus. The increasing behavior of academic dishonesty during online learning needs to be evaluated to prevent unethical behavior.

Keywords: Group conformity, Academic dishonesty, Online learning, Student college.

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Introduction

Online learning has been enforced on whole-level education globally since COVID-19 was declared a pandemic in 2020. The whole learning is conducted online for continuity education. However, several studies said that enforcement of online learning is ineffective (Lestari & Agustang, 2021; Puspita, 2022; Zapata-Cuervo et al., 2021) because of technical problems or not problems understanding the material. Besides that, results from another study say that online learning provides convenience for the student for doing behavior no honest; results in the study qualitative say that college students use various methods for behavior no, honest-including making groups specializing in social media, signing in with accounts owned by her friend with standard user password. Results from another study noted that pressure to get a scholarship, pressure from a parent permanently, and the burden of challenging academic becomes the reason for dishonesty in academic During online. Several results could conclude that academic dishonesty occurs more often than offline learning.

Academic Dishonesty

As agreed Together, academic dishonesty is a severe problem in this world of education. This problem occurs not only in one or two countries but also in many countries around the globe. Many journals have reported academic dishonesty behavior in various countries based on the last five years. In the Asian continent, such as Malaysia (Tiong, 2018), Indonesia (Ampuni et al., 2019; Herdian & Mildaeni, 2022; Parkinson et al., 2011), Thailand (Thomas, 2017), Philippines (Balbuena & Lamela, 2015). In Continental Europe, such as Russia (Maloshonok & Shmeleva, 2019), Moldova (Ives & Giukin, 2020), and Austria (Hopp & Speil, 2021). The Americas, such as the United States (Peled, 2019) and Mexico (Guerrero, 2020).

Based on education level, academic dishonesty behavior has been studied at all levels of education. First, at the *Elementary School level*, the study results stated that 92% of elementary school students carried out academic dishonesty, and 45% considered academic dishonesty an acceptable social behavior (Jatmiko, 2020). Second, at *the Junior High School level*, research shows that 32% of plagiarized students use the internet, 51% of students cheat on exams, and 74% of students copy their friends' homework (Krou, 2020). In comparison, junior high school students are considered to behave honestly (Le et al., 2019). Third, at the *Senior High School level*. High school students commit dishonesty when taking national exams (Herdian, 2017). Fourth, at the tertiary level, it is stated that there are 83.48% of undergraduate students and 52% of postgraduate students commit plagiarism via the internet (Pantu, 2020). Many students think that academic dishonesty behavior can be accepted and used as an educational strategy by students (Shmeleva & Semenova, 2019). Whereas at the tertiary level, the cultivation of character education is still critical because the learning activities held at the tertiary institution do not only provide knowledge and skills but also direct students to become human beings who develop their thoughts and in their personalities are strived to be able to develop and improve in a better direction (Janosik, 2005).

Focusing on the phenomenon of academic dishonesty at the tertiary level, dishonest behavior is contrary to the competency standards of graduates in Indonesia. The competency standards of graduates in Indonesia, especially at the tertiary level, have been regulated in the Government Regulation of the Republic of Indonesia article 26

number 19 of 2005, explaining that one of the competency standards for graduates at the tertiary level education level is to prepare students to become members of society with noble character, even though universities are expected to produce competent and good moral students (Vinet & Zhedanov, 2011).

On the side, On the other hand, globalization opens various things to enter the territory of Indonesia, including various customs, cultures, and all information from outside, which often does not follow the culture of the Indonesian nation. The unpreparedness of the Indonesian people to accept various things from outside, including understanding and patterns of thinking, has resulted in the nation's moral decadence. This unpreparedness causes a decline in the character of the nation's children. The decline in the character of this nation's children results from the *output of* the world of education, which is more concerned with cognitive than affective. Such rapid social change causes a shift in values. One of the values that have changed is honesty. Higher education is more concerned with student intelligence than honest character or process and based on noble character. As a result, it is not uncommon for many students to pursue a 100% graduation rate incorrectly (Santoso, 2013). This is contrary to the goal of the national education system as previously stated that honesty is the main character that every student needs to have, as well as honesty in the academic sphere.

Academic dishonesty behavior is considered normal for students. Students are increasingly cultivating academic dishonesty behavior (Nugraha, 2020), and frequent behavior happens in college (Herdian & Rahayu, 2022). This is evidenced by the research of Choi & Kim (1996), which states that almost 90 percent of students are dishonest in their exams. Another study noted that at the Faculty of Economics, Padang State University, Indonesia, the percentage of academic dishonesty in the Economic Education Study Program was 48%, the Accounting Study Program was 42.6%, the Development Economics Study Program was 52.4%, and Management Study Program by 45.0% (Fitriyani, 2011).

Academic dishonesty is any behavior that violates standards where students have used the work of others to support their work (Lambert et al., 2006). Several factors influence academic dishonesty: group conformity (Fitriah, 2022). Conformity occurs when an individual changes his attitude or behavior to suit his group. So that individuals who initially have never carried out certain behaviors will equate their behavior with the norms in their group so that they can be accepted and become part of the group, including those related to academics. This may also occur in how the individual is in groups with his friends who are used to doing things academic dishonesty. Individuals will do anything to achieve the targets set together. If one of the individuals in the group does not take the same action to achieve a common target, that individual will be punished for conformity, such as intimidation.

Group Conformity and Its Effect on Educational Outcomes

Group conformity is a change in behavior due to group pressure, as can be seen from teenagers' tendency always to equate their behavior with the group so that they can avoid reproach and alienation from Santrock (cited in Lestari & Lestari, 2017). Group conformity is also defined as adjusting adolescents' attitudes to adhere to the norms of the reference group and accept ideas or rules that show how adolescents behave (Baron, 2005).

Conformity also occurs when students adopt the attitudes or behavior of other students because they feel pressured, either real pressure or just a shadow pressure by their friends (Rohana, 2015). an experimental study reports how academic achievement interacts with conformity. low-achieving students in minority roles tend to conform more often than high-achieving minority students—especially when among the high-achieving majority (Uchida et al., 2020). The influence of group conformity on academic achievement of active students of UKM Religious Arts State Islamic University Maulana Malik Ibrahim Malang, Indonesia (Albardi, 2019)

Academic dishonesty behavior can occur if there has been an intention, creating trust, attitude, and intention to perform academic dishonesty behavior. The emergence of an individual's intention to commit academic dishonesty is primarily learned from the individual's environment (Amalia Mintarso, 2020). With the existence of Inner conformity in groups, individuals will carry out academic dishonesty behavior together to get good and impressive grades so that it is seen that conformity is a good and natural thing.

Muliyani's (2016) research shows a significant positive effect between group conformity and deviation from social cheating. Furthermore, a study by Amelia et al. (2016) also explains a positive and significant influence between group conformity and intention to cheat. From this research, it can be concluded that group conformity has a positive and significant influence on academic dishonesty behavior that occurs in students. The higher the group conformity, the higher the academic dishonesty behavior. Vice versa, the lower the conformity of the group, the lower the academic dishonesty behavior that occurs.

Purpose of the Study

This study aims to investigate how group conformity affects academic dishonesty behavior during online learning. Benefits This research is expected to contribute to ethical research in universities, especially regarding academic dishonesty. In addition, this study provides information on how peer conformity affects academic dishonesty when online learning occurs during the pandemic. So this research helps evaluate online learning in higher education. This research is essential because online learning is often considered ineffective. it has limitations, such as the difficulty of inviting students to participate actively, but students are more active outside of learning. This is significant in how student interaction can influence unethical behavior during online learning, and this study differs from a study that previously studied academic dishonesty in online learning. So that result could be compared to with results study before.

Method

Study this use quantitative, quantitative study notice on collection and deep data analysis form numeric and character objective. Intercorrelation variables could be measured methodology study quantitative used to explain the connection between cause and effect between researched variables.

Table 1. Demographics of Participants

No	Demographic	N	percent
1	Sex		
	Male	136	41.1%
	Female	195	58.9%
2	Major		
	Management	307	92.7%
	Accounting (bachelor)	23	6.9%
	Accounting (diploma)	1	0.3%
3	Semester		
	Two	36	10.9%
	Four	213	64.4%
	Six	26	7.9%
	Eight	56	16.9%
4	GPA		
	<2	2	0.6%
	2.00-2.75	9	2.7%
	2.76-3.50	123	37.2%
	3.51-4.00	197	59.5%

Participants

Demographic data participants showed in table 1. Based on demographic data, gender is dominated by female participants amounted to 195 (58.9%) compared to male participants, namely 136 (41.1%). Based on demographic data, the study program participants were dominated by from the Management study program, totaling 307 (92.7%) than participants 23 students (6.9%) from the accounting study program (bachelor) and 1 participant from the Accounting (diploma) study program (0.3%). Based on the demographics of the participating semesters, the research was dominated by 4th-semester participants totaling 213 (64.4%), then 2nd-semester participants totaled 36 (10.9%), 6th-semester participants were 26 (7.9%), and 8th-semester participants were 56 (16.9%). Based on the GPA demographic data, it can be concluded that most research participants are participants with a GPA range of 3.51-4.00 total of 197 (59.5%) than participants with a GPA range of 2.75-3.50, totaling 123 (37.2%), participants with GPA ranges from 2.00-2.75 were 9 (2.7%), and participants with GPA ranges <2 were 2 (0.6%).

Measurement

Academic Dishonesty Scale

Scale Dishonesty academic used to measure behavior dishonesty academic based on aspects according to McCabe & Trevino (1993) and Stone et al. (2010), developed by Ampuni et al. (2020), including cheating, unauthorized collaboration, and plagiarism. The scale is arranged using a *Likert scale* (0-4) with 14 items. The academic dishonesty scale has a Mark reliability of 0.91. A high score indicates more significant levels of Academic Dishonesty.

Conformity Scale

Scale group conformity consists of 40 items developed based on aspects in the conformity group according to Frings (2018): cohesiveness, agreement, and obedience. The scale is arranged using a *Likert scale* (1-5) with 25 items. The conformity scale has a Mark reliability of 0.91. A high score indicates more significant levels of Group Conformity than lower scores and vice versa

Analysis

This study examines whether group conformity affects academic dishonesty in students of the Faculty of Economics and Business in Banyumas, Indonesia. The data analysis method used in this study uses the regression test analysis method simple. Simple regression analysis is used when one independent variable and one variable are dependent. A simple regression analysis technique was used to determine the extent of the simultaneous influence between the independent variables X (conformity group) and dependent variable Y (dishonesty academic). Normality and linearity calculations were performed before hypothesis analysis. Based on the normality test results, the academic dishonesty variable has a value of .370 and group conformity .120. This shows that the data is normally distributed. The results of the linearity test show a value of .285, which means that the group conformity variable to academic dishonesty is linear. All calculations in this study use SPSS (Statistical Product and Service Solution) version 23.00 for windows.

Results

This study aims to test the effect of conformity on academic dishonesty. Based on Table 2. The results of the regression test at a significance level of 5% for the effect of group conformity on academic dishonesty obtained the results (F(1,329)=38.691, p <.000), with R^2.105. Participants predicted academic dishonesty equals 9.867 + 0.334 (group conformity). Participants' academic dishonesty increased by 0.334 for each group conformity. Based on the analysis results, the coefficient of determination R-square of 0.105 means that conformity gave an adequate contribution of 10.5% to academic dishonesty in this study group. In comparison, 89.5% contributed to other factors (not examined).

Table 2. Linear Regression Result

Model	R	R^2	Adj. R^2	Overall Model Test				
				F	Estimate	B	t	p
Ego depletion to academic dishonesty	.324	.105	.103	38,691	.334	9,867	6,220	<.001

Results of data analysis on the study this show that (F (1,329) = 38.681, t= 6.220, p=0.000) then proposed hypothesis accepted that there is a significant influence group to dishonesty academic on college student Faculty Economy and Business Banyumas, Indonesia. This thing strengthened with results from equality line regression (y = a+bx), i.e., y = 9.867 + 0.334x; dishonesty academic will change by 0.334 for every change in the conformity

group. From the result analysis of the data obtained, the taller the conformity group, the higher behavior dishonesty academic going on. So also, on the contrary, the lower conformity group so the lower behavior and dishonesty academic going on.

Discussion

This study aims to investigate how group conformity affects academic dishonesty behavior during online learning. This study Results following research conducted by Lestari & Lestari (2017) that variable conformity group have significant influence by 39.7% against happening behavior dishonesty academic. Conformity group Becomes the wrong one's factor happening behavior dishonesty academic. Other factors causing academic behavior dishonesty are price self and efficacy self. In research, the individual will be affected by academic dishonesty when seeing others do something similar.

Behavior dishonesty academic has done by the individual in the background back by conformity group as researched by Andriani (2013), behavior dishonesty academic is behavior that is not ethical. However, this occurs because the effect of a conformity group can change an individual's perception of something experienced so that conformity can be justified. An individual will follow behavior dishonesty academic when seeing a friend in the group also do behavior dishonesty academic for individual could welcome in the group.

They are reinforced with research results conducted by Wahyuningtyas & Indrawati (2020), who stated that the conformity group takes effect significantly by 40.3% against the intention to cheat. This means the more height conformity group, the more high-intensity cheating is done, and vice versa, the lower conformity group, so the more low-intensity cheating happens. Study this also in line with research conducted by Mulyani (2016) that the conformity group has a significant influence of 39.4% against deviation social cheat. They were reinforced again with research by Amalia (2017), which states that conformity with friends of the same age affects 19.8% of academic dishonesty. This means that the taller the conformity group so well, the taller behavior dishonesty academic and vice versa; the lower the conformity group so well, the lower the behavior dishonesty academic going on.

Based on the description above, so could conclude that the conformity group influences the academic behavior of college students. Faculty Economy and Business in Banyumas, Indonesia. Based on results analysis also obtained results coefficient determination R-square of 0.105. Mark the contain meaning that in Ridhayana et al., (2018) research, this conformity group donates effective by 10.5% against behavior dishonesty academic while 89.5% are a donation from other factors (factors that do not research). Other factors that can influence dishonesty in academic is the locus of control (Desi, 2018), procrastination academic (Beautiful & Shofiah, 2012), religiosity (Ridhayana, 2018), pressure academic (Pantu, 2020), climate organization (Mustapha et al., 2017), fear will failure (Lusiane & Garvin, 2019) and intelligence intellectual (Riyana, 2021).

Conclusion

Based on the statistical analysis results, the hypothesis that group conformity significantly affects academic dishonesty in students of the Faculty of Economics and Business in Banyumas, Indonesia, is acceptable. The practical contribution of the group conformity variable to academic dishonesty was 10.5%, while the remaining 89.5% was contributed by other factors not examined.

Recommendations

The results of this study are expected that students can increase their self-confidence by studying every time they will face an exam and by looking for a positive environment for themselves, and by knowing the forms of academic dishonesty, students can sort out behaviors that should or should not be done so that the process of internalizing honesty can go well. It is hoped that educational institutions will be able to handle this academic dishonesty behavior so that it can be prevented, especially students of the Faculty of Economics and Business in Banyumas, Indonesia, who are prepared to become excellent graduates to enter the world of work in finance and entrepreneurship who must have good and honest characters. The limitation of this study is the relatively small number of samples, and this is due to the difficulty of getting willing participants during the pandemic. In addition, this study does not discuss in depth how group conformity affects individuals in committing academic dishonesty. Therefore we recommend further research to use mixed methods to understand the phenomenon of academic dishonesty more deeply.

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Assessment of Mathematics Instructional Resources (Mirs) In Public Senior High Schools in The Central Region, Ghana

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Abstract

This paper investigated the status quo regarding the availability and usage of Mathematics Instructional Resources-(MIRs) for teaching and learning mathematics in the public Senior High Schools (SHSs) in the Central Region of the Republic of Ghana. A descriptive survey research design was used using quantitative and qualitative methodologies. The respondents include 72 mathematics teachers, selected using quota sampling, and 20 storekeepers, selected purposively, from eight (8) public Senior High Schools (SHSs). Two sets of close-ended survey questionnaires and observation schedules were employed. Reliability coefficients of 0.756 and 0.821 were obtained after subjecting the research instruments to vetting and pilot testing. Both descriptive and inferential statistics were employed in analyzing data and testing hypotheses. The results showed that mathematics textbooks, syllabus, teachers' reference books for mathematics, mathematical sets, graphical calculator, and chalk/marker boards were available and adequate in the SHSs, whereas electronic MIRs such as computers, overhead projectors, and interactive whiteboards were not available for teaching and learning of mathematics. It also emerged that teachers utilize MIRs in diverse ways, among others. It is recommended that the Ministry of Education (MoE) in collaboration with other stakeholders in education, must take steps to ensure that the other MIRs are available and adequate in the various SHSs. The implications of this study for research and practice are discussed.

Keywords: Mathematics instructional resources, MIRs, Availability, Utilization, SHSs, Mathematics education

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Introduction

Instructional Resources (IRs) are materials or objects used by teachers and learners to make classroom activities more interactive, comprehensive, and all-embracing during lessons (Tamakloe, Amedale & Atta, 2005). They transmit information, ideas, and notes to learners (Abdullahhi, 2010). IRs, no matter their nature and composition, constitute an essential and relevant component of successful teaching and learning. Usman and Adewumi (2006) state that IRs can be referred to as the wide variety of equipment and materials used for teaching/learning by teachers to stimulate self-activity on the part of the learners. Instructional Resources (IRs) are available from many sources, including visual and audio-visual materials and resource places and people (Tamakloe, Amedale & Atta, 2011). According to Onyilagha and Nnajiofor (2016), visual equipment are those materials that you see and include; flashcards, posters, charts, textbooks, real objects, models, chalkboard, and other related reference materials. Audio-visual materials are those materials that stimulate both the visual and audio senses. Examples are computers, televisions and radio sets, electronic videos, audiotapes, filmstrips, moving pictures, and slides

Megbo and Saka (2015), assert that actual teaching cannot be wholly attained without using IRs. This is because they encourage faster and more active communication between the instructor and students. The issue of effective communication in the classroom is crucial. Since it is evident that IRs can help achieve effective communication, which results in effective learning, it becomes necessary to ascertain the extent of their availability and utilization. Contributing to the importance of IRs, Mwangi (2006) pointed out that IRs enhance retention, stimulate students' interest and make learning more permanent by providing first-hand experience with the realities of the physical and social environment. Many educators and educationists agree that using IRs goes a long way in helping students understand and remember what they have been taught. Any effort to enhance effective teaching and learning of any subject, especially mathematics, should encompass the availability and use of instructional resources.

Despite the emphasis put on the value of IRs within instructing and education development, it is perceived that they are used sparingly by teachers in teaching mathematics; teachers teach in their various schools without instructional materials, the reasons being that they are not available. Research on the availability and usage of instructional resources for teaching at various stages of education have been reported in contradicting manners. While some researchers found instructional resources to be available in schools, others found instructional resources to be unavailable and inadequate. For instance, a study by Ifeakor (2006) found that some instructional resources were available and adequate but were partly used in teaching and learning. On the other hand, Achimugu (2016) reported that most instructional teaching resources were unavailable or utilised during the teaching process, which calls for more investigation into the subject matter. The implication of these conflicting reports calls for more research efforts in that direction. It is for this unsettled research conclusions this study sought to investigate whether or not instructional resources are available and adequate for teaching, the extent to which instructional resources are used, and factors depriving teachers of using instructional resources for teaching mathematics among the Senior High Schools (SHS) in Agona West Municipality and Agona East Districts in the Central Region of Ghana.

Purpose of the Study

The purpose of the study was to investigate the status quo regarding the availability and usage of Mathematics Instructional Resources (MIRs) for mathematics lessons among public SHSs in the Agona West Municipality and the Agona East District in the Central Region of Ghana. Because of the above assertion, this study specifically seeks to examine the following:

1. The availability of MIRs for teaching and learning mathematics in public SHSs in Agona of Central Region
2. How teachers utilize MIRs for teaching and learning mathematics in public SHSs in Agona of Central Region
3. The factors inhibiting the utilization of MIRs in teaching and learning mathematics at the public SHSs in Agona of Central Region
4. The demographic variables and how they influence utilization of MIRs at the SHSs in Agona of Central Region

Research Questions

Based on the purpose of this study, the following research questions guided the study:

1. What Mathematics Instructional Resources (MIRs) are available for the teaching and learning of mathematics in the public SHSs?
2. How are Mathematics Instructional Resources (MIRs) used by teachers for effective teaching and learning of mathematics in the public SHSs?
3. What factors inhibit the utilization of Mathematics Instructional Resources (MIRs) in Mathematics lessons in the public SHSs?

Research Hypotheses

Regarding objective four of the study, the following null hypotheses were stated in line with the fourth objective:

1. H_0: There is no statistically significant difference between male and female mathematics teachers regarding the degree of utilization of MIRs.
2. H_0: There is no statistically significant difference between age group of mathematics teachers and their degree of utilization of MIRs.
3. H_0: There is no statistically significant difference between teaching experience and degree of utilization of MIRs.

Significance of the Study

First, it has been identified by the Secondary Education Commission (SEC), cited in Aggarwal (2001), that even the best curriculum and the perfect syllabus remain dead unless quickened into life by a suitable teaching method. As such, the study's findings would expose the available instructional resources and their usage for teaching

Mathematics within the Agona West and East districts. Secondly, the study would also be relevant for theoretical and practical reasons. Theoretically, the study will contribute new conceptual insight to the existing literature on Mathematics teachers' utilization of Instructional Resources (IRs) and provoke academic discussions on the issue. In addition, policy and implementers would be awakened to the issue and put in place measures if needed to help advance teaching of Mathematics. Finally, the study would also be relevant to SHS Mathematics instructors and learners since they stand to benefit from quality Mathematics instruction.

Theoretical Framework

This study was guided by the theory of learning as described by cognitive psychologists. Cognitive psychologists posit that in an attempt to learn anything, a child must pay attention to it (source). It also involves exploring the visual field, fixing the eyes successively on different parts of rating, and these parts anticipate a phenomenon that is not yet clearly perceived (Akanbi, 1989). This indicates that students learn better through manipulations of instructional materials combined with illustrations and symbols. The researchers believe that mathematics teachers should ensure availability and usage of different instructional materials and resources to ensure full participation of learners in learning and maximize the acquisition of mathematics competencies. This, we believe, enables students to perceive learning situations positively easily. This position is supported by Farrant (1980) when he said that the inability of the teacher to utilize appropriate instructional materials and resources to teach specific concepts would affect the student negatively in the subject.

Conceptual Framework

A conceptual framework is a model of presentation where a researcher explores and represents the relationships among the studied variables (Orodho, 2004). Figure 1 shows the relationship of the study variables in this study:

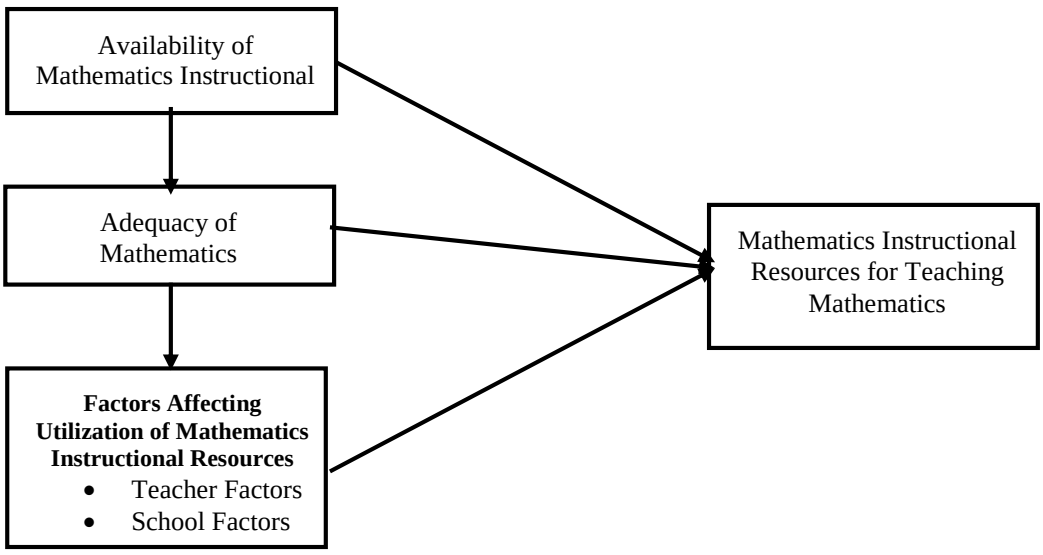

Figure 1. Conceptual Framework

From the conceptual framework illustrated in Figure 1 above, the availability of the MIRs may affect the extent to which the teachers use them for teaching mathematics. Also, it is expected that available MIRs for teaching must be adequate and relevant to the concept being taught, and this should also relate to students' understanding to the concept. However, some challenges inhibit the utilization of the available resources to achieve their aims. These challenges are school related as well as teacher related. From the hypotheses of this study, teaching experience, teachers' gender, and teachers' age group tend to affect the utilization of the instructional materials but they have not been represented categorically in the framework. Thus, the researcher perceived that the challenges, as grouped in the framework should be able to cater for these weaknesses in the framework

Method

Research Design

This study employed an Explanatory Sequential Mixed-Methods design. "Mixed methods procedures employ aspects of both quantitative methods and qualitative procedures" (Creswell, 2009, p.17). This design combines quantitative and qualitative data to analyze the research problem(s) comprehensively. In an explanatory sequential design, quantitative data is first collected in the first phase and then follows qualitative data in the second phase to help explain or elaborate on the quantitative results in the first phase. These two sets of data are separate but connected to address unexpected results that might arise from the quantitative data to be examined in more detail. Mixed-methods research, according to Hanson, Creswell, Plano-Clark, Petska, and Creswell (2005), as cited in Ampadu (2012), is an approach to inquiry about a phenomenon, in this manner, making use of both quantitative and qualitative approaches to the premises of collection, examination, and integration of the information or data.

The rationale for this design is that the quantitative data result provides a general picture of the research problem; specifically, through qualitative data collection, the general picture is improved, extended, or explained. With this, better knowledge and understanding of the survey on the availability and utilization of instructional materials in the schools were obtained. Although this design has some loopholes, such as difficulty in getting respondents to answer questions thoughtfully and honestly and getting a sufficient number of the questionnaires completed and returned so that meaningful analysis can be made (Frankel & Wallen, 2000), Notwithstanding these demerits, the descriptive survey helps to observe, describe and document situations as they naturally occur. For these reasons, the descriptive survey design is appropriate for this study.

The Population

The population for the study consisted of all the senior high schools within two district assemblies, Agona West Municipality and Agona East District in the Central Region of Ghana. However, the target population for this study comprised all public Senior High School mathematics teachers and storekeepers selected from eleven (11) schools within the two districts. The population was selected based on proximity, cost, and time effectiveness. The storekeepers were included in the study because, by their experience, they are knowledgeable and informative about phenomenon under study. Therefore, they provided helpful information for this study. Statistics gathered from the Central Regional Directorate of the Ghana Education Service (GES) of the Ministry of Education (2021)

stipulated that there were eleven (11) accredited Public SHSs (excluding Technical Institutes) in the study areas during the period of this study. Out of the eleven (11) SHSs, six (6) are situated in the Agona West Municipality whilst the remaining five (5) are situated in the Agona East District. These two areas were chosen to enable more respondents to answer the research question and generalize results from the sample's observation to the target population. The estimated number of the target population of respondents in the two study areas was two hundred and seventy-six (276). Out of this number, two hundred and forty-one (241) are mathematics teachers, and thirty-five (35) are storekeepers. These formed the base for the sample of the study

Sample and Sampling Procedure

The multi-stage sampling technique was used to select the schools and respondents based on the target population. Purposive sampling was used to select the site for the study. The site was Agona of Central Region, made up of two District Assemblies namely; Agona West Municipal Assembly (AWMA) and Agona East District Assembly (AEDA). The researchers used these two areas as strata where simple random sampling technique was used to select four (4) schools from each stratum. Simple random sampling was used to accord each school in the population equal chances of inclusion. Specifically, the lottery method was used for the selection of the schools. Likewise, purposive and quota sampling techniques were used to select 72 mathematics teachers and 20 storekeepers for the study. Purposive sampling was preferred to other sampling techniques due to the fact that, the study focused on SHS Social Studies teachers as well as storekeepers. According to Black (2010), purposive sampling is based on the judgment of the researcher to select a population who are representative to the phenomenon and well-versed with the issue at hand. The number of respondents selected by district and gender is shown in Table 1A and 1B.

Table 1A. Distribution of Sample Groups by District

Study Areas	No. of Schools	Sample Schools	Sample Teachers	Sample Storekeepers	Total Sample
Agona West Municipality	6	4	38	12	50
Agona East District	5	4	34	8	42
Total	**11**	**8**	**72**	**20**	**92**

Table 1B. Distribution of Sample Respondents by Gender

	Math Teachers		Store Keepers		Total Sample Size	
Gender	Freq. (f.)	Percent (%)	Freq. (f.)	Percent (%)	Freq. (f.)	Percent (%)
Female Respondents	28	38.9	11	55.0	39	42.4
Male Respondents	44	61.1	9	45.0	53	57.6
Total	**72**	**100**	**20**	**100**	**92**	**100**

From Tables 1A and 1B, a sample size of ninety-two (92) respondents, made up of mathematics teachers and storekeepers, comprising 53(57.6%) males and 39(42.4%) females from the eight senior high schools in the Agona

East Districts and Agona West Municipality was used for the study. Other demographic information of study respondents is shown in Table 2 below.

Table 2. Demographic Characteristics of Study Respondents

		Teachers (N=72)		Storekeepers (N=12)		Sample (N=84) Total	
Variable	Sub-Scale	Freq. (f.)	Percent (%)	Freq. (f.)	Percent (%)	Freq. (f.)	Percent (%)
Age Groups (in years):	25 – 30	6	8.3	1	5.0	7	7.6
	31 – 35	23	31.9	2	10.0	25	27.2
	36 – 40	26	36.1	7	35.0	33	35.9
	Above 40	17	23.6	10	50.0	27	29.3
	Total	72	100	20	100	92	100
Highest Educational Qualification:	Bachelor's Degree/HND	55	76.4	14	70.0	69	75.0
	Master's Degree	17	23.6	6	30.0	23	25.0
	Total	72	100	20	100	92	100
Length of Service:	Below 5	20	27.8	3	15.0	23	25.0
	5 – 10	26	36.1	7	45.0	33	35.9
	11 – 15	13	18.1	6	30.0	19	20.7
	16 – 20	8	11.1	4	20.0	12	13.0
	Above 20	5	6.9	-	-	5	5.4
	Total	72	100	20	100	92	100
Attendance to in-Service Training or workshop:	Yes	17	23.6	4	20.0	21	22.8
	No	55	76.4	16	80.0	71	77.2
	Total	72	100	20	100	84	100

Instrument(s) for Data Collection

Survey questionnaire and an observation schedule were used to collect data from respondents. The researchers developed two sets of questionnaires, namely, the Mathematics Teachers' Instructional Resource Questionnaire (MTIRQ) and Store Keepers' Confirmatory of Mathematics Instructional Resource Questionnaire (SKCMIRQ). The MTIRQ had 56 measurement items divided into four (4) sections. The first section had 5 close-ended items which elicited information about the teachers' demographic background. Section two and three respectively elicited responses on the level of availability, extent and ways of utilisation of MIRs in the schools using forty-one (17+17+7) closed-ended items. The final section presents items that collected data on the factors that affect the effective utilisation of MIRs by school teachers on a 5-point Likert Scale (strongly agree to strongly disagree) using ten (10) items.

Similarly, the SKCIRQ had two sections. Section one collected data on the demographic characteristics of the storekeepers, and the second section had a list of MIRs for the storekeepers to identify whether or not the resources are available, including the degree of usage of the resources measured on (Small Extent (SE), Large Extent, (LE), and Very Large Extent (VLE)). Thus, 39 measurement items were included in this questionnaire. Even though the

extent of utilisation of the MIRs can be limited to the teachers, including it in the storekeepers' questionnaire paved the way for the researcher to compare the responses of the two groups of respondents. There were no opened-ended questions in this questionnaire. This was done to limit the respondents to the scope of the study.

The observation was done using Researcher's Observation Guide (ROG). The ROG was developed to determine the availability, adequacy, and extent of utilisation of the MIRs from the researcher's perspective. Generally, the observational guide was used to confirm, cross-validate or corroborate the responses that were supplied in the questionnaires. The checklist only included a YES or NO option to determine whether or not a particular MIR was used for its intended purpose, whether or not the MIRs were available and adequate, and whether or not teachers used the MIRs during teaching and learning.

Validity and Reliability of the Instruments

The content and construct validity of the instruments was established by having the instruments validated by two experts from the department of mathematics; the University of Education, Winneba (UEW). A reliability coefficient of 0.756 and 0.821 were obtained after subjecting the research instruments to pilot testing using 10 mathematics teachers from a sister SHS in the study region.

Data Collection Procedures

The researchers made preliminary visits to the selected public SHSs to meet with the Headmasters/Headmistresses of the schools to secure permission and made an appointment for data collection. After the various heads had granted permissions, the researchers briefed the respondents on the purpose and nature of the study and scheduled a day to administer the questionnaires. The data collection lasted for two weeks. First, the questionnaires, intended to collect data from mathematics teachers and storekeepers, were dropped by the researchers and collected the subsequent day. This gave the respondents ample time to complete all items on the questionnaire. Next, data were gathered through the use of the observation guide by the researchers to complement responses obtained from the questionnaires. Finally, the researchers visited various schools and classrooms to observe mathematics lessons and obtain information about utilizing MIRs.

Data Processing and Analysis

The data obtained were analysed according to the research questions and hypotheses. Data collected were cleaned, coded, and entered into the computer and processed using the IBM Statistical Product and Service Solutions (SPSS) version 22.0 and Microsoft Excel (2010). Data were analyzed using descriptive statistical tools like frequencies, percentages, and mean. Tables and graphs presented the respondents' responses to address the various research questions. Independent samples t-test and the One-Way Analysis of variance (ANOVA) were used to analyse the three research hypotheses at .05 alpha level of significance. The summary of the data analysis is shown in Table 3.

Table 3. Summary of Data Analysis based on Research Questions

Research Questions/ Hypotheses	Type of Data	Instrument(s)	Analytical tool
RQ1	Quantitative & Qualitative	Questionnaire & Observation guide	Frequencies, Percentages & Mean
RQ2.	Quantitative & Qualitative	Questionnaires, Observation guide	Frequencies, Percentages & Mean
RQ3.	Quantitative	Questionnaire	Percentages & Mean
RH1-Ho:	Quantitative	Questionnaire	Independent samples t-test
RH2-Ho:	Quantitative	Questionnaire	One-Way ANOVA test
RH3-Ho:	Quantitative	Questionnaire	One-Way ANOVA test

Results

Research Question 1:

What Mathematics Instructional Resources (MIRs) are available for the teaching and learning of Mathematics in the public Senior High Schools (SHSs)?

The intent of research question one was to assess the level of availability and adequacy of MIRs in teaching and learning Mathematics in the public SHSs in Agona of Central Region. To achieve this purpose, two sets of questionnaire (MTIRQ and SKCMIRQ) on a Likert scale rating, coupled with researcher's observation checklist was used to seek opinions of the Mathematics teachers and storekeepers. The responses were evaluated using frequency counts and percentages for Teachers' responses (see Table 3) and Storekeepers' responses (see table 4).

Table 4. Summary of Teachers' Responses on the Availability of MIRs.

S/N	Item	NA	AM	ANA	AA
		No. (%)	No. (%)	No. (%)	No. (%)
1	Mathematics textbooks	-	-	17(23.6)	55(76.4)
2	Geometrical graph boards	25(34.7)	-	47(65.3)	-
3	Teachers' reference guides/books	-	8(11.1)	5(6.9)	59(81.9)
4	Mathematics syllabus	-	3(4.2)	26(36.1)	43(59.7)
5	Mathematics software	65(90.3)	7(9.7)	-	-
6	Flip charts/photographical slides	47(65.3)	4(5.6)	21(29.2)	-
7	Graphical calculator	-	11(15.3)	21(29.2)	40(55.6)
8	Mathematics four figure table	49(68.1)	11(15.3)	12(16.7)	-
9	Mathematical sets	-	14(19.4)	13(18.1)	45(62.5)
10	Model of 3D shapes	47(65.3)	15(20.8)	10(13.9)	-
11	Mathematical board instruments	34(47.2)	-	38(52.8)	-
12	Computer with internet system	34(47.2)	16(22.2)	22(30.6)	-
13	Overhead/Table projector	31(43.1)	21(29.2)	20(27.8)	-
14	Interactive white boards	65(90.3)	7(9.7)	-	-
15	Mathematical games	57(79.2)	15(20.8)	-	-
16	Chalk/Marker boards	-	-	29(40.3)	43(59.7)
17	Other resources and improvisation	40(55.5)	14(19.4)	18(25.0)	-

N=72; Scale: 1 =Not Available (NA); 2 = Ambivalent (AM); 3 = Available but Not Adequate (ANA); 4 = Available and Adequate (A&A)

Results in Table 4 showed that, 11 out of the 17 itemised mathematics Instructional Resources (MIRs) received unfavourable responses with the majority of the mathematics teachers stating that interactive white boards (n=65; 90.3%), mathematics software (n=65; 90.3%), mathematics games (n=57; 79.2%), mathematics four figure table (n=49; 68.1%), Model of 3D shapes (n=47; 65.3%), flipchart/photographic slides (n=47; 65.5%) and Overhead/table projectors (n=31; 43.1%) were not available in their schools. However, results from Table 4 revealed that mathematics textbooks (n=55; 76.4%), mathematics syllabus (n=43; 59.7%), teacher's reference guide for mathematics (n=59; 81.9%), mathematical sets (n=45; 62.5%) graphical calculator (n=40; 55.6%) and Chalk/marker boards 43(59.7%) received positive responses, indicating they were available and adequate.

Again, the opinions of the storekeepers on the level of availability and adequacy of MIRs for teaching mathematics were also sought and are presented in Table 5 below;

Table 5. Summary of Storekeepers' Responses on Availability of MIRs

S/N	Item	NA	AM	ANA	AA
		No. (%)	No. (%)	No. (%)	No. (%)
1	Mathematics textbooks	-	-	7(35.0)	13(65.0)
2	Geometrical graph boards	-	-	20(100)	-
3	Teachers' reference guides	3(15.0)	-	7(35.0)	10(50.0)
4	Mathematics syllabus	4(20.0)	-	5(25.0)	11(55.0)
5	Mathematics software	15(75.0)	5(25.0)	-	-
6	Flip charts/photographical slides	9(45.0)	-	11(55.0)	-
7	Graphical calculator	-	10(50.0)	10(50.0)	-
8	Mathematics four figure table	14(70.0)	6(30.0)		-
9	Mathematical sets	4(20.0)	-	5(25.0)	11(55.0)
10	Model of 3D shapes	12(60.0)	8(40.0)	-	-
11	Mathematical board instruments	3(15.0)	-	6(30.0)	11(55.0)
12	Computer with internet system	11(55.0)	-	9(45.0)	-
13	Overhead/Table projector	13(65.0)	7(35.0)	-	-
14	Interactive white boards	20(100)	-	-	-
15	Mathematical games	15(75.0)	-	5(25.0)	-
16	Chalk/Marker boards	-	-	5(25.0)	15(75.0)
17	Other resources and improvisation	3(15.0)	-	6(30.0)	11(55.0)

N=12; Scale: 1 =Not Available (NA); 2 = Ambivalent (AM); 3 = Available but Not Adequate (ANA); 4 = Available and Adequate (A&A)

The results from Table 5 showed that 10 out of the 17 itemised MIRs received negative responses. The interactive whiteboard received the highest negative response 20 (100%), for not being available for teaching mathematics in the schools. This was followed by mathematics software and mathematical games, of which 15 (75.0%) of each of the storekeepers stated that they were not available to teach mathematics in the schools. Also, from the results, mathematics textbooks (n=13; 65.0%), teachers' reference books for mathematics (n=10; 50.0%), chalk/marker boards (n=15; 75.0%), mathematics syllabus, mathematical sets, mathematical board instruments and, other

resources and improvisation of which 11(55.0%) each of the storekeepers indicated that they are available for teaching mathematics in the various schools.

Furthermore, results from Table 6 regarding the observations by the researcher revealed that although other MIRs were available in the schools, they were just a few and were not being used for teaching mathematics. At best, they could be described as decorative elements (see Table 6)

Table 6. Observation results on state of Availability and Adequacy of MIRs

S/N	Mathematics Instructional Resources (MIRs)	Available	Not Available	Adequate	Not Adequate
1	Mathematics textbooks	√		√	
2	Geometrical graph boards	√			√
3	Teachers' reference guides	√			√
4	Mathematics syllabus	√			√
5	Mathematics software		√		
6	Flip charts/photographical slides		√		
7	Graphical calculator	√			√
8	Mathematics four figure table		√		
9	Mathematical sets	√			√
10	Model of 3D shapes		√		
11	Mathematical board instruments	√			√
12	Computer with internet system	√			√
13	Overhead/Table projector	√			√
14	Interactive white boards		√		
15	Mathematics games		√		
16	Chalk/Marker boards	√		√	
17	Other resources and improvisation	√			√

Judging from the responses of responses provided in Tables 4 & 5 coupled with the researcher's observation result in Table 6, it can be concluded that the level of availability and adequacy of MIRs was low in SHSs in the Agona West Municipality and Agona East District in the Central Region of Ghana.

Research Question 2:

How are Mathematics Instructional Resources (MIRs) used by teachers for effective teaching and learning of mathematics in the public Senior High Schools (SHSs)?

It is worthy of notice that utilisation of Mathematics Instructional Resources (MIRs) enhances effective teaching and learning, promoting the understanding of the given mathematics concept. Using MIRs becomes crucial in improving the overall quality of teaching. Because of this, the researcher posed two investigating questions for mathematics teachers. Below are each of the posed questions and their analysis based on the data collected

To what extent are the available MIRs utilised for teaching mathematics in the public Senior High Schools (SHSs)?

In response to this question, the mathematics teachers were required to rate the extent of utilization of MIRs in teaching and learning process in the schools. Figure 2 presents the summary of the various percentages of responses by the mathematics teachers.

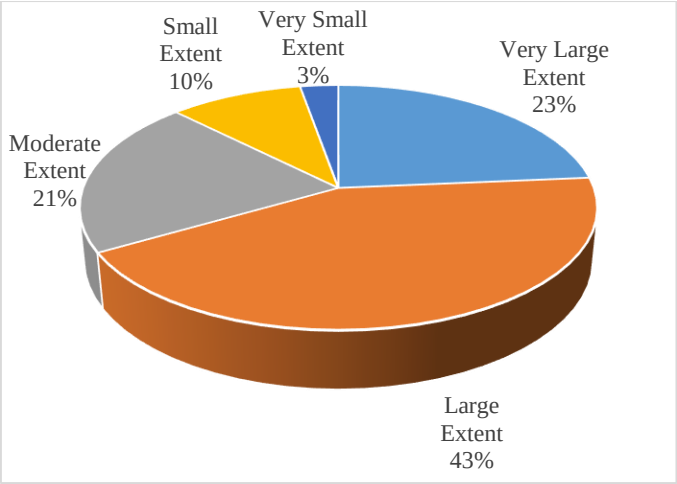

Figure 2. Extent of Utilization of Mathematics Instructional Resources (MIRs)

Results in Figure 2 showed that the majority, (43%+23%) of the teacher respondents representing approximately 66.0%, were of the view that MIRs, to a large extent and considerable extent, were used in their schools. In comparison, 21.0% of the teachers indicated MIRs were used to a moderate extent in their schools. Nevertheless, 10.0% and 3.0% of the teachers indicated MIRs were used to a small extent and minimal extent, respectively. The mathematics teachers were further requested to rate their extent of utilization of some specified MIRs in teaching mathematics. The responses on a 5-point Likert scale were evaluated using means and standard deviations (see Table 7).

Table 7. Teachers' Responses on Extent of Utilization of MIRs

S/N	Extent of Utilization of Resource	Mean Score	Std.Dev.
1	Mathematics textbooks	4.39	.581
2	Geometrical graph boards	3.39	.491
3	Teachers' reference guides	3.43	1.387
4	Mathematics syllabus	3.82	.989
5	Mathematics software	1.18	.757
6	Flip charts/photographical slides	2.24	.569
7	Graphical calculator	3.22	.791
8	Mathematics four figure table	1.84	.451
9	Mathematical sets	3.15	1.002
10	Model of 3D shapes	2.17	1.011
11	Mathematics board instruments	3.09	.682
12	Computer with internet system	1.97	1.034
13	Overhead/Table projector	1.94	.710
14	Interactive white boards	1.93	.657
15	Mathematics games	1.22	.727
16	Chalk/Marker boards	4.53	.723
17	Other resources and improvisation	2.40	.522
Mean of Means/Average standard deviation		**2.70**	**0.769**

Results from Table 6 depicted that 8 out of the 17 itemised MIRs for teaching and learning mathematics are being

used, to a large extent, with chalk/marker boards (M = 4.53, S.D = 0.723) the most used MIR followed by mathematics textbooks (M = 4.39, S.D = 0.581). However, among the MIRs that have been used to a small extent, mathematical games (M = 1.22, S.D = 0.727) were the least used for teaching mathematics. The grand mean of 2.70 implies that MIRs are generally used to a small extent in the SHSs for teaching and learning mathematics. The observation results also found that MIRs for mathematics instruction was not effectively utilized. It was discovered that textbooks and chalk/marker boards are the most commonly used in mathematics lessons (see Table 7).

Table 7. Teachers' Observational Results on the Utilization of MIRs

S/N	Mathematics Instructional Resources	Extent of Use	
		SE	LE
1	Mathematics textbooks		√
2	Geometrical graph boards	√	
3	Teachers' reference guides		√
4	Mathematics syllabus		√
5	Mathematics software	√	
6	Flip charts/photographical slides	√	
7	Graphical calculator		√
8	Mathematics four figure table	√	
9	Mathematical sets	√	
10	Model of 3D shapes	√	
11	Mathematics board instruments	√	
12	Computer with internet system	√	
13	Overhead/Table projector	√	
14	Interactive white boards	√	
15	Mathematics games	√	
16	Chalk/Marker boards		√
17	Other resources and improvisation	√	

In what ways do teachers use Mathematics Instructional Resources (MIRs) for effective teaching and learning of mathematics in the public Senior High Schools (SHSs) of Agona of Central Region?

Mathematics teachers' opinions on utilizing MIRs for teaching Mathematics were requested. Various statements were presented to the teacher respondents and required them to agree or disagree with each statement. The responses were analysed and discussed using mean and standard deviation. The mean of means value for acceptance is $X \geq 3.00$; otherwise, reject (see Table 8).

Table 8. Usage of Mathematics Instructional Resources (MIRs) in Mathematics

S/N	Ways of Usage of MIRs	Mean	Std. Dev
1	To demonstrate and motivate learners' interest and readiness for instructional process	4.37	.488
2	Learners' ability to understand is increased by the use of instructional materials by the teacher	3.78	.967
3	To enhance learners' aptitude towards instructional process	2.62	.956
4	Teachers used instructional resources as teaching learning materials (TLMs)	3.61	.797
5	To prepare and deliver mathematics lessons	3.39	.928
6	To provide students with meaningful source of information	3.31	1.360
7	To communicate with students and other teachers	2.40	1.134
Mean of Means/Average Standard Deviation		**3.35**	**0.947**

As evident in Table 8, it was found that, the majority (M = 4.37; SD = 0.488) of the teachers agreed that they use MIRs to demonstrate and motivate learners' interest and readiness for the instructional process. Most teachers also strongly agreed (M = 3.31; SD = 1.360) that they use MIRs to provide students with meaningful information. It was found (M = 3.78; SD = 0.967) that teachers are using MIRs to increase learners' ability to understand. Most teachers were found to agree (M = 3.39; SD = 0.928) with the statement that they use MIRs to prepare and deliver mathematics lessons. The statement "MIRs are used to enhance learner's aptitude towards instructional process" found that most of the teachers agreed (M = 3.62; SD = 0.956). Most teachers agreed (M=3.61; SD=0.797) to the statement, "I use instructional resources as teaching-learning materials". However, the teachers generally disagreed with the claim that they use instructional resources to communicate with students and other teachers (M = 2.40; SD = 1.134). It can be inferred from the results in Table 9 that a greater number of items (5 out of 7) received favorable responses. The mean values of each of the 6 items was above 3.0. The mean of means and mean of standard deviations for all the 7 items were 3.35 and 0.947, respectively. The results indicated that mathematics teachers in the Agona West and East districts utilize instructional resources in diverse ways. The outcomes from the observation on the ways in which teachers use the MIRs are presented in Table 9.

Table 9. Observation Results of usage of MIRs in Mathematics

S/N	Way of usage	Yes	No
1	To demonstrate and motivate learners' interest and readiness for instructional process	√	
2	To provide students with meaningful source of information	√	
3	Learners' ability to understand is increased by the use of MIRs by the teacher	√	
4	Teachers do not use MIRs for teaching and learning for fear of damaging them		√
5	To prepare and deliver mathematics lessons	√	
6	To enhance learners' aptitude towards instructional process	√	
7	To communicate with students and other teachers		√
8	Teachers used MIRs as teaching learning materials (TLMs)	√	

From the observational results, it is evident that mathematics teachers in the schools mostly use the MIRs to demonstrate concepts to students as a form of motivation to arouse learners' interest in mathematics.

Research Question 3:

What factors inhibit the utilization of Mathematics Instructional Resources (MIRs) in Mathematics lessons in the Senior High Schools (SHSs)?

What was perceived to be important factors that may affect the use of MIRs in mathematics lessons was investigated in the study. Responses of the teachers were analysed using means and standard deviations. A score above 3.0 specify factors affecting teachers in using MIRs and a mean score below 3.0 stipulates that teachers do not face challenges in using MIRs. The results are presented in Table 10.

Table 10. Factors inhibiting usage of MIRs in Teaching Mathematics

S/N	Statement	Mean	Std. Dev.
1	Non-availability and inadequacy of several instructional resources made specifically for mathematics	4.61	.571
2	Adequate experience and skills in using MIRs	3.93	.738
3	Lack of suitable places to keep or store the iMIRs	3.83	1.256
4	Absence of training offered to teachers on the issues of ICT in education by the school	3.47	1.321
5	Incompatibility between the available instructional resources and the lesson/learning objectives	3.10	1.245
6	Broken and out of order instructional resources	3.10	1.313
7	Lack of support from schools' administrations in terms of provision of funds needed to purchase MIRs when need arises.	3.42	1.264
8	Intent of the teachers themselves to use MIRs	3.58	1.275
9	Inability to keep up with the technology used for MIRs	3.01	.868
10	Lack of time in using the MIRs	1.21	.871
Mean of Means Score/ Mean S.D Score		**3.33**	**1.07**

On the factors that prevent teachers from utilising the MIRs for teaching mathematics in the schools, the results from Table 10 revealed that 9 out of the 10 factors had received positive responses with the non-availability and inadequacy of several MIRs made specifically for mathematics (M = 4.61, S.D = 0.571) being the most factor affecting the teachers. However, lack of time in using instructional resources for teaching (M = 1.21, S.D = 0.871) was never a factor contributing to teachers' inability to use the MIRs. The mean of means and mean of standard deviations for all the items were 3.33 and 1.07, respectively means that, in general, there are several factors affecting the mathematics teachers' effective use of MIRs for teaching mathematics in public senior high schools in the Agona West Municipality and Agona East District of the central region.

Statistical Test of Hypotheses

Hypothesis 1

H_0: There is no statistically significant difference between male and female mathematics teachers' use of Mathematics Instructional Resources (MIRs) (see Table 11)

Table 11. T-test Results showing gender implications of MIRs usage

Gender (Sex)	N	M	SD	T	df	P	Mean Difference
Male	44	3.80	0.412	4.424	70	0.000*	0.50
Female	28	3.30	0.531				

Levene's test showed that the difference between the male and female mathematics teachers was statistically insignificant *($p < 0.05$)*, and hence, this study was girded by equal variances assumed. The independent samples t-test result in Table 11 indicated that the mean score of male teachers (M = 3.80; SD = 0.412) was significantly higher than their female counterparts (M = 3.30; SD = 0.531). The mean difference between male and female teachers was 0.50 in favor of male teachers. This is supported by t(70) = 4.424, p=0.000<0.05; the null hypothesis that stated no statistically significant difference was rejected, leading to the conclusion that male and female teachers differ in the utilization of instructional resources for teaching mathematics.

Hypothesis 2

H_0: There is no statistically significant difference in mathematics teachers' age and their utilization of Mathematics Instructional Resources (MIRs) for the teaching of mathematics in SHSs (see Table 12).

Table 12. ANOVA Test on the Usage of MIRs According to Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.044	3	0.681	2.509	0.066
Within Groups	18.467	68	0.272		
Total	20.511	71			

Table 12 revealed that the p-values were greater than 0.05 (p-value > 0.05). The null hypothesis was therefore retained leading to the conclusion that there was no statistically significant difference in teachers' age distributions and their utilization of Mathematics Instructional Resources (MIRs) in the mathematics classroom.

Hypothesis 3

H_0: There is no statistically significant difference in mathematics teachers' teaching experience and their utilization of Mathematics Instructional Resources (MIRs) in teaching mathematics in SHSs (see table 13)

Table 13. ANOVA Test on Usage of MIRs - length of service

	Sum of Squares	df	Mean Squares	F	Sig.
Between Groups	0.408	4	.102	.340	.850
Within Groups	20.103	67	.300		
Total	20.511	71			

The results in Table 13 shows that the p-value was greater than 0.05 (p-value < 0.05). The null hypothesis was therefore retained leading to the conclusion that there was no significant difference in teachers' teaching experience and their utilization of instructional resources in teaching of mathematics in public SHSs.

Discussion

The data analysis revealed that, except for teachers' reference guides for mathematics, mathematics textbooks, mathematics syllabus, mathematical sets, graphical calculators, and chalk/marker boards, which are highly available, all other MIRs were either inadequate or not available in the SHSs. First, this situation can be attributed to the inadequate finance that makes the supply of MIRs problematic. Again, the inadequacy of MIRs can allude to the high intake of students in recent times, making a sufficient supply of curriculum materials and other resources critical. Whatever the reasons, the unavailability of MIRs in the teaching and learning of mathematics does not afford the students an opportunity for maximum understanding since the teaching and learning were done in an abstract form. The outcome is in agreement with the findings of some scholars (Harris, 2002; Oakes & Saunders, 2002; SPRA, 2002; Rand, 2002), who inferred from their studies that many teachers do not have access to the number and quality of instructional resources needed to provide students with the educational opportunities required to meet academic standards.

The unavailability of MIRs revealed through this study also concurs with the results of Oakes and Saunders (2002) that in many schools, shortages of instructional resources for mathematics exist in concert with other problematic school conditions that diminish students' opportunities to learn. With the unavailability of most of the MIRs in schools, teachers will not be able to function at their best regarding lesson delivery.

The study also found that MIRs were utilized to a low extent. This result is in agreement with that of Fatoba and Abidakum (2019) and Arokoyu and Charles-Ogan (2017), which indicated that utilization of instructional resources in secondary schools is moderate and inadequate. Further analysis indicated that mathematics teachers in the Agona West and East districts utilize MIRs in diverse teaching methods. However, it is evident that teachers in secondary schools mostly use the MIRs to demonstrate concepts to students as a form of motivation to arouse learners' interest in mathematics. These findings supported the study of Haddad and Drexler (2002), which recognized that instructional resources could be utilized in at least five diverse ways in education: introduction, exhibition, drill and practice, interaction, and collaboration. In the same vein, Allen (2007) believes that some teachers use concrete materials to give students enjoyment and fun.

The study again revealed that non-availability and inadequacy of several instructional resources explicitly made

for mathematics, adequate experience and skills in using mathematics Instructional Resources (MIRs), lack of suitable places to keep or store the instructional resources, lack of support from schools' administrations in terms of provision of funds needed to purchase instructional resource when need arises were among the observed factors serving as barricade to the utilization of MIRs for teaching the subject. The above finding concurred with the submission of Kareem (2009), that non-availability and inadequacy of several instructional resources and lack of space to keep teaching-learning materials always discourage teachers from creating instructional resources and, therefore, depend on much on talk and chalk, leading to distracting verbalism. The findings confirmed the study of the Organization for Economic Cooperation Development (OECD) in 2009 that some many barriers or challenges inhibit the use of instructional resources in education. These barriers include limited equipment, inadequate skills, minimal support, time constraints, and teachers' lack of interest or knowledge.

Again, the study found no significant difference between the responses of male and female mathematics teachers on the use of MIRs available for the teaching of Mathematics in SHSs. This means that gender does not impact how MIRs are used in teaching Mathematics in the SHSs. This finding agrees with Norris et al. (2003), whose research in California, Florida, Nebraska, and New York revealed that gender does not influence the extent of instructional resource utilization. Finally, there is a significant difference in the Mathematics teachers' age groups as well as Mathematics teachers' experience and the extent of utilization of MIRs for teaching Mathematics in SHSs in the study area. This depicts that teachers' age (experience) influences their usage of MIRs to model students' understanding of the concept being taught. This finding is opposed to Gumo (2003), who opined that a teacher with many years of teaching has learned more about the utilization of instructional materials and can make comparisons, inter-relationships, and connections, which enhance the refinement of what they already know. This makes more experienced educators better users of instructional resources more appropriately than a new graduate

Conclusion

The study revealed that electronic MIRs, such as computers, overhead projectors, mathematics softwares, etc., were not available for use by mathematics teachers in their instructional deliveries. This development affects teaching and learning mathematics as MIRs play a crucial role in teaching and learning mathematics. Learning is more inclusive and meaningful when MIRs are used during teaching. Therefore, it can be inferred from the findings that Mathematics Instructional Resources (MIRs) of any kind, when made available to Mathematics teachers, can be utilized to improve the teaching process in public SHSs.

Recommendations

In light of the findings of the study, the following recommendations are made:

1. In collaboration with other education stakeholders, the Ministry of Education (MoE) should prioritize providing adequate MIRs for teaching and learning Mathematics.
2. Adequate funds should be allocated to the schools from the budget of the ministry of education to cater for the shortfall
3. With the numerous benefits of instructional resources to both teachers and students, it is recommended

that workshops, symposiums, and conferences should be organized periodically for mathematics teachers on the importance of the use of MIRs in the attainment of educational objectives. In such programs, they should be exposed to various kinds of MIRs with regard to how and where they can be produced, collected, and utilized.

4. Mathematics teachers should also take the initiative and be creative to improvise their MIRs within the environment to promote effective teaching of Mathematics and enhance student's understanding and application of lesson content.

Areas for Further Research

1. The researchers suggest that a similar study should be carried out in another geographical area (districts) in Ghana to establish whether the study findings apply to other areas to generalize the results.
2. Additionally, studies should be conducted to seek information from students and determine other variables, such as school factors, and student factors, among others, that affect the utilization of MIRs for teaching Mathematics.

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Investigation into The Effectiveness of The "I Love My School" Intervention Program Regarding the Improvement of Attitudes Toward School

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Abstract

The current study aims to examine the effectiveness of the "I Love My School" intervention program designed to improve primary school students' levels of attitude towards school. The study was conducted at a primary school in the Selçuklu district of Konya province in the 2021-2022 academic year. A quasi-experimental design with a pretest-posttest control group was employed in the study, and the participants consisted of primary school 1st, 2nd, 3rd, and 4th grade students. There are 30 students in the control group and 32 students in the study group. The pre-test and post-test results of the groups were compared via nonparametric analysis techniques. The research results reveal that the "I Love My School" intervention program has positively improved primary school students' levels of attitude towards school positively. Hence, it is recommended to implement such programs as "I Love School" and similar in-school intervention programs to support the commitment of primary school students who cannot receive family support regarding love, value, adaptation, and trust regarding school.

Keywords: Attitudes toward school, Primary school students, Intervention programs, Quasi-experimental design.

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Introduction

Apart from the time spent with the family, children spend most of their time at school, commonly described as their 'second home'. School is a large ecosystem for children who have reached school age, where they meet for the first time with children from different age groups, teachers conducting the education-teaching process, school administrators, and school staff ready for various tasks. Schools are safe socialization environments that surround children like a cocoon, where they start to get to know themselves and others, become individuals and learn. As a social system, schools are service organizations that provide education and training services for groups of people organized according to specific criteria, in a particular area and time, within the framework of a curriculum and plan (Şişman & Turan, 2004). This routine operation of schools effectively maintains discipline and order and adapts students to a new social environment. However, it can also direct the attitudes developed toward school. One of the most significant factors required to maintain the order of schools is students' affective characteristics since they are significant in forming attitudes developed towards school. The affective domain consists of many spiritual elements specific to the individual, including such internal characteristics as self-personality perceptions, self-confidence, interest, motivation, value judgments, and such social relations as beliefs, choices, emotions, expectations, values, and ethics. Considering students' affective characteristics and creating a school atmosphere that can influence them in this context is one of the most powerful steps in developing attitudes towards school (Kurnaz, 2002). In this sense, it is possible to turn students' attitudes towards school into positive ones by addressing and paying particular attention to students' affective characteristics.

In general, attitudes toward school include students' positive or negative opinions about it, their thoughts, feelings, and behaviors about how they feel at school (Stern, 2012). Attitudes are generally evaluated in terms of cognitive, affective, and behavioral aspects (Taylor, Peplau, & Sears, 2005), and therefore attitudes toward school should also be considered within this framework. In order for individuals to form an attitude towards a phenomenon, they need to have a pre-experience with the attitude object or have awareness about the subject in any way. In this context, the attitude object is school, and students' thoughts, beliefs, and school knowledge refer to the cognitive dimension in their attitudes toward school (Linden et al., 2015). Affective features are at the center of attitudes and possess a crucial role in their formation (Martin & Briggs, 1986).

To sum up, all positive or negative feelings about an attitude object form the affective characteristics of the attitude (Petty, Fabrigar & Wegener, 2003). The affective dimension of attitudes towards school consists of students' liking or disliking of school and their feelings about it. The behavioral dimension of attitudes is individuals' all observable behaviors about an attitude object or the intention to act (Eagly, 2008). Such actions as students' communication with their teachers, being cheerful or sad when they go to school, going to school willingly or unwillingly, protecting or damaging school belongings, making positive or negative statements in their conversations concerning school, being enthusiastic or reluctant to participate in school activities refer to the behavioral dimension of students' attitudes towards school (Atik, 2016). Cheng and Chan (2003) argue that the effort put forth by students in activities inside and outside the classroom and all school-related studies represents the behavioral dimension in their attitude toward school.

In-school elements possess a significant impact on students in the formation of attitudes toward school. The most important in-school factor in attitudes toward school is how teacher-student relations influence students (Yoon, 2002). The results of the research conducted by Hallam, Ireson, and Davies (2004) point out that group activities in the classroom are a dominant factor influencing students' attitudes toward school. In a study to test the hypothesis on the subject, İlhan (2017) states that their perceptions could explain 33% of students' attitudes toward school in the context of the classroom assessment atmosphere. According to the research results, the classroom climate's characteristics and the classroom environment's elements have significant relationships with the attitudes toward school (Macmillan et al., 1992; Marks, 1998; Şeker, 2011 and 2013). Similarly, Açıkgöz (2017) states that a significant negative relationship exists between students' peer victimization and peer bullying levels and their attitudes toward school. Additionally, school burnout is influential in developing negative attitudes towards school (Salmela-Aro, Savolainen & Holopainen, 2009).

Some studies examine the phenomenon of teachers in attitudes toward school. According to Yavuzer (1996), a teacher's positive communication with students and the way s/he conducts the educational process and classroom activities contribute notably to students' success and the development of positive attitudes towards school. One of the significant results of Atik's (2016) thesis study is that students' trust in their teachers explains about 43% of the variance in their attitudes towards school and directly influences their attitudes towards school. Lee (2007) specifies that if students believe their teachers are honest and reliable, they develop positive attitudes toward the lessons and school. Consequently, students' trust in their teachers, perform pleasant group activities with their peers without being bullied, have fun while learning, and have a positive classroom atmosphere will bring about positive attitudes toward school.

In forming attitudes towards school, the factors that include families and teachers are mostly related to students' affective characteristics. Nielsen and Mortorff-Albert (1989) and McCoach and Siegle (2001) conclude in their research that students with low school achievement have negative school attitudes compared to those with high school success. In Yüksel's (2003) thesis study, it is concluded that the learned helplessness levels of 9th-grade students are effective in explaining the variability in school attitudes. According to the findings of Pişkin's (2005) thesis study, developing students' self-efficacy enhances positive school attitudes. Feld and Shusterman (2015) state that there is a significant relationship between student stress levels and attitudes toward school. In Koç's (2019) thesis study, it is argued that values are the most important variable influencing adolescents' attitudes towards school and school burnout. In Demir's (2021) thesis study, a positive and moderately significant relationship is concluded between secondary school students' social skills and their attitude toward school. In this sense, it can be argued that students' attitudes towards school are shaped by the level of learned helplessness, the level of stress at school, school success, values, social skills, and self-efficacy. It can be said that attitudes towards school have lots of short and long-term effects on students, schools, and society. Majoribanks (1992), Ainley (1994), Maher (2000), Price (2000), McCoach and Siegle (2003), Bölükbaşı (2005), Ak and Sayıl (2006), Downey, Ainsworth and Qian (2009), Erkman et al., (2010) and Alıcı (2013) state in their studies that there is a direct and significant relationship between students' attitudes towards school and their academic achievement. Atik (2016) concludes that attitudes toward school indirectly influence academic achievement. It is concluded that positive attitudes toward school result in improved self-regulation skills and motivation (McCoach, 2000) and

social-emotional learning skills (Kutluay Çelik, 2014). More widespread effects are spotted when the subject is evaluated in terms of negative school attitude. The first is the relationship between negative school attitudes and school absenteeism. In the study of Adıgüzel and Karadaş (2013), it is seen that students with high absenteeism have more negative attitudes toward school compared to those with less absenteeism. Gülcemal's (2019) thesis study states that school perception and attitude toward school predict school dropout behavior at a moderate level. It is known that dropouts occur due to more negative school attitudes. Ainley and Sheret (1992) and Rumberger and Lim (2008) emphasize that students with negative attitudes toward school have higher dropout rates than other students. In addition, for the good of society, it is necessary to examine students' potential to commit the crime and take necessary precautions.

For this reason, it can be said that attitude towards school can be a detection tool in this regard. Atmaca's (2019) research results indicate a positive, moderately significant relationship between asocial behavior, alienation from school, negative school attitude, and tendency to crime. In this correlation, negative attitudes towards school explain the levels of asocial behavior, alienation from school, and tendency to crime in secondary school students at a rate of 44%. In addition, Cheng and Chan (2003) report that some students with negative school attitudes exhibit substance use and involvement in the crime. It is significant for students to develop positive attitudes towards school so that they can reach the desired level of educational goals and acquire as many learning outcomes as possible (Kpolovie, Joe, & Okoto, 2014).

Besides, Baron, Byrne, and Branscombe (2006) point out that students' attitudes towards school will have an effect on their future decisions about career choice and lifestyle. The results of the studies on the subject indicate that positive attitudes towards school are a necessity for students and schools. It is also essential for the healthy functioning of society. In the literature review, while there are mainly case studies on attitudes toward school, there are few hypothesis-testing studies. However, no direct intervention studies have been conducted to improve attitudes toward school and turn them into positive ones. In addition, it is concluded that studies on secondary school students' attitude levels toward school are mostly limited, and research on primary school students. Positive attitudes towards school will enable students to associate themselves with the school. Therefore, students' willingness to go to school and their participation in the course will increase, and academic, social, and emotional skills will be developed. Besides, early measures will be taken against students' potential to commit crimes. Developing attitudes towards school, especially starting from the primary education level, will help achieve these outcomes earlier and permanently. In this regard, it is thought that the current study will significantly contribute to the literature and practice. The following hypotheses are tested in the study, which examines the effectiveness of the intervention program called "I Love My School" to improve primary school students' attitude levels toward school:

H1: The "I Love My School" intervention program effectively develops positive attitudes towards school in students.

H1.1: The "I Love My School" intervention program effectively affects students' love of school.

H1.2: The "I Love My School" intervention program effectively allows students to adopt a school as a value.

H1.3: The "I Love My School" intervention program is effective in helping students adapt to school.

H1.4: The "I Love My School" intervention program effectively builds students' trust in school.

Method

Research Design

The current study was a quasi-experimental design with the pretest-posttest control group, one of the quantitative research methods. Basically, the experimental method represents research models in which the researcher directly controls education and intervention to find out the cause-effect relationship (Karasar, 2015). In the quasi-experimental model, however, not all variables can be controlled. This model is frequently utilized to determine effectiveness, especially in social sciences and education research. Experimental and control groups are randomly formed. While the pretest-posttest is applied to both groups, intervention is only done to the experimental/study group (Balcı, 2018; Büyüköztürk et al., 2017; Creswell, 2016; Karasar, 2015). The procedure regarding the experimental process of the research is presented in Table 1.

Table 1. Experimental Process

	n	Pre-Test	Procedure	Post-Test
Experimental Group	32	☒	☒	☒
Control Group	30	☒	☐	☒

Participants

Sixty-two students participated in the research. Before the study started, the students' families were informed about the study, and their permission was obtained. The number of participants in the control group is 30, and the number in the experimental group is 32. Information about the students is presented in Table 2.

Table 2. Descriptive Statistics of Participants

		Control Group (n=30)		Experimental Group (n=32)		Total (n=62)	
		n	**%**	**n**	**%**	**n**	**%**
Gender	Female	13	43,3	17	53,1	30	48,4
	Male	17	56,7	15	46,9	32	51,6
Grade Level	1	6	20,0	6	18,8	12	19,4
	2	8	26,7	5	15,6	13	21,0
	3	5	16,7	11	34,4	16	25,8
	4	11	36,7	10	31,2	21	33,8

When Table 2 is examined, it is realized that the gender variable is at similar rates in control, experimental, and total participant groups. Males (56.7%) in the control group, females (53.1%) in the experimental group, and total males (51.6%) have slightly higher rates and frequencies. When the grade levels are examined, the participants with the highest frequency are the 4th grade students, with a rate of 33.8%. Similarly, there are 4th grade students mostly (36.7%) in the control group. In the experimental group, however, it is spotted that most (34.4%) students are from the 3rd grade. In addition, before the research, participants' attitudes toward school were compared in the experimental and control groups. The comparison results are provided in Table 3.

Table 3. Comparison of Participants' Pre-Test Scores

	Control Group			Experimental Group						
Scores	**N**	**Mean**	**Sd**	**N**	**Mean**	**Sd**	***U***	***Z***	***p***	***r***
Love	30	16,57	2,50	32	17,97	3,94	390,50	-1,272	,203	,026
Value	30	15,53	2,79	32	16,56	3,72	407,50	-1,027	,304	,017
Adaptation	30	11,60	2,18	32	12,28	2,68	444,50	-,506	,613	,004
Trust	30	17,73	2,21	32	17,88	3,48	430,00	-,713	,476	,008
Total	30	61,43	7,46	32	64,69	11,87	446,50	-,473	,637	,004

According to the analysis results in Table 3, the pre-test scores are love (U = 390.50; p > .05), value (U = 407.50, p > .05), adaptation (U = 444.50; p > .05), trust (U = 430.00; p > .05) and total scores (U = 446.50; p > .05). Therefore, it is concluded that there is no statistically significant difference between the control and experimental group scores. In other words, at the beginning of the study, there was no significant difference between the attitude levels of the control and experimental group students towards school.

Data Collection Tools

Personal Information Form

The form, developed by the researchers, includes information about students and their parents, such as gender, class, number of siblings, mother's education level, father's education level, and family income level.

Attitude Scale towards School

The validity and reliability study of the scale was carried out by Adıgüzel (2012). In the first part of the item pool, students were asked in which sentences they expressed their positive or negative attitudes toward school, and these sentences were recorded as a list. In the second part of the item pool, the scale items developed to find out attitudes toward school in the relevant literature were examined, and the statements of attitude were listed. Later, the two lists were brought together, and the first question pool consisting of 42 items deemed appropriate was prepared. Expert opinions were taken, and four items containing mistakes were excluded from the scale. For the remaining 38 items, a pre-test was applied to a determined group, and as a result, incomprehensible sentences were rearranged. The prototype version of the 38-item scale was evaluated via factor analysis, and 17 items with an item load of less than .1 were removed from the scale. The rotation process was performed with the remaining 21 items, and as a result, four sub-dimensions were obtained. These sub-dimensions are: Love (6 items), Value (5 items), Adaptation (4 items), Trust (6 items).

The general internal consistency coefficient of the scale was found to be .860. In the scale, a 5-point Likert-type graded answer option was provided so that students could express their level of agreement with the statements. These are listed as “I totally agree (5), I agree a lot (4), I agree somewhat (3), I agree a little (2), and I do not agree at all (1)” of the 21 items on the scale, 14 have positive attitudes toward school, and seven are related negative attitudes.

Experiment Process

In order to contribute to student's academic and social development at a primary school in the Selçuklu district of Konya, to increase their attendance at school and learning motivation, interviews were held with teachers, school administrators, and parents.

Table 4. Content Information of the Intervention Program

Activity Goal	Activity Name and Duration	Activity Content	Following Activities	Materials
(Improving Peer Interaction and Collaboration)	"Will you play with me?" (40')	Ice breaking activities and meeting	Question-answer	Ball, ball of string, balloon
	"Who is s/he?" (40')	Each participant's description and estimation of one of the other group members with the 3 most distinctive features	Expressing students' views on the activity in a single sentence	Paper-pencil
	"My Portrait, Your Portrait" (40')	Group members sitting in pairs and facing each other and drawing portraits of each other	Double portrait presentations	Types of water-dry-crayons, painting paper
	Two heads are better than one (40+40')	Preparation of a stationery aid box together for students in need at school	Sharing feelings/opinions about the activity	School bag and school stationery supplies
(School From Students' Perspectives)	"What Does School Mean?" (40+40')	Through different methods (Brainstorming, metaphor), revealing the school image formed by students	Creating a joint mind map (with drawings or words)	Paper, Colorful pencils
	"Dear Diary, Today at School…" (40+40')	Among the events that happened at school that day, expressing the most affected event in a diary format, either verbally or in writing	Peer recommendations regarding the events experienced	Paper-pencil
	"My Dream School-1" (40+40')	Illustration of the school that is imagined in accordance with the principles of visual design	Painting exhibition	Types of water-dry-crayons, painting paper
	"My Dream School-2" (40+40')	Preparing a common school model using waste materials by combining the most popular features among school designs.	Model exhibition	Types of water-dry-crayons, cardboard, adhesive, plastic and paper waste materials
(Developing Positive Attitudes Towards School)	"Good Things-Bad Things" (40+40')	In two boxes named Good Things and Bad Things, students write down the situations that they like or do not like at school, then choose a good and a bad situation paper randomly from the opened box and read it, share opinions about good things, discuss what can be done to fix bad things.	Exit ticket - Write a solution and paste it on the board	Sticky paper, pencil, two sealed boxes
	"What Would Happen If There Was No School?" (40')	Discussing the situation of a society without school with the reverse brainstorming technique	Creative drama about the unschooled society	Paper, pencil
	"How Did You Succeed?" (40+40')	Interviewing an individual who has achieved a good position as a result of his/her success at school and asking questions about the role of school in success	Question-answer	Paper-pencil
	"Here is My School" End of Education Celebration (40+40')	Karaoke party, treats, dance performances etc.	Emotion/opinion sharing	Class decoration materials, sound system, treats

The results of the interviews indicated that the students had negative attitudes toward school. Attitude is having a positive or negative approach to a person, event, phenomenon, or situation (Uyanık, 2017). There is a cause-and-effect relationship between attitude and behavior. Students' temperaments, teachers, school administration, families, and the physical conditions of the school affect their attitudes (Adıgüzel, 2012). Consequently, it was planned to develop and implement an intervention program for students. During the process, the parents of the

students at the appropriate grade level were informed about the study, and the research consent and voluntary participation forms were sent. Among the parents who agreed to participate in the research, the control and experimental groups were formed by considering the students' grade levels and genders.

The content of the intervention program to be applied to improve students' attitudes toward school was prepared by considering the topics obtained from the interviews before the research. The work schedule of the intervention program was planned as three months, February-April 2022. Content information regarding the implemented intervention program is summarized in Table 4.

The intervention program consists of three main modules (Developing peer interaction and collaboration, developing positive attitudes towards school and school from students' perspectives). Each module has four sub-applications and the implementation period of the module was one month. The implementations were planned as separate sessions for each grade level, and the intervention program was completed within a total of three months.

Data Analysis

Before the research data analysis, the data set was checked for incorrect entries and missing and extreme values. Before the analysis, the normality assumptions of the data were examined in the context of the sub-scores and total scores of the scale. The Kolmogorov-Smirnov significance values referenced for the univariate normality control were $p > .05$, the skewness and kurtosis values were between –1.5 and +1.5, and were checked by examining the histograms, Q-Q graphs, and P-P graphs (Akbulut, 2010; Tabachnick & Fidell, 2013). As a result of the normality tests, it was concluded that the data did not indicate normal distribution characteristics, and it was found appropriate to use nonparametric tests in the analysis. Wilcoxon Signed Rank Test was used for repeated measurement scores. In addition, Mann-Whitney U analysis was employed to compare the pre-test and post-test scores between the groups. In this sense, the measurement results obtained and the process of the analyses performed are presented below.

Table 5. Process of the Analysis Performed

	Measurement	
Group	**Pre-test**	**Post-test**
Experimental Group	A1.E.Pre	A1.E.Post
Control Group	A1.C.Post	A1.C.Post

First of all, A1.E.pre*A1.C.pre comparison was made, and it was checked whether there was a significant difference between the control group and the experimental group before the intervention. The purpose of this comparison was to reveal that the participants were chosen randomly and that they had similar attitude levels in the beginning.

A1.E.post*A1.C.post comparison was made, and it was tested whether there was a significant difference between the experimental and the control group attitude scores after the intervention. The purpose of this comparison was to reveal the improvement of the group that received the intervention at the end of the process compared to the

group that did not.

By comparing A1.E.pre*A1.E.post, it was aimed to reveal the improvement experienced in the experimental group before and after the intervention. With the A1.C.pre*A1.C.post comparison, it was aimed to reveal whether there was any improvement in the control group depending on the time passed during the experiment or the development without intervention. In the analyses, the maximum value of type I mistake probability was accepted as 5%, that is, $p \leq .05$. In terms of sensitivity to smaller mistake probabilities, $p \leq .01$ and $p \leq .001$ significance levels were also taken into account in reporting, and p values were specified.

Results

In order to determine the effectiveness of the intervention program within the scope of the research, pre-test and post-test comparison analyses were carried out specifically for the experimental and control groups. In the study's first hypothesis, it is stated that the "I Love My School" intervention program will effectively develop positive attitudes toward school in students. The Wilcoxon Signed Rank Test analysis results obtained in the context of testing both the first hypothesis and sub-hypotheses are presented in Table 6 for the experimental group and Table 7 for the control group.

Table 6. Pre-Test & Post-Test Comparison Results of the Experimental Group Scores

Scores		***n***	***Rank Mean***	***Rank Total***	***z***	***P***	***r***
Love	Negative Rank	6	11,83	71,00			
	Positive Rank	20	14,00	280,00	-2,667[b]	**,000*** **	**,115**
	Equal	6					
Value	Negative Rank	3	4,17	12,50			
	Positive Rank	26	16,25	422,50	-4,448[b]	**,000*** **	**,319**
	Equal	3					
Adaptation	Negative Rank	3	7,50	22,50			
	Positive Rank	23	14,28	328,50	-3,898[b]	**,000*** **	**,245**
	Equal	6					
Trust	Negative Rank	15	15,90	238,50			
	Positive Rank	16	16,09	257,50	-,188[b]	,851	,001
	Equal	1					
TOTAL	Negative Rank	5	11,00	55,00			
	Positive Rank	25	16,40	410,00	-3,654[b]	**,000*** **	**,214**
	Equal	2					

Note: b= Based on negative ranks; c= Based on positive ranks; * = p <.05; **= p <,01; ***= p <.,001.

When Table 6, which presents the comparison results of the pre-post test scores of the experimental group, is examined, it is seen that there is a statistically significant difference between the pre-test and the post-test scores in terms of love (z=-2.667; p ≤.001), value (z=-4.448; p ≤.001), adaptation (z=-3.898; p ≤.001) and total (z=-3.654; p ≤.001). In terms of the trust sub-dimension (z=-.188; p >.05), there is no statistically significant difference. According to these results, A1-A2-A3 hypotheses are accepted, and A4 hypothesis is rejected. When the effect sizes obtained in the analysis results are examined, a moderate effect size (0.3 < r < 0.5) is obtained in the context of the value score. In the context of love, adaptation, and total score types, small (r < 0.3) effect size values are spotted.

When the means in Tables 3 and 8 regarding the types of scores for which a significant difference is obtained are examined, it is spotted that there is a significant increase in all sub-scores and total score means of the experimental group after the intervention. For example, while the total pre-test score mean is $\bar{X}$ = 64.69, the final score mean is $\bar{X}$ = 72.97. In other words, after the intervention, there was a positive increase in the attitude levels of the experimental group students toward school. The Wilcoxon signed ranks test results related to the comparison results of the pretest-posttest scores of the students in the control group are presented in Table 7.

Table 7. Pre-Test & Post-Test Comparison Results of the Control Group Scores

Scores		***n***	***Rank Mean***	***Rank Total***	***z***	***P***	***r***
Love	Negative Rank	8	13,38	107,00	-1,748	,080	,102
	Positive Rank	18	13,56	244,00			
	Equal	4					
Value	Negative Rank	13	13,42	174,50	-,651	,515	,014
	Positive Rank	15	15,43	231,50			
	Equal	2					
Adaptation	Negative Rank	10	10,45	104,50	-1,024	,306	,035
	Positive Rank	13	13,19	171,50			
	Equal	7					
Trust	Negative Rank	18	13,36	240,50	-1,659	,097	,092
	Positive Rank	8	13,81	110,50			
	Equal	4					
TOTAL	Negative Rank	13	15,42	200,50	-,659	,510	,013
	Positive Rank	17	15,56	264,50			
	Equal	0					

Note: b= Based on negative ranks; c= Based on positive ranks; * = p <.05; **= p <,01; ***= p <.,001

When the pre-test-post-test comparison results of the scores obtained for the control group students are examined, it is observed that there is no statistically significant difference in terms of love (z=-1.748; p >.05), value (z=-.651; p >.05), adaptation (z=-1.024; p >.05), trust (z=-1.659; p >.05) and total attitude levels towards school (z=-.659; p >.05). In another saying, there is no significant change in the attitude levels of the students in the control group, who did not receive any intervention. After the intervention, the analysis results carried out between the experimental and control groups in the context of school attitude scores are presented in Table 8.

Table 8. Descriptive Statistics of Experimental and Control Groups Post-Test Results and Mann Whitney U Results

	Control Group			**Experimental Group**						
Scores	**N**	**Mean**	**Sd**	**N**	**Mean**	**Sd**	***U***	***Z***	***p***	***r***
Love	30	17,57	2,10	32	19,94	3,53	275,50	-2,905	**,004****	**,136**
Value	30	16,17	2,74	32	20,19	1,79	125,50	-5,048	**,000*****	**,411**
Adaptation	30	12,23	2,06	32	14,94	1,52	153,00	-4,680	**,000*****	**,353**
Trust	30	16,70	2,29	32	17,91	2,23	339,00	-2,014	**,044***	**,065**
Total	30	62,67	6,42	32	72,97	7,37	137,00	-4,838	**,000*****	**,378**

Note: * = p <.05; **= p <,01; ***= p <.,001

When Table 8 is examined, the results of the analysis performed in the context of post-test score means indicate that there is a statistically significant difference between the experimental group and the control group in terms of love (U = 275.50; p ≤.01), value (U = 125.50; p ≤.001), adaptation (U = 153.00 p ≤.001), trust (U = 339.00) and total scores (U = 309.50; p ≤.001). When the mean scores of the groups are examined, it is concluded that the mean scores of the experimental group are higher in all sub-scores and total score means. In other words, while there was no significant difference between the experimental and control groups before the intervention program, the scores of the experimental group increased significantly after the intervention. When the effect sizes are examined, medium effect sizes are seen in value, adaptation and total scores, and small-level effect sizes are obtained in love and trust scores.

When the mean scores of the pre-test presented in Table 3 and the post-test presented in Table 8 are scrutinized, there are non-significant increases in the levels that can be described as time and development effects in other score types except for the trust sub-dimension. However, in the context of the trust sub-dimension, the control group's mean score decreased from 17.73 to 16.70 at the end of the study.

As a result, while the students have similar levels of attitude towards school, in the beginning, there is a statistically significant difference between their scores after the intervention. This difference is seen both within the experimental group (pre-test – post-test) and as a result of comparing the post-tests of the experimental and control groups. That is to say, while there is no significant change in the attitude levels of the control group, the meaningful and desired change after the intervention offered to the experimental group indicates that the intervention content is effective.

Discussion

The research examines the effectiveness of the “I Love My School” intervention program in improving primary school students' attitude levels toward school. The study participants are primary school 1st, 2nd, 3rd, 4th grade students. The research was carried out according to the quasi-experimental design with the pretest-posttest control group, one of the quantitative research methods. The results of the research point out that the "I Love My School" intervention program has improved primary school students' attitude levels toward school in a positive way.

One of the results obtained in the research is that the intervention program applied to the students effectively develops students' love for school. In a study conducted by Azapağası-İlbağı & Akgün (2012), students define school as 'the place where they learn knowledge and skills that will benefit them in the future, use their time correctly and effectively, and develop love attitudes towards school.' However, it is argued that the structures of schools and parents’ adverse school backgrounds negatively affect students’ attitudes toward school (Başaran & Yıldırım, 2017). Nevertheless, as seen in this research, it can be ensured that children love school through correct practices.

It is observed that the intervention program applied to the students participating in the research effectively defines a school as a "value." It is realized in metaphorical studies that there is negative progress regarding the value attitude towards school. In the study conducted by Atalay- Mazlum and Balcı (2018) for vocational high schools, it was found that the participants defined school with metaphors such as 'zoo, prison, arena, coffeehouse' that could not be associated with school and that the majority of the teachers did not regard school as a value. Archambault et al. (2009) express in their research that the perception of "value" regarding school is not normative. In addition, when primary school children are compared with secondary and high school students, they argue that primary school students tend to see school as a value. Studies in the literature reveal that different situations create different levels of value perception in children toward school. The current study's appropriate intervention program for children strengthened students' perceptions of valuing school. As a result, it is concluded that the proper practices contribute to developing positive attitudes in students toward school.

According to the research results, the intervention program applied to the students participating is effective in developing adaptation and trust attitudes toward school. Children experience different environmental transitions during childhood that require adaptation to new environments (Bronfenbrenner, 1979). The school environment itself is an environmental transition that children face. It can take different forms, such as transitioning from one level of education to another, starting a new school, and transitioning from one school to another. Regardless of which of these, the child has to deal with lots of new challenges to adapt (Ladd & Price, 1987). According to Balcı (1999), perceiving school as authoritarian, chaotic, and disciplined reduces school adaptation and confidence in primary school children. The fact that attitudes towards school have started to evolve into negative ones while still in primary school indicates a severe problem that needs to be intervened. It is possible to mention many factors that undermine adaptation and trust in school. However, as seen in the results of the research, appropriate and valid practices increase children's adaptation and trust in school.

According to the results of the research, the intervention program implemented improved the students' attitudes toward school in a positive way. Students' attitudes toward school have positive or negative effects on their development and academic life (Tatar, 2006; Sarı & Cenkseven, 2008). Considering that students spend most of their time at school, it can be concluded that their feelings and thoughts about school will also impact their personality traits. Today, it is a well-known fact that attitudes towards school play an important role among other important factors affecting students' success (Berberoğlu & Balcı, 1994; Marks, 1998; Lamb & Fullarton, 2002; Mok & Flyyn, 2002; Yapıcı, 2003; McCoach & Siegel, 2003; Cheng and Chan, 2003; Tatar, 2006; Erkman et al., 2010). It cannot be expected that the academic success of a student who does not like his school, does not like going to school, hates school, and exhibits truant behavior at school. The academic success of a student who loves his school enjoys going to school, and believes in the importance of school is the same (Alıcı, 2013). In this sense, the positive development of student's attitudes towards school is of great importance for both school and life success. Hence, it is essential to develop students' positive attitudes towards school via the intervention program implemented in the research.

Attitudes towards school are in cognitive, affective, and behavioral dimensions and include the love, value, adaptation, and trust a student has towards school. Developing attitudes towards school will boost students' commitment to school and benefit from school in different subjects. For the sustainability of societies, bringing up generations properly in all respects is the primary duty of the family and school. Schools are the environments where children from all walks of life can receive education and equal opportunities in education can be achieved. Therefore, it is essential to develop students' attitudes towards school starting from the primary school level with the support of parents and teachers. The intervention program, the effectiveness tested in the current study, is an essential action-oriented

educational step that encourages students to develop positive attitudes towards school, especially by addressing their affective characteristics.

Conclusion

The study aims to examine the effectiveness of the "I Love My School" intervention program, which was prepared to improve primary school students' attitude levels toward school. The following conclusions are reached in light of the research findings.

- The intervention program increased students' love attitude towards school.
- The intervention program increased students' value attitude towards school.
- The intervention program increased students' school adaptation levels.
- The intervention program increased students' trust in school.

According to the research results, it was concluded that the students found the "I Love My School" intervention program helpful and experienced a general increase in positive moods toward school. In light of these results, it can be argued that implementing an intervention program is an effective method in developing attitudes towards school, preserving the existing positive attitude levels, and thus supporting students' affective characteristics, which are the main source of their attitudes towards school. As a result, it can be said that the intervention program "I Love My School," which was designed to develop positive attitudes towards school at the primary school level, is effective.

Recommendations

It can be concluded that the intervention program implemented in the current research enabled the students to like school. For this reason, such activities as "Two Heads Are Better than One, Good Things, Bad Things and Dear Diary" based on the identity, region, and culture of each school and students' affective characteristics and which will make students like school can be implemented. In light of these examples, new activities can be designed, and necessary interventions can be made by considering these factors.

Considering that the intervention program in the research made the students like school, it can be recommended to implement activities similar to the activities applied in this intervention program. It is thought that there should be areas where the school can attribute value to students and society, with its corporate identity and material and moral benefits. For this reason, feasibility studies can be carried out so that schools create their unique identity cultures and have important societal positions and weights.

In order for schools to rise as a value, activities such as "What Does School Mean? "My Dream School-1, My Dream School-2" can be applied to students. In the intervention program implemented in the current study, great attention was paid to ensuring that all the elements that make up the school were in harmony. Thus, a positive development of attitudes towards school has been achieved. In order to achieve this, the factors that cause

disruptions and unrest within the school should be detected, and necessary studies should be carried out in this regard.

Within the scope of the studies to be done, “Will you play with me? Who is s/he? My Portrait is Your Portrait” activities can be applied to students. In order to create a sense of trust in the school, students must have positive experiences at school. In this sense, practitioners and researchers should determine the elements students need to have trust in school. Accordingly, “What Would Happen If There Was No School? How Did You Succeed? Here is My School” activities can be done.

In order to enhance the attitudes towards school, if possible, cooperation can be made with guidance teachers from the primary school level, and educational interventions can be integrated into guidance lessons. These applications should cover all members of the school, not just students. Therefore, training of teachers, administrators, and even school personnel, especially family education, can be added to intervention programs.

In future studies, other quantitative measurement tools can be used to determine the effectiveness of the intervention in multiple ways and to increase its validity and reliability. In addition, qualitative data collection methods such as interviewing and identifying metaphorical perceptions can be used. The current study examines students' attitudes toward school, consisting of love, valuation, adaptation, and trust. Future research can also investigate cognitive, emotional, and behavioral dimensions of attitudes. Attitude is a sub-dimension of motivational beliefs. Motivational beliefs include motivation, self-efficacy for learning, anxiety, and perceptions of expectation and value. In this respect, studies on students' motivation toward school can be included in the broader scope.

This research has been conducted through an experimental method and a quantitative approach. In future studies, student's attitudes toward school can be examined with qualitative approaches or a mixed approach in which quantitative and qualitative approaches are employed together. The study was conducted with primary school students. Research can be conducted on the effectiveness of intervention programs that can be applied to middle and high school students.

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Use of Kahoot! for Assessment in Chemistry Classroom: An Action Research

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Abstract

Kahoot! is a game-based learning platform used to review students' knowledge, for formative assessment, or as a break from traditional classroom activities. This study implements formative assessment in chemistry education classroom instruction using Kahoot! to monitor students' development and assess their interest in learning. The action research adopted experiments and survey design. Thus, two instruments (a test and a survey) were designed to obtain data from 32 enrolled undergraduate chemistry education students at Sokoto State University. A paired-sample t-test was conducted to monitor students' development between different test scores performed by the same respondents. The result indicated that while pairs 3 and 4 had no significant difference, there was a significant difference between pairs 1, pair 2, pair 5, and pair 6. Moreover, the results also revealed an effective enhancement of students' interest when Kahoot! is implemented as a tool for formative assessment in chemistry instructions. Kahoot! is a free online game-based application that includes quizzes, discussions, and surveys that make learning challenging, fun, and engaging. The study concluded that teachers should cautiously reap the benefits of Kahoot! in engaging, interesting, and monitoring students' development in learning.

Keywords: Kahoot!, Chemistry, Formative assessment, Instruction, Classroom.

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Introduction

In order to increase student engagement and motivation, technology is becoming more and more integrated into educational settings. Interactive classroom environment, student participation, activity, and instructional games, which are features of electronic learning, are the factors that define the quality of e-learning (Gokbulut, 2020). Indeed, the rapid increase in the availability and affordability of interactive technologies has contributed to the adoption of games in instructional science (Licorish et al., 2018).

The effective ideas or approaches included in game designs to encourage positive learning outcomes contribute to the engaging learning experience of game playing, even though fun and entertainment are typically what first draw individuals to games. Some of the most important factors in gamified instruction are concentration, focus, motivation, interest and engagement (Bicen & Kocakoyun, 2018; Cárdenas-Moncada, 2020; Chen et al., 2016; Kaur & Nadarajan, 2020; Kaur & Naderajan, 2019; Mohd Muhridza et al., 2018; Reynolds & Taylor, n.d.; Sanga Lamsari Purba et al., 2019; Tóth et al., 2019; Zarzycka-Piskorz, 2018). Along with these characteristics and the principles of effective learning, well-designed digital games can encourage and support learning by allowing players to actively and critically explore, practise, and reflect on their ideas in a problem-based, contextual, and low-risk context. According to Li & Tsai (2013), while playing games, learning happens organically. As Gee (2007) stated, "you can- not play a game if you cannot learn it".

Student participation in the classroom activities is crucial to their learning because it fosters stronger bonds between them, improves communication, and enables them to learn and practise new skills. When students are actively involved in the learning process, they commit to it, comprehend the learning objectives and goals, and remain motivated to learn. Student response systems (SRSs) were developed in the sixties to make large classes more interactive and have been used in classrooms since the early seventies. Clickers were one of the SRSs that introduced game features to increase the students' engagement during classroom instruction. According to Wang & Tahir, (2020b), Kahoot! was the first SRS designed to provide a game experience using game design principles from theory on intrinsic motivation and gameflow. When Kahoot! was launched, it distinguished itself from the rest of SRSs as it had a strong focus on being a game-based platform, and thus can be classified as a Game-based Student Response System (GSRS) (Cárdenas-Moncada, 2020; Wang, 2015; Wang & Tahir, 2020b).

Kahoot! is a game-based student response system (GSRS) launched by the teacher in a web browser on a laptop connected to a large screen. Kahoot! provides a tool for creating quizzes, including adding pictures and YouTube videos to the questions. It also makes it possible to publish and share your quizzes and edit quizzes made by others. When playing Kahoot!, the students log into the system using a game pin (a number) and a nickname. The goal for the students is to correctly answer the question as quickly as possible to get as many points as possible. A question is shown on the large screen along with four or fewer alternative answers in different colors with associated graphical symbols. The students give their answers by choosing the color and symbol they believe corresponds to the correct answer. Once all participants have responded to the question, the system will show the results, allowing students to see the correct response and the percentage of the class who responded correctly. Students are scored on response rate for accuracy and timeliness, with the 1st, 2nd, and 3rd participant names

shown across the screen.

Problem Statement

Wang & Tahir (2020) claims that when the class is entire, most teachers are aware of the difficulty in maintaining students' motivation, involvement, and attentiveness during direct instruction. Learning outcomes can be reduced, and the classroom environment can become unpleasant when students are not motivated, engaged, or focused during class. There are several examples of game-based learning being used both within and outside of the classroom, along with evaluations of their impact on classroom dynamics, engagement, learning, concentration, motivation, and enjoyment. Most of the research in this area focuses on evaluations of the use of game-based learning applications and the effect they have on the students revealing that a positive effect has been achieved compared to more traditional learning methods except for Murciano-Calles's (2020) study.

Murciano-Calles (2020) conducted a study to decipher the effectiveness of Kahoot! for chemistry students as an assessment tool for higher education with a comparative analysis with other traditional methods, such as solving problem sets. This study's findings reveal that a game's competitive incentive and playfulness is less preferred than the intrinsic challenge of solving a difficult question or problem. Although the study result could be helpful in a small classroom setting, it may not be in a great learning environment. Research in educational settings has shown that games and game elements can influence subjective experience as well as behavior and learning outcomes, but according to Wang & Lieberoth (2016), these factors are often intermingled within studies. Many teachers used multiple approaches for making lectures more interactive, including breaking the class into smaller groups, questioning the audience, using audience responses (systems), introducing cases the students can work on, using written material, organizing debates, reaction panels, and guest talks, using simulations and role-plays, using video and audio-visual aids, and using practical presentation skills.

According to Wang & Tahir (2020) Kahoot! is a game-based learning platform used to review students' knowledge, for formative assessment, or as a break from traditional classroom activities. Ismail and Mohammad (2017) applied Kahoot! as a formative assessment tool to promote learning among 113 freshman medical school students in Malaysia. The study investigated the effectiveness of two assessment platforms, Kahoot! and an e-learning portal, and gender differences in Kahoot! use. The results indicated that Kahoot! is effective as an assessment tool because it is easy to use, practical, fun, and enjoyable.

Furthermore, a study conducted by Bicen & Kocakoyun (2018b) to analyze the effect of the scientific word learning-based online game -Kahoot!- on students who had difficulty in learning physical science lessons in secondary schools reveals that when Kahoot! is played twice a week, there seemed to be increased in students' focus and task behaviors. The results of student satisfaction research showed that the students liked playing Kahoot! and found it easy to use. The goal of Kahoot! is to improve learning outcomes and classroom dynamics by raising engagement, motivation, enjoyment, and concentration. A study conducted by Wang & Tahir (2020) investigated how Kahoot! affects learning performance, classroom dynamics, students' and teachers' attitudes and perceptions, and students' anxiety concluded that Kahoot! can positively affect learning performance, classroom

dynamics, students' and teachers' attitudes, and anxiety.

Studies (Aliyu et al., 2021; Cárdenas-Moncada, 2020; Gokbulut, 2020; Licorish et al., 2017; Murciano-Calles, 2020; Prieto et al., 2019; Tóth et al., 2019; Wang & Lieberoth, 2016; Wang & Tahir, 2020) shown that students who are actively involved in the learning activity will learn more than passive students. This means that there is a possibility of achieving improved understanding and learning outcomes when students are effectively engaged during classroom instruction. The goal of Kahoot! is to increase engagement, motivation, enjoyment, and concentration to improve learning performance and classroom dynamics. Kahoot! is a game-based learning platform used to review students' knowledge for formative assessment or as a break from traditional classroom activities.

Objectives of the study

The study aims to evaluate students' development when learning the history and philosophy of chemistry with the Kahoot! student response system. Kahoot! was formerly used by researchers in different areas of chemistry, including general chemistry (Youssef, 2022); elemental quantum chemistry; acid-base and reduction-oxidation equilibrium; colligative properties of solutions; and reaction kinetics (Murciano-Calles, 2020). Consequently, Ghawail & Yahia (2022); María et al. (2018); Ramli et al. (2020); Sanga Lamsari Purba et al. (2019) executed studies by using Kahoot! to motivate students to learn chemistry, but the chemical concept or areas were not mentioned by both authors. Chemistry is a complex subject, and teachers require different approaches to facilitate the learning of different concepts. This is because some concepts require memorization, some require mathematical computation abilities, and for others, science process abilities and illustrations via model are significantly required. Thus, the findings of a study conducted in a particular chemical area will not directly affect other chemical concepts. Since this study focused on chemistry's historical and philosophical site, a distinction was made from further research conducted by several authors. This study provides teachers with foundational information about the significance of Kahoot! influencing the learning of an area of chemistry that combines the three levels of representation from which all concepts of the subject originated.

Students learning is developed and monitored by teachers during instruction in the classroom through formative assessment. However, because of the ease of use and the practical implications of game-based student response as effective cognitive tools, researchers implemented Kahoot!'s online game as an assessment tool:

i. to monitor and assess students' development when learning the history and philosophy of chemistry
ii. to assess students' interests when learning the history and philosophy of chemistry.

Methodology

This section discusses the method employed by the researchers to guarantee the achievement of the established objectives of the study. Thus, the section comprises a research model, participants, measuring tools, a data collection process, and data analysis.

Research Model

This study is an action research project that monitors and evaluates chemistry students' progress in learning the history and philosophy of chemistry. Thus, it is a quantitative study that adopts a survey research design and a one-shot case study research design. In this pre-experimental research design, only one variable is considered. This is a posttest study where students are evaluated after having a course of treatment that was thought to result in change.

Participants

The participants are 200-level undergraduate students (UG2) of Sokoto State University enrolled in History and Philosophy of Chemistry (SED214) in the 2019/2020 academic session. A total of 32 students enrolled in the course. And since the class is not large, all students participated in the study as a whole.

Measuring Tools

Two different instruments were used for the study. Firstly, a total of 10 different five-minute online Kahoot! game multiple-choice tests are designed for the whole content of the "History and Philosophy of including the introduction, history of chemistry, philosophy of chemistry, philosophers, and the development of chemistry in the Nigerian educational system and goals of science education in Nigeria. Secondly, an online survey was adapted from Bicen & Kocakoyun (2018), Kaur & Naderajan (2019), and Wang & Lieberoth (2016) to assess students' perception and engagement during instructions supplemented by the Kahoot! online game. This instrument, Students' Perception and Engagement on the Kahoot! The instructional Game Questionnaire (SPEKIGS) was developed on a four-point Likert agreement scale.

If the data is ordinal, Cronbach's alpha can be used to calculate the internal consistency of a test with more than two options, such as the Likert scale (Tavakol & Dennick, 2011). Thus, the alternative responses were scored 1, 2, 3, and 4 from the anchor of the Likert scale of agreement (strongly disagree, disagree, agree, and strongly agree, respectively). These scores were later keyed into SPSS 25 to determine the reliability of the items as well as perform other analyses. To form a conclusion on whether the test items are measuring the same construct or whether they are closely related, the interpretation of the value of Cronbach's alpha is also provided by Tavakol & Dennick (2011), represented in Table 1 below. The closer the value gets to 1, the better the reliability.

Table 1. Tavakol & Dennick (2011) Reliability Index Interpretation for Cronbach's Alpha

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Table 2 shows Cronbach's alpha values for the instrument. The higher the Cronbach's alpha coefficient of

reliability, the more reliable the scale is (Santos, 2013). The closer the coefficient value is to 1, the higher the reliability and the more items measure the same construct.

Table 2. Cronbach's Alpha Reliability Coefficient of the Instrument

Cronbach's Alpha	Cronbach's Alpha Based On Standardized Items	N of Items
.920	.940	10

It can be observed from Table 2 that Cronbach's Alpha coefficient is 0.920 indicates that the instrument is reliable. This is due to the coefficient being close to 1.

Data Collection Processes

There are 32 students who have enrolled in the course titled "History and Philosophy of Chemistry." This course is a two-unit undergraduate, 200-level core subject for chemistry education students at Sokoto State University. It is taught one day a week for about thirteen weeks in a semester, after which an end-of-semester summative assessment will be conducted. Each week, students are assessed three times, at the start, midpoint, and end of the lesson, for a duration of five minutes each. At the beginning of the class, students are evaluated on their current knowledge of the concept to be taught. At the midpoint, students' development is monitored, while the final evaluation is done at the end of the lesson to ascertain the attainment of the set objectives. This way, lessons are conveyed to the students in a fun and challenging manner that stimulates their curiosity.

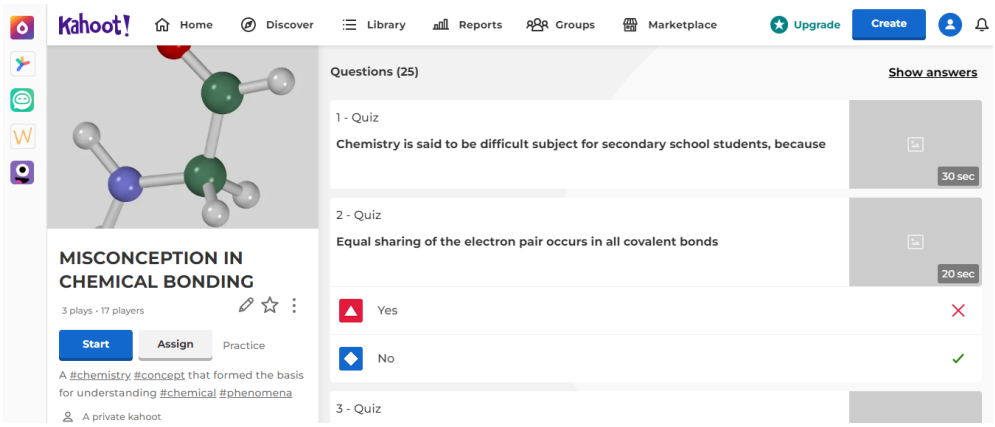

Figure 1. Chemical Bonding Assessment Created by Chemistry Teacher on Kahoot!! Platform (retrieved from https://Kahoot!.com)

Data Analysis

The collected data is analyzed using the Statistical Package for Social Science (SPSS) version 25. A paired-sample t-test was used to determine students' progress in learning the history and philosophy of chemistry. Moreover, mean and standard deviation were used to determine students' interest in using Kahoot as a game-based student response system.

Result

The data obtained was keyed into Microsoft Excel and later computed in the Statistical Package for Social Science (SPSS) version 25. Since the respondents are undergraduate students of chemistry education, only gender was considered as the demographic information of the respondents of the study indicated in Figure 1. Furthermore, the student's development and interest in learning are analyzed using a paired sample t-test and the standard deviation.

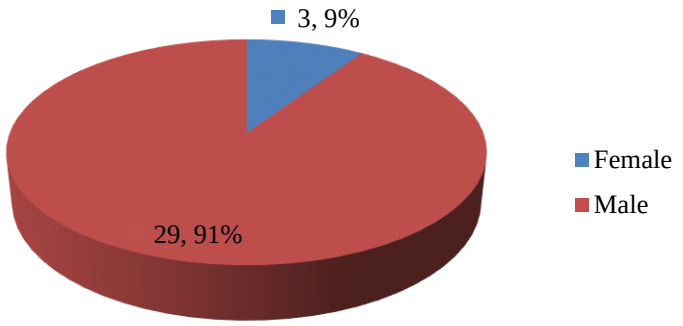

Figure 2. Gender of the Respondents

Figure 2 indicates that while 3 (or 9%) of the respondents are female, about 29 (or 91%) of them are male. This result indicates that more male students are taking "history and philosophy of chemistry" than females.

Table 3. Paired Sample t-test for Students' Development in Learning (formative assessment)

		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pair 1	WEEK1 - WEEK3	-3759.438	2111.906	-10.070	31	0.000
Pair 2	WEEK3 - WEEK5	-11519.375	22060.288	-2.954	31	0.006
Pair 3	WEEK5 - WEEK7	-379.063	33922.863	-0.063	31	0.950
Pair 4	WEEK7 - WEEK10	3394.281	23205.544	0.827	31	0.414
Pair 5	WEEK1 - WEEK5	-15278.813	22067.304	-3.917	31	0.000
Pair 6	WEEK1 - WEEK10	-12263.594	2492.573	-27.832	31	0.000

It can be observed from Table 3 that the first pair of 1st and 3rd test p-values = 0.000 is less than the 0.05 significant level, which indicates that there is a significant difference between the two scores of the same individual. Similarly, the second pair of p-values for the third and fifth tests, 0.006, is less than the 0.05 significant level, indicating that the two scores differ significantly. However, the third pair of 5th and 7th test p-values = 0.950 is greater than the 0.05 significant level, revealing no significant difference between the two scores. The fourth pair of 7th and 10th test p-values is 0.414, which is greater than the 0.05 significant level, indicating no significant difference between the two scores. While the fifth pair of the 1st and 5th test p-values equals 0.000, the sixth pair of the 1st and 10th test p-values equal 0.000, revealing a significant difference between the scores. These results reveal that students perform woefully on the first test but do better on the subsequent tests, in which the last test

has the highest scores.

Table 4. Statistics of Students' Interest when Kahoot!! is Used as a Tool for Formative Assessment

SN	Items	SD	D	A	SA	Total	Mean	Std. Dev
1	A gamification method increases my interest in the lesson	0	1	5	26	32	3.78	0.49
2	I prefer my teacher to conduct Kahoot!! activities at least twice a week.	0	0	2	30	32	3.94	0.25
3	Using a gamification method on my smartphone makes me feel better.	0	1	12	19	32	3.56	0.56
4	I want gamification methods to be used in other lessons as well	0	0	5	27	32	3.84	0.37
5	Winning badges through a gamification method makes me feel important	0	1	0	31	32	3.94	0.35
6	I will study more to become more successful via gamification methods.	0	0	0	32	32	4.00	0.00
7	The gamification method allows me to see my achievement status and improve myself in the areas that I am weak in	0	1	2	29	32	3.88	0.42
8	I feel motivated when I compete with my friends to get higher scores in Kahoot!! game	0	0	0	32	32	4.00	0.00
9	I feel positive towards my learning when I participate in Kahoot!! games	0	0	0	32	32	4.00	0.00
10	The scoring system of Kahoot! increases the ambition of students to be a top-five scorer	0	0	1	31	32	3.97	0.18

It can be observed from Table 4 that items 6, 8, and 9 have a mean value of 4.00 with a 0.00 standard deviation. This means that the data for items 6, 8, and 9 are entirely centered on the mean. Consequently, items 5, 1, 7, 4, 5, 2, and 10 have their standard deviations a little bit spread around the mean. Generally, the mean values of all items revealed that there is an effective enhancement of students' interest when Kahoot! is implemented as a tool for formative assessment in chemistry instruction. To make the result clearer, Figure 3 represents the chart of the mean and standard deviation of the data.

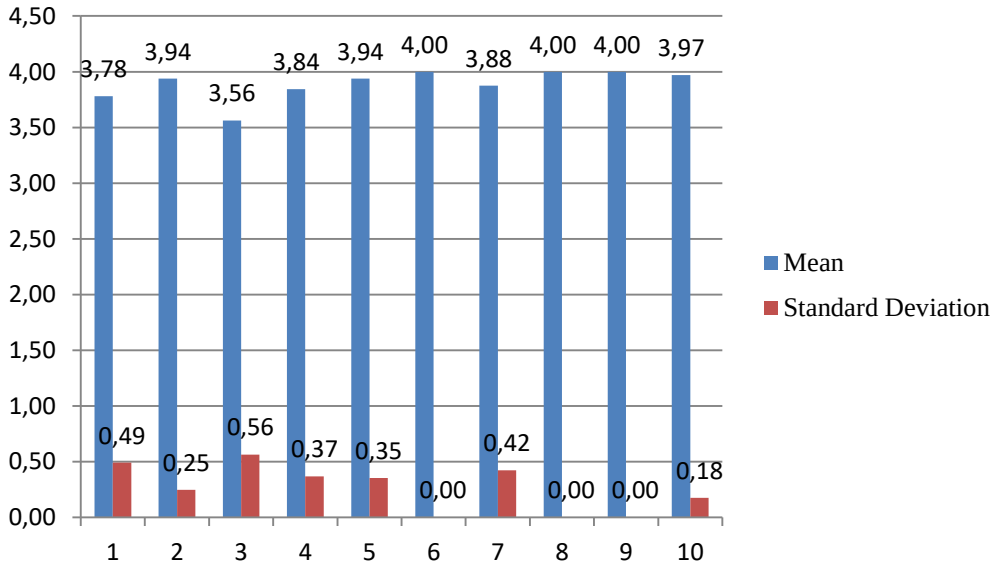

Figure 3. The Mean and Standard Deviation of the Data

It can be observed that items 6, 8, and 9 have consistent data, while item 3 has widely spread data. All respondents

strongly agree on items 6, 8, and 9. Although few respondents have other opinions, most strongly agree with items 5, 1, 7, 5, 4, 2, and 10.

Discussion

A paired-sample t-test was conducted to monitor students' development between different test scores performed by the same respondents. The result indicated that while pairs 3 and 4 had no significant difference, there was a significant difference between pairs 1, 2, 5, and 6. These findings are compelling enough to conclude that students' learning has advanced significantly. Kahoot!, as a game-based student response, enhanced academic performance in learning the history and philosophy of chemistry. Moreover, the results also revealed an effective enhancement of students' interest when Kahoot! is implemented as a tool for formative assessment in chemistry instruction.

This finding contradicts the outcome of a study conducted by Murciano-Calles (2020) to utilize Kahoot to instill problem-solving skills in students. The contradiction resulted from the varying concepts explored by the researchers and the role presumed to be played by Kahoot. Firstly, the study conducted by Murciano-Calles (2020) covered topics that include elemental quantum chemistry, acid-base, reduction-oxidation equilibrium, colligative properties of solutions, and reaction kinetics. These concepts are categorized at the macroscopic level of representation in chemistry, which refers to the observable state of matter. Physical skills are essential to learning at this level of representation. Moreover, Kahoot may not serve a significant purpose in enhancing problem-solving skills in chemistry education. This is because problem-solving skills involve an understanding of the language in which the problem is stated, the interpretation of what is given in the situation and what is sought, an understanding of the scientific concepts involved in the solution, and the ability to perform mathematical operations if these are involved in the problem. Kahoot was reported to be effective in enhancing engagement (Ghawail & Yahia, 2022; Wang & Tahir, 2020; and Youssef, 2022), encouragement (Wang & Tahir, 2020), motivation (Wang & Tahir, 2020)' performance (María et al., 2018; Wang & Tahir, 2020; and Youssef, 2022); and interest (Wang & Tahir, 2020). Thus, the findings of this study and those of Murciano-Calles (2020) are independent and valid based on the research area explored.

Kahoot! is a practical assessment tool used in undergraduate chemistry classrooms, according to a conclusion made by Youssef (2022) in research titled "Assessing the Use of Kahoot! in an Undergraduate General Chemistry Classroom." The conditions under which the studies were conducted (Kahoot!) and the findings of Youssef's (2022) study and the current study shared similarities. Both studies used Kahoot! for a formative assessment of an undergraduate chemistry course. They both used a whole class experiment approach. Moreover, their outcome reveals that Kahoot! is an effective tool for assessing undergraduate students too. Not only is Youssef's (2022) study, but also in María et al. (2018), Kahoot! improved students' learning and grades. Moreover, another study whose findings conform with the current research is a work executed by Ghawail & Yahia (2022), who utilized a similar action research approach to examine how well the Kahoot! game works for improving cognitive performance.

Other studies similar to the current study's findings were carried out to address different goals, such as determining

the effectiveness of using online games Kahoot! to increase student motivation to learn chemistry (Sanga Lamsari Purba et al., 2019); investigating the efficacy of using the Kahoot! game in developing cognitive achievement (Ghawail & Yahia, 2022); and measuring the extent to which the student's knowledge has developed (María et al., 2018). According to Wang & Tahir (2020), the main challenges mentioned by students include technical problems such as unreliable internet connections, hard-to-read questions and answers on a projected screen, not being able to change an answer after submission, stressful time pressure for giving answers, not enough time to answer, fear of losing, and being unable to catch up if an incorrect answer had been given. Kahoot! is a free online game-based application that includes options like quizzes, discussions, and surveys that make the learning process challenging, fun, and engaging (Yürük, 2019).

Conclusion

This study monitors and assesses students' development and interest when learning the history and philosophy of chemistry. The research is a quantitative study that adopts a survey research design and a one-shot case study research design. In this pre-experimental research design, only one variable is considered. 32 enrolled undergraduate chemistry students were the participants in the study. The result reveals that Kahoot! is an effective tool for assessing students' development in learning the history and philosophy of chemistry. Moreover, the survey shows that the participants were interested in Kahoot! as a game-based student response system.

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Examining the ICT Level of Projects Done by Teachers on Social Networks in Turkey in Terms of Different Variables Example of eTwinning Activity

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Abstract

In this research, the competency of teachers using technology in eTwinning projects was evaluated in terms of different variables. The research was carried out in the causal comparison model. The research participants consisted of 42.745 projects that applied to the eTwinning quality label in Turkey in 2022. The data of the research were obtained from the evaluations of the technology used in the projects during the project evaluation process of the eTwinning National Support Organization of Turkey. The data of the research were analyzed with descriptive statistics. As a result of the research, it was found that female teachers with a quality label, teachers having international projects, teachers working with children in secondary and high school, and teachers with more project experience use technology better in their eTwinning projects. The technology competency of teachers living in the city center is similar to working in the countryside. According to these results, studies can be carried out for male teachers to improve their competency level in technology in eTwinning projects, and more incentives should be given to them to do projects; training to teachers should be given according to the school types.

Keywords: eTwinning projects, Social network, Use of technology, Teachers and technology.

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Introduction

Over the last few centuries, technological developments have changed our attitudes, behaviors, habits, leisure activities, and how we lived (Vatandaş, 2020). Moreover, with the new inventions and developments in science and technology, the cultural, economic, and all daily life have changed radically (Bacigalupo and Cachia, 2011). One of the most important tangible change has happened in the educational technologies and communication technologies. After for a while, these developments become necessary and compulsory need for human beings.

Today, educational technology integration and learning environments have gained great importance. Increasing number of complex challenges of teachers in their schools have made educational technologies and the digital spaces necessary for teachers to interact with their peers and to increase their own professional development (Hertz and Engelhardt, 2021). These technologies inevitably changed the role of teachers and they become mentors and facilitators in the lessons rather than transmitters of knowledge (Cassells et al. 2015). While using technology in education, teachers use digital platforms and materials according to student needs and the feasibility of the contents and the schools. These online learning environments offer vast and important opportunities for individuals to train themselves with the flexible and voluntary participation (Bacigalupo and Cachia, 2011).

The digital social networks create an effective e-learning opportunities for individuals by contributing to learning processes. Hereby, the European Commission tries to increase the competencies, attitudes, knowledge and skills of human being by aiming to create responsible, active, open-minded members of society through school communication and collaboration with educational technologies (Papadakis, 2016). In this respect, the school networking helps to carry out the following main objectives of the European Union (2018):

- Increasing the quality of education with more flexible learning environments,
- Creating global citizenship by promoting a culture of peace and non-violence,
- Introducing new and innovative forms of teaching and learning,
- Mobile and digital society by improving the entrepreneurial competencies,
- Maintaining the language capacity by investing in language learning,
- Appreciating cultural diversity, human rights, and gender equality,
- Focusing on inclusive education by reaching the disadvantaged regions,
- Increasing the skills of creativity, self-regulation, critical thinking, resilience, computational thinking, problem-solving, analytical skills, and the ability to cooperate,
- Carrying out extra-curricular activities in schools,
- Providing sustainable development and sustainable lifestyles,
- Motivating more young people.

By taking account of these priorities, teachers can create innovative projects in social networking platforms and learning environments by working with their colleagues. In this regard, the European Commission creates and supports the eTwinning platform as an educational, social network, and collaborative learning environment for schools that works remotely synchronously or asynchronously with internet technology (Papadakis, 2016).

eTwinning Action

eTwinning is a valuable pedagogical tool in the education system in Europe and in the partner countries aiming to provide a safe platform for teachers, schools, and users (Gilleran, 2019). Additionally, eTwinning has been a unique project in educational technology, inspiring schools and teachers (Carpenter and Tanner, 2013). It aims to improve professional skills and knowledge through structured initiatives realized onsite and online events at European, national and regional levels (Kearney and Gras-Velázquez, 2018). eTwinning not only supports teachers through its virtual learning environments with its webinars, learning events, online workshops, social media posts, MOOCs, and web tools but also provides onsite conferences, workshops, seminars, and informative meetings for the professional development of the target audience (Mouratoglou, Gilleran, and Scimeca, 2021). After all, eTwinning is a flexible space far from paperwork and bureaucracy, and it triggers innovative and enthusiastic teachers to start networking (Cassells, Gilleran, Morvan and Scimeca, 2015).

Starting in 2005, eTwinning is a 17-year-old virtual platform for schools in Europe and some neighboring countries to run online projects, which provides professional development opportunities, and to exchange best practices (Bacigalupo and Cachia, 2011). eTwinning portal is available in 34 countries as a central meeting point for schools and teachers in Europe (European Commission, 2021). eTwinning is also an opportunity for integrating ICT in education by developing and applying novel pedagogies and methodologies in real-life instruction (Kearney and Gras-Velázquez, 2018). It is incorporated into school education policies and is a fast-growing digital transformation. As of 2022, there are more than one million teachers and more than 200 thousand projects in eTwinning (MoNe, 2022).

The action is granted by the European Commission under the Erasmus+ programme and managed and sponsored by the European Education and Culture Executive Agency (Mouratoglou, Gilleran and Scimeca, 2021). At the central level, the Central Support Organization (CSS) is run by European Schoolnet and works on behalf of the European Commission (Papadakis, 2016). CSS moderates and leads the platform by supporting the representatives of other partner countries (Carpenter and Tanner, 2013). In 44 countries, the initiative is managed by the National Support Organizations (NSO) (Gilleran, 2019). NSOs provide training and user support with emails, project cards, telephone lines, and social media channels. NSO also organizes online and onsite events, campaigns, and competitions and publishes news, promotional materials, and activities at the national level (Papadakis, 2016). At National Level, in Turkey eTwinning is moderated and managed by the Turkish National Support Organization, which has worked under the Ministry of National Education General Directorate of Technologies since 2009 (MoNe, 2022).

eTwinning Projects

eTwinning is a platform for teachers and schools and provides a safe space in which the educational community can form partnerships and projects with colleagues and pupils from other European countries (Akıncı and Sağ, 2019). The ultimate aim of these projects is to create education networks and develop collaborative projects enabling teachers to use innovative teaching methods and techniques (Kearney and Gras-Velázquez, 2018). To

create an eTwinning project there should be at least two different registered schools and teachers that communicate and collaborate via the Internet (Vuorikari, 2010). It is worth to say that the schools and teachers do not get any grants in eTwinning action. Additionally, apart from the NSO validations there aren't any administrative issues.

As aforementioned, teachers implementing an eTwinning action can create projects with their project partners. When the projects have been completed, the project members make a quality label application. The National Quality Label (NQL) is given to the successful projects as an award evaluated by respective NSOs showing the quality of teachers' projects. The next level of recognition is the European Quality Label (EQL) nominated by NSOs and awarded by CSS as an acknowledgment for the work and efforts done. The highest level of recognition is the European prize nominated and chosen by NSOs, CSS, and EC among the European quality label projects (Papadakis, 2016).

The projects in eTwinning help pupils to take responsibility for their learning, increase their ICT literacy and develop communication skills in English and other languages with the online cooperative learning activities (Bacigalupo and Cachia, 2011). The project section of eTwinning is the TwinSpace platform which serves as an interactive online classroom that helps teachers learn project management, teamwork, and multidisciplinary approach and learn to use ICT tools. This section offers a forum, pages, materials, twin mail, teacher's bulletin, and chat box to the users allowed to enter this space. This virtual space is used for communication and cooperation among project partners (Vuorikari et al., 2011).

The Impact of eTwinning

As a social networking platform, eTwinning provides a safe venue for teachers to share practices with their peers and students (Kearney and Gras-Velázquez, 2018). It inspires the national education system by responding to teachers' needs, procuring opportunities and tools, and providing meaningful, effective and exciting online activities (Carpenter and Tanner, 2013). eTwinning not only contributes teachers' personal, professional and career development but also contributes two main competencies of teachers and students (Mouratoglou, Gilleran and Scimeca, 2021). The first one is language competency and the second one is the digital competency. Teachers and students are exposed to the real-life language and they gain self-confidence while connecting with their peers in the platform (Kearney and Gras-Velázquez, 2018). Therefore, it is one of the windows for language learning. The second competency is related to digital skills. eTwinning as a virtual platform tries to boost the use of technology and digital learning in educational settings (Akıncı and Sağ, 2019).

The project-based method in eTwinning makes pupils responsible for their own learning and gives chance to create new materials in cooperation with their peers (Anda and Güven, 2013). In addition to this, eTwinning increases the extrinsic motivation of teachers and pupils (Bacigalupo and Cachia, 2011). eTwinning not only provides geographic balance at national level by disseminating the pedagogy of educational technologies by providing access to all school, but also provides pre-service training for student's teachers in universities in the concept of Initial Teacher Education (ITE) by disseminating eTwinning in Universities (Mouratoglou, Gilleran and Scimeca, 2021).

The schools proving the commitment of collaboration, sharing and the teamwork in eTwinning action gets eTwinning school label (Licht, Pateraki and Scimeca, 2020). eTwinning Schools gives the opportunity to leverage school-level effect instead of simply individual level competencies. This helps to increase collaboration at schools by including school principals in teachers' work in developing a school wide approach in the eTwinning School concept. This concept helps to embed eTwinning more effectively at the level of the whole school approach (Kearney and Gras-Velázquez, 2018).

- It has a bottom-up approach with a low administrative burden, and the decisions are taken according to the needs of the target.
- It is a safe place as the NSO members endorse the registrations, and the users connect and share ideas in closed (private) specific areas.
- It not only increases students' confidence but also enables schools to collaborate.

Quality in eTwinning Projects

Each project is evaluated for recognition of the work done in the projects. eTwinning offers several opportunities, such as quality labels, eTwinning awards, and eTwinning school labels. The quality of the eTwinning project is evaluated according to the following five criteria (MoNE, 2021):

Pedagogical Innovation: This criterion measures the pedagogical innovations, creativity, originality of the project idea, and diversity of the activities.
Compliance with the Curriculum: The criteria measure whether there is a strategic effort of the project partners to integrate the curriculum and whether the students' basic skills and competencies are taken into account in the project. The project should complement some of the subjects in the school, and the interdisciplinary approach should be visible.

Cooperation between Partner Schools: This criterion measures communication and cooperation activities. There should be clear coordination strategies among teachers and cooperation among students. At the end of this cooperation, a joint product of partners should be uploaded to the system.

Use of Technology: This criterion evaluates whether the partners use the technological tools effectively or not in the project. The evaluators also check the workspace management in the TwinSpace platform and the application of EU General Data Protection Regulation (GDPR) and copyright issues.

Results, Impact, and Documentation: At the end of the project, the project's results and impact should be realized and disseminated through online media or onsite events. It is expected that the users to realize some activities like surveys or reports on the evaluation of the project. Regular planning, evaluation, reflection, and possible feedback need to be documented. The number of quality label applications and the number of awarded National Quality Label projects in the last eight years are given in Table 1.

Table 1. The Number of Quality Label Applications and The Number of National Quality Label Awarded Projects from 2015 to 2022

Years	Quality Label Applications	Awarded National Quality Labels	The Percentage of Success
2015	398	201	(%50)
2016	801	456	(%56)
2017	2.061	750	(%36)
2018	4.232	1.764	(%41)
2019	8.539	5.081	(%59)
2020	15.732	10.941	(%69)
2021	38.002	31.865	(%83)
2022	42.745	36.503	%88,5

When looking at Table 1, it can be easily seen that the number of quality label applications and the number of awarded teachers increased or nearly doubled every year. The number of 398 quality label applications in 2015 will become 41.238 in 2022. Accordingly, the 201 awarded National Quality Labels will become 36.503 in 2022. However, the success rate of the applications did not increase on a regularly and decreased in 2017 and 2018. The reason for this change is the limitation of the budget given by the European Commission, as these teachers were awarded for attending the National eTwinning Conferences. To increase the number of successful projects, the Turkish NSO had to finish this practice and this tendency in 2019.

Considering that eTwinning project applications are entirely based on an internet-based social network, teachers' use of technology is decisive in these projects. However, in a rapidly developing environment, the ICT competency level of these teachers and the effect of eTwinning in using technology in education are still ambiguous. This research has tried to determine and understand the factors that differentiate the teachers' use of technology in eTwinning projects. In this context, the teachers' gender and branch, the school's type, the geographical region of the school, the potential of teachers to have quality labels, the place (whether in the city center or not), the type of project (whether national or international), the type of task the teachers undertake in the projects, the ages of the students and the number of projects realized by a teacher are taken into account.

There were approximately eight hundred eTwinning projects in Turkey in 2015 and 398 of them have applied for the National Quality Label. By 2022, it is seen that approximately 45 thousand eTwinning projects have been made and about 41 thousand two hundred thirty-eight of them have applied for the National Quality Label. Considering that eTwinning project applications are completely based on an internet-based social network, teachers' use of technology is decisive in their effectiveness in these projects. However, it is not known which characteristics of teachers affect the competency of technology in eTwinning projects in a such rapidly changing

and developing eTwinning Project application process. The aim of the research is to reveal which variables affect teachers' technology competency in eTwinning projects.

Within this research, it has been tried to determine the factors that differentiate the teachers' use of technology. In this context, the gender of the teachers, the quality label reward of teacher, the location of school, , the type of school, the geographical region of the school, the content and the level of the projects (national or international), the type of task undertaken in the projects, the ages of students, the branches of teachers, the number of projects applied. It has been tried to determine whether the category causes differentiation in technology usage. It is thought that the results obtained from the research will contribute to increasing the technology use of teachers who make eTwinning projects and the effectiveness of eTwinning projects. At the same time, the results will contribute to the evaluation process of technology use in eTwinning projects carried out in the National Support Center in our country. In this study, within the framework of this general purpose, answers were sought to the following questions;

1. Does the use of technology of teachers in eTwinning projects differ according to their gender?
2. Does the use of technology run by teachers in eTwinning projects differ depending the city or the countryside according to the city center of the school they work in?
3. Does the number of projects having quality label make difference in the competency level of ICT?
4. Does the use of technology of teachers in eTwinning projects differ according to the type of school they work at?
5. Does the ICT competency level of teachers in eTwinning projects differ according to the geographical region of the school they work in?
6. Does the technology use of teachers in eTwinning projects differ according to the school they work in?
7. Does the ICT competency level of projects differ at the national and international levels?
8. Does the use of technology run in eTwinning projects differ according to the age of students?
9. Does the use of technology run by teachers in eTwinning differ according to the number of projects applied?
10. Does the use of technology of teachers in eTwinning projects differ according to the category they apply?

In this research, the use of technology by teachers in eTwinning projects was examined in terms of different variables. The conceptual framework of the research is shown in Figure 1.

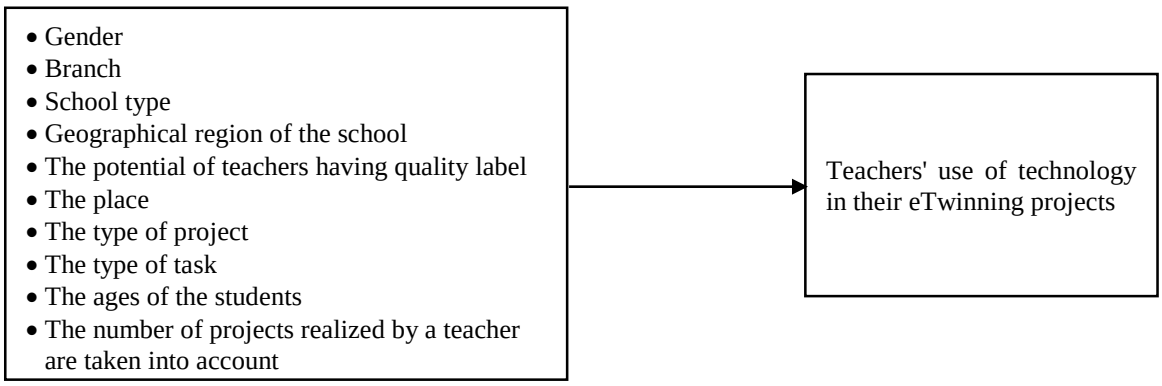

Figure 1. The Conceptual Framework of the Research

Method

Model of the Research

The research was carried out in the causal comparison model. Causal comparison studies are studies to determine the causes of an existing/naturally occurring situation or event and the variables affecting these causes or the consequences of an effect (Büyüköztürk et al., 2010). In this research, the use of technology in eTwinning projects in Turkey has been examined in terms of different variables.

Data Collection Tool

The data of the research were made according to the scoring of the applications, with the assistance of the eTwinning National Support Organization of Turkey. This scoring was made according to the scoring scale created according to the evaluation criteria determined substantially by the European Commission and the Central Support Service. In the project, it is expected that teachers use ICT tools appropriate for students'' age/level and skills to support the pedagogical goals of the project. The other expectations are; students need to take part in creating a digital product with adequate guidance from the teachers, creative use of digital tools, the use of alternative tools for the same product, the involvement of students in the tool recommendation, the ability of students to use the tools independently, sharing the images and personal information of students by the eTwinning Code of Conduct; the visible communication between students in the TwinSpace, the internet safety, produced materials for the project (video, image, music, text, etc.) coherent with the copyright licenses and the criteria for citing sources. In scoring, each item receives a score between 1 and 5, and a minimum of 10 and 50 points can be obtained from the scale. The Cronbach Alpha reliability coefficient of the scale was calculated as 0.94.

Data Collection

Data was taken from eTwinning Turkish National Support Organization (NSO), and the external evaluator evaluated the projects. The external project evaluators were selected according to specific criteria in 2018. The external project evaluators work entirely voluntarily. Therefore, they have no right to demand any expectations and privileges. The selection of external evaluators needs to have the following criteria;

- Having European Quality Label in the last three years,
- Having participated successfully in face-to-face training given by the NSO,
- Having attended the training given by the NSO on project evaluation,
- Having the ability to work compatibly,
- Having information on using technology,
- Knowing project-based learning,
- Having sufficient foreign language knowledge skills,
- Being responsible and devoted to the action,
- Agreeing to work voluntarily, with confidentiality and flexibility the project evaluation calendar,
- Proving to evaluate the projects in terms of scoring and explanations

In the evaluation process, as a requirement of a sustainable policy, the NSO tries to continue to work with experienced external evaluators. That is to say, and for the objectivity of evaluation, the evaluation process is continued with people whose evaluation scores are close to the ideal score. The evaluators complete the project evaluation process meticulously by paying attention to time management. Apart from the online training organized at regular intervals, at least two face-to-face training are held per year with evaluators.

In training, examples of projects that can be described as excellent and poor quality are delivered to the evaluators, and it is expected to reach the perfect scores. The results of the projects are discussed internally. This workshop training continues until the standard scores are attained. Moreover, NSO creates a group of these project evaluators. And the evaluators are supplemented according to the number of applications. The project evaluation team is assigned each year with the ministry's approval.

In addition, each project evaluator logs in to their evaluations through the TURNA program using their Turkish ID number and a password. In this manner, they are held responsible for the scoring they give. In the evaluation, made by taking these measures, a total of 45 projects, 15 of which are among the examples of projects that can be described as good, medium, and bad, are scored by all evaluators. In this scoring, the correlation between raters was calculated as 0.87. The data in this article were taken from the results and scores of the external evaluators described above.

Analysis of Data

Following the purpose of the research, some assumptions were checked before the analyzes were carried out. In the first step, the distribution of ICT competency level scores was checked. The skewness and kurtosis coefficients in the range of ±1 indicate that the scores have a normal distribution (Tabachnick and Fidell, 2013). The calculated skewness and kurtosis coefficients are within the specified range (Table 2). This result indicated that the ICT competency level scores had a normal distribution.

Table 2. The Skewness and Kurtosis Coefficients

Variables	Skewness		Kurtosis	
	z	SH	z	SH
ICT competency level scores	-0,746	0,19	0,736	0,37

Independent groups t-test was applied to compare ICT competency level scores according to two-category variables (gender, etc.). One-way analysis of variance was applied to compare ICT competency level scores according to variables (school type, etc.) with more than two categories. Levene's F test was used to test the homogeneity of variances. Hochberg's GT2 statistics, one of the multiple comparison tests used in case the variances are equal, is a post-hoc type. Analyzes were performed using SPSS 24.0 statistical package program.

The effect power of the significant difference according to the variables was calculated. Expresses the strength of the relationship between the predictive and predicted variables; indicates how much of the variance in the

predicted variable is explained by the independent variable. Techniques used to calculate impact power: 1. Cohen's d: It is calculated by dividing the difference between the means by the standard deviation. T-test and ANOVA use this technique. In Cohen d, .20 is considered low potency, .50 average potency, .80 and above are considered high potency. 2. Eta-square (η^2): It shows how much of the variance in the dependent variable is explained by a particular independent variable. T-test uses this technique. At η^2 value, .02 low potency, .13 average potency, and .26 and above are considered high potency (Cohen, 1992).

Results

In the research's first sub-problem, the answer of the question "Does the use of technology of teachers in eTwinning projects differ according to their gender?" has been sought. Data related to this question are shown in Table 3.

Table 3. Comparison of the ICT Competency Level of Teachers with the Gender of Teachers

Gender	N	M	Sd	t	df	p	Cohen d
Woman	34249	36,24	10,179	19,635	41743	0,000	0,256
Man	7496	33,64	11,331				

As seen in Table 3, teachers' use of technology in eTwinning projects differs significantly by gender (t=19,635, p<0,001). When the data are examined, it is seen that the mean score of technology use by female teachers (x= 36,24) is higher than the mean score of male teachers (x= 33,64). Accordingly, it can be said that female teachers use technology better in eTwinning projects. The Cohen d effect size value calculated to determine the size of the difference is 0.25, which indicates a moderate difference in the level of technology use in the projects of male and female teachers.

In the second sub-problem of the research, the answer of the question "Does the use of technology run by teachers in eTwinning projects differ depending the city or the countryside according to the city center of the school they work in?" has been sought. Data related to this question are shown in Table 4.

Table 4. Comparison of the ICT Competency Level of Projects with the Teachers' Location

City or Countryside	N	M	Sd	t	df	p
City	25627	35,82	10,518	1,145	41718	0,252
Countryside	16093	35,70	10,325			

As seen in Table 4, the place of the school does not make any difference in using technology in eTwinning (t=1,145, p>0,001). That is to say, the ICT competency level has nothing to do with the place. In other words,

there is no significant difference in the level of technology usage among teachers working in city center or rural schools in eTwinning projects.

In the third sub-problem of the research, the answer of the question "Does the number of projects having quality labels make a difference in the competency level of ICT?" has been sought. Data related to this question are shown in Table 5.

Table 5. Comparison of the ICT Competency Level of Projects with Teachers Having Quality Label Status

Result	N	M	Sd	t	df	p	Cohen's d
Awarded Winners	32508	38,96	7,465	142,443	41743	0,000	0.95
Losers	9237	24,57	11,641				

As seen in Table 5, teachers' use of technology in eTwinning projects differs significantly ($p<0,001$) according to teachers' quality labels. When the data are examined, it is seen that the average score of the teachers having quality label ($x= 38.96$) is higher than the average score of teachers who have not ($x= 24,57$). Accordingly, it can be said that teachers who receive the quality label use technology better in their eTwinning projects. The Cohen d effect size value calculated to determine the size of the difference is 0.95, which indicates that there is an above difference in the level of using technology in the projects of male and female teachers.

The answer of the question "Does the use of technology of teachers in eTwinning projects differ according to the type of school they work at?" has been sought in the fourth sub-problem of the research. Data related to this question are shown in Table 6.

Table 6. Data on Teachers' Use of Technology in eTwinning Projects According to the Type of School

	Sum of Squares	df	Mean of Squares	F	p	η^2
Between Groups	124858,099	19	6571,479	61,932	,000	,027
Within Groups	4427320,734	41725	106,107			
Total	4552178,833	41744				

As seen in Table 6, when the data on the use of technology in eTwinning projects according to the type of school teachers working are examined. It is seen that there is a significant difference in the scores of technology use according to the type of school. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed. The η^2 effect size value calculated to determine the size of the difference is 0.027, indicating a moderate difference in the level of technology use in different school types of projects. The data obtained are shown in Table 7.

Table 7. Comparison of the ICT Competency Level of Teachers with the Type of School

	Type of School	N	M	Sd	Difference
1	Anatolian Imam Hatip High Schools	1315	37,66	9,48	2-3-10-5-8-9-13-15-7-14
2	Secondary Schools	7857	37,07	9,57	2-7-5-13-8-9-10-14
3	Science and Art Education Centers (BİLSEM)	719	35,76	10,98	12-8-13-14
4	Special Education Schools	93	35,38	11,08	14
5	Kindergartens	5167	34,67	10,50	13-14
6	Primary Schools	17621	34,53	10,95	13-14
7	Imam Hatip Secondary Schools	1273	34,34	10,78	13-14
8	Vocational Technical and Anatolian High Schools	2043	33,87	11,28	13-14
9	Regional Boarding Schools	106	33,77	11,33	14
10	Science High Schools	617	33,76	11,95	14
11	Anatolian High Schools	2978	33,19	11,37	14
12	Multi-Program High Schools	282	32,70	12,16	
13	Social Sciences High Schools	776	31,96	11,56	
14	Private Schools	229	27,73	12,91	

When Table 7 is examined, it can be said that the use of technology in eTwinning projects of teachers working in Anatolian Imam Hatip High Schools and Secondary Schools and BİLSEM is better, and the use of technology in eTwinning projects of teachers working in other school types are similar.

In the fifth sub-problem of the research, the answer of the question "Does the ICT competency level of teachers in eTwinning projects differ according to the geographical region of the school they work in?" has been sought. Data related to this question are shown in Table 8.

Table 8. Comparison of the ICT Competency Level of Projects with The Geographic Region of the School

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	6570,900	6	1095,150	10,069	,000	,001
Within Groups	4527865,001	41630	108,764			
Total	4534435,901	41636				

As seen in Table 8, when the competency level of ICT use in eTwinning projects compared with the geographical region of the school where the teachers work, it is seen that there is a significant difference in the technology use scores when regions are compared. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed. The η^2 effect size value calculated to determine the size of the difference is 0,001, which indicates a small difference in the level of technology use in different projects of different regions. The data obtained are presented in Table 9.

Table 9. Comparison of the ICT Competency Level with The Regions

N.	Regions	N	M	Sd	Difference
1	Marmara Region	9494	36,14	10,634	1-2-3-4-56>7
2	Aegean Region	4583	35,78	10,400	
3	Mediterranean Region	6911	35,99	10,046	
4	Central Anatolian Region	9789	35,70	10,322	
5	Black Sea Region	5162	35,86	10,539	
6	Eastern Anatolian Region	2627	35,64	10,538	
7	Southeast Anatolian Region	3071	34,52	10,736	

When Table 9 is examined, according to Hochberg's GT2 analysis results, it can be said that the use of technology in eTwinning projects of teachers working in Marmara, Aegean, Mediterranean, Central Anatolian and Black Sea Regions is better than teachers working in the Southeast Region.

In the sixth sub-problem of the research, the answer of the question "Does the technology use of teachers in eTwinning projects differ according to the school they work in?" has been sought. Data related to this question are shown in Table 10.

Table 10. Comparison of the ICT Competency Level with the Place of Schools

	Sum of Squares	df	Mean Square	F	p	η^2
Between Groups	41900,844	79	530,390	4,900	,000	,009
Within Groups	4510277,989	41665	108,251			
Total	4552178,833	41744				

As seen in Table 10, when the data on the use of technology in eTwinning projects are examined according to the school where teachers work, it is seen that there is a significant difference in technology use scores according to school type. The η^2 effect size value calculated to determine the size of the difference is 0,009, which indicates that there is a small difference in the level of using technology in the projects of the place of school. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed.

Table 11. Comparison of the ICT Competency Levels of Teachers in the Cities of Turkey

Provincial Traffic Code	N	M	Sd	Provincial Traffic Code	N	M	Sd
Sinop	121	38,84	9,054	İstanbul	4333	36,11	10,767
Bolu	170	38,47	10,321	Aksaray	193	35,96	10,012
Tunceli	58	38,10	7,599	Manisa	494	35,95	11,260
Kilis	46	37,83	7,576	Yozgat	148	35,95	11,056
Giresun	245	37,31	9,586	Balıkesir	727	35,93	10,038
Çorum	400	37,15	10,180	Uşak	125	35,92	9,845
Osmaniye	235	37,15	9,782	Yalova	154	35,91	11,525
Muğla	709	37,08	9,332	Ankara	3723	35,82	10,144
Mersin	2433	36,82	9,958	Mardin	203	35,76	9,270
Batman	139	36,76	9,796	Ağrı	127	35,75	10,655
Bitlis	149	36,64	10,108	Denizli	654	35,75	10,188
Sivas	488	36,64	10,558	İzmir	1456	35,65	10,661
Bursa	1931	36,62	10,144	Zonguldak	492	35,63	10,897
Edirne	183	36,61	10,456	Adana	942	35,62	10,298
Çanakkale	317	36,53	10,582	Adıyaman	158	35,57	11,371
Elazığ	290	36,52	10,715	Gaziantep	1116	35,56	10,944
Nevşehir	212	36,42	9,947	Sakarya	670	35,54	10,697
Koceli	1087	36,41	10,763	Hatay	888	35,52	10,037
Erzurum	826	36,38	10,011	Niğde	198	35,51	10,922
Malatya	337	36,35	10,295	Kayseri	622	35,45	10,138
Afyon	280	36,32	10,285	Kastamonu	136	35,37	11,669
Bilecik	148	36,28	10,772	Aydın	642	35,33	10,464
Ordu	1241	36,28	9,870	Erzincan	873	35,32	11,208
Trabzon	420	36,24	10,930	Bingöl	153	35,29	8,034
Antalya	1460	36,22	9,987	Konya	1982	35,28	10,413
Karaman	215	35,21	10,085	Burdur	275	34,47	10,072
Tekirdağ	480	35,10	10,754	Gümüşhane	18	34,44	7,838
Iğdır	83	35,06	11,410	K.Maraş	270	34,33	10,135
Kırşehir	87	34,71	12,280	Düzce	254	34,17	10,776
Kitahya	503	34,71	10,384	Amasya	212	33,96	10,366
Karabük	89	34,61	11,287	Artvin	143	33,92	10,683
Van	150	34,60	9,737	Ardahan	18	33,89	6,978
Kırklareli	436	34,50	10,827	Isparta	408	33,63	9,616
Rize	148	33,58	11,369	Bayburt	75	32,67	7,769
Tokat	254	33,54	11,178	Şanlıurfa	493	32,64	10,799
Şırnak	264	33,48	10,354	Siirt	47	32,13	11,409
Diyarbakır	605	33,29	10,700	Hakkari	20	31,50	13,089
Bartın	80	33,00	11,518	Kırıkkale	89	30,11	12,200
Muş	75	32,80	12,254	Kars	57	29,12	11,539
Samsun	744	36,20	10,977				

When Table 11 is examined, it is seen that the ICT competency level of teachers working in the cities of Sinop, Bolu, Tunceli, Kilis, Giresun, Çorum, Osmaniye, Muğla, Mersin, Batman, use technology is quite high. However, the cities of Kars, Kırıkkale, Hakkâri, Siirt, Şanlıurfa, Bayburt, Isparta, Ardahan, Artvin, Amasya and Düzce are quite low and they are behind the group.

In the seventh sub-problem of the research, the answer of the question "Does the ICT competency level of projects differ at the national and international level?" has been sought. Data related to this question are shown in Table 12.

Table 12. Comparison of the ICT Competency Level of Projects with the Type of Project

National / International	N	M	Sd	t	df	p	Cohen's d
National	16703	33,62	10,165	-34,912	41743	0,000	0,35
International	25042	37,21	10,379				

As seen in Table 12, teachers' use of technology in eTwinning projects differs significantly according to their national or international level (t=- 34,912, p<0.001). When the data is examined, it is seen that the average technology usage score of the teachers carrying out their projects at international level (x= 37,21) is higher than the projects at National level (x=33,62). Accordingly, it can be said that the use of technology in eTwinning projects run by teachers who carry out international projects have higher ICT competency. The η2d effect size value calculated to determine the size of the difference is 0.35, which indicates that there is a difference in the level of using technology in the projects of national and international projects.

In the eighth sub-problem of the research, the answer of the question "Does the use of technology run by teachers differ according to the type of task they take in the projects?" has been sought. Data related to this question are shown in Table 13.

Table 13. Comparison of the Competency Level of Teachers with the Type of Task They Are Doing in Projects

	Sum of Squares	df	Mean Square	F	p	η^2
Between Groups	15755,540	2	7877,770	72,487	,000	,003
Within Groups	4536423,294	41742	108,678			
Total	4552178,833	41744				

Teachers can take part in projects as founders, managers or members. As can be seen in Table 12, when the data on the use of technology in eTwinning projects are examined according to the type of task that the teachers take in the projects, it is seen that there is a significant difference in the scores. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed. The η^2 effect size value calculated to determine the size of the difference is 0,003, which indicates that there is a small difference in the level of using technology in the projects of type of task. The data obtained are presented in Table 14.

Table 14. Comparison of the competency level of teachers with the type of task they are handling

Task Type in Project	N	M	Sd	Difference
1 Founder	10065	34,70	10,972	2>1-3
2 Member	30453	36,14	10,219	
3 Administer	1227	35,50	10,874	

When Table 13 is examined, it can be said that the ICT level of members in the projects is better than the founders and managers. In the research's eighth sub-problem, the answer of the question "Does the use of technology run

in eTwinning projects differ according to the age of students?" has been sought. Data related to this question are shown in Table 14.

Table 14. Comparison of the ICT Competency Level of Teachers with the Students Ages

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	112344,491	4	28086,123	264,883	,000	,025
Within Groups	4394193,695	41442	106,032			
Total	4506538,186	41446				

As seen in Table 14, when the data on the use of technology in eTwinning projects are examined, it is seen that there is a significant difference (p<0,000) in the ages of students. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed. The η^2 effect size value calculated to determine the size of the difference is 0.025, indicating a moderate difference in the level of technology use in projects of different ages. The data obtained are shown in Table 15.

Table 15. Comparison of the ICT Competency Level of Projects with the Students' Ages

Ages of Students	N	M	Sd	Difference
1) 12-15	9310	37,76	9,404	2-3-4-5
2) 16-19	6581	36,68	9,873	3-4-5
3) 0-6	8546	34,15	11,013	
4) 7-11	16434	33,30	11,426	
5) Not Specified	576	34,84	9,192	

When Table 15 is examined, it can be said that the use of technology in eTwinning projects of teachers working in the 12-15 and 16-19 age groups are better than the students in other age groups.

In the ninth sub-problem of the research, "Does the use of technology by teachers in eTwinning projects differ according to their fields?" The answer of the question has been sought. Data related to this question are shown in Table 16.

Table 16: Data on Teachers' Use of Technology in eTwinning Projects by Field

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	201802,684	16	11211,260	107,451	,000	0,045
Within Groups	4324204,740	41444	104,338			
Total	4526007,423	41462				

As seen in Table 16, when the data on the use of technology in eTwinning projects of teachers according to their fields are examined, it is seen that there is a significant difference (p<0,000) in technology use scores according to school type. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed.

The η^2 effect size value calculated to determine the size of the difference is 0.045, which indicates that there is a moderate difference in the level of using technology in the projects of projects by field. The data obtained are presented in Table 16.

Table 17. Comparison of the ICT Competency Levels with the Branches of Teachers

Lessons	N	M	Sd
Pre-Primary	8478	37,98	9,314
Class	12783	37,12	9,445
Special Education	761	35,65	10,9
Technology Design	555	35,48	10,21
Vocational High School (Occupational Courses)	539	35,27	10,876
Secondary Education Mathematics	962	35,21	10,854
Religion Culture	598	35,12	10,637
Psychological Consult. and Guide.	1166	34,91	10,147
Foreign Language	6866	34,79	11,17
Mathematics (in Elementary Schools)	401	34,71	11,044
Science	1680	34,56	10,601
Information Technologies	782	34,39	10,892
Turkish	1028	34,27	10,205
Visual Arts	349	34,18	10,76
Turkish Language and Literature	589	34,18	10,811
Social Science	340	34	10,582
Physical Education	241	32,7	10,675
Total	41463	35,78	10,448

As seen in Table 17, the use of technology in the eTwinning projects of pre-school teachers, classroom teachers, special education teachers, and technology and design teachers is better than teachers of visual arts, Turkish language, social sciences, and physical education teachers.

In the tenth sub-problem of the research, the answer of the question "Does the use of technology run by teachers in eTwinning differs according to the number of the projects applied?" has been sought. Data related to this question are shown in Table 18.

Table 18. Comparison of the ICT Competency Level with the Number of Projects Done

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	70091,534	6	11681,922	108,784	,000	,015
Within Groups	4482087,299	41738	107,386			
Total	4552178,833	41744				

As seen in Table 18, when the data on the use of technology in eTwinning projects are examined, the significant difference (p<0,000) can be easily seen. The more project a teacher makes, the more successful the project gets. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed. The η^2 effect size

value calculated to determine the size of the difference is 0.015, which indicates that there is a small difference in the level of using technology in the projects in the projects done. The data obtained are presented in Table 19.

Table 19. Comparison of the ICT Competency Level of Teachers with the Number of Projects Run

Project Numbers	N	M	Sd	Difference
1) 1-5	17841	34,68	10,551	
2) 6-10	4628	35,05	10,724	
3) 11-15	4999	36,15	10,242	
4) 16-20	3015	36,22	10,315	
5) 21-30	5440	37,51	9,920	1-2-3-4-7
6) 31<	4201	38,36	9,603	1-2-3-4-5-7
7) Not specified	1621	35,41	11,007	
Total	41745	35,77	10,443	

As seen in Table 19, the projects of the teachers who have scored 21 or more projects is better in ICT than the teachers who have done 20 or less projects.

Teachers in Turkey can apply for special category prizes at National level for years. The special category prizes in 2022 were: The Theme Category (The New European Bauhaus), Accessible eTwinning, Vocational and Technical Education Category, Disabled Category, STEM Category, Primary Education Category (for the disadvantaged groups), and Innovation and Entrepreneurship categories. In the eleventh sub-problem of the research, the answer of the question “Does the use of technology of teachers in eTwinning projects differ according to the category they apply?" has been sought. Data related to this question are shown in Table 20.

Table 20. Comparison of the ICT Competency Level of Teachers with the Special Category Applied

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	151879,465	7	21697,066	205,802	,000	0,033
Within Groups	4400097,001	41736	105,427			
Total	4551976,466	41743				

As it can be seen in Table 20, when the data on the use of technology in eTwinning projects according to the special category to which the teachers applied are examined, it is seen that there is a significant difference ($p<0,000$) in the technology use scores according to the category they apply. To understand the source of the difference, Hochberg's GT2 from Post-hoc tests was performed. The η^2 effect size value calculated to determine

the size of the difference is 0.033, which indicates that there is a moderate difference in the level of using technology in the projects of Teachers with the Special Category Applied. The data obtained are presented in Table 21.

Table 21. Data on Teachers' Use of Technology in eTwinning Projects by Category to which They Apply

National Special Category Prizes	N	M	Sd	Difference
1) The Theme Category (The New European Bauhaus)	1907	39,60	8,537	6-7-8
2) Disabled Category	749	38,25	9,002	8
3) eTwinning Türkiye Special Category Prize of 2022	113	45,93	6,766	1-2-4-5-6-7-8
4) Vocational and Technical Education Category	280	36,18	11,106	
5) STEM Category	791	40,61	8,397	2-4-6-7-8
6) Primary Education Category	7081	38,33	8,813	
7) Innovation and Entrepreneurship Category	971	37,77	9,805	8
8) Not Specified	29852	34,63	10,769	
Total	41744	35,77	10,443	

As seen in Table 21, the teachers who applied from the eTwinning Turkey Special Award 2022 Theme category; The teachers who applied from the STEM category won the Barrier-Free eTwinning, Vocational and Technical Education, Basic Education and Turkey Special Award of the Innovation and Entrepreneurship Category. It is seen that the teachers applying for the 2022 Theme Category and The New European Bauhaus category are better than the teachers applying for the Basic Education and Turkey Special Award Innovation and Entrepreneurship Category.

Discussion

At the end of the research, it was determined that female teachers use technology better in eTwinning projects. Hakkâri, Atalar, and Tüysüz (2015) stated in their research that gender has no effect on the use of information and communication technology. The findings of the study of Gerçek et al. (2006) also support this. Birgin et al. (2010), Summak et al., (2010); Menzi et al., (2012) stated in their studies that male teacher candidates have higher technology use skills than female teacher candidates. In addition, it has been stated in many studies that teacher candidates' attitudes towards technology do not differ when gender is taken into account (Karasakaloğlu et al., 2011; Çetin and Güngör, 2014). In contrast, Kaplan et al. (2013) stated that female teachers have higher scores in using information technologies than male teachers. Erdemir et al. (2009) also found that female teacher candidates

were at a better level than male teacher candidates in their self-confidence in using technology for teaching purposes. Studies show that male and female teachers have different results in their technology skills. However, it can be said that female teachers are better than male teachers in terms of technology proficiency in eTwinning projects.

In the research, it is tried to compare teachers' ICT competency level of teachers working in the city and in the countryside. Atalay and Anagün (2014) stated in their research that the use of technology in rural areas increases the motivation of teachers. In addition, Atalay and Anagün (2014) stated that six of the classroom teachers working in rural areas express themselves as competent, three of them expressed themselves as moderately competent and two of them expressed themselves as not competent. However, in this study, it was determined that teacher's residence (living in the city center or in the countryside) do not affect the ICT competency of teachers in eTwinning projects. According to the results of the research conducted by Kearney and Gras-Velázquez (2015) with 6.000 eTwinning teachers, it is stated that eTwinning is effective in the context of equal opportunity in education for schools in disadvantaged regions. Avcı (2021), in his qualitative study done to 20 students, similar to other studies, found that eTwinning activities improve the technology skills of teachers working in different settlements, provides equal opportunities for teachers in education, and brings teachers and students together from different socio-economic situations. Demir and Kayaoğlu (2021), in their study with 11 high school students from Turkey and 23 students from Azerbaijan, and 2 teachers, concluded that eTwinning activity increased students' ICT proficiency and cross-cultural awareness. At the same time, it was stated in this research that eTwinning activity provides equal opportunities in terms of giving the opportunity to cooperate with schools in regions with low economic level. Accordingly, teachers can use technology effectively with eTwinning projects wherever they work. It can be said that eTwinning projects also enable the use of technology in rural areas, thus contributing to the provision of equal opportunities and access in education.

According to the results of this research, it can be said that the teachers receiving a quality label beforehand can use technology better in their eTwinning projects. Projects that have received the quality label are projects that contribute greatly to the development of students. Projects are highly integrated with curricula and they support the development of creativity and innovation skills. A teacher can only receive a quality label in a project if he gets more than seventeen points in eTwinning projects (MoNE, 2022). Before these criteria, there are some essential requirements for a project to be evaluated. The project created by teachers needs to be visible in the pages of the TwinSpace platform which functions as a virtual classroom. The project needs to be created in the last two years and the number of Turkish teachers in a project needs to be 10 or less. The teachers' individual contribution needs to be noticeable and the quality label application forum needs to be original. So, copy pasting documents are not accepted during the evaluation process. Together with these requirements, the teachers in the project need to have common goals and plans in the project. In this research, it was observed that the teachers who received the quality label by getting high scores from these criteria also used technology in their projects better.

As a result of the interviews done to 470 teachers in Bursa during the 2020-2021 academic year by Başar et al. (2021), it was seen that teachers who received the quality label on eTwinning platform have a high awareness of

media literacy and e-security process. In this study, it was also observed that the eTwinning activity increased the motivation of the students and the students participate more actively in the education process. In addition to this, Çetin and Gündoğdu (2022) realized a research with 10 successful teachers who have received the eTwinning quality label. The outcomes of the research were; teachers learned many innovative teaching approaches like 6 thinking hats technique, gaming and gamification-based learning, critical thinking, blended learning, cooperative learning, interdisciplinary learning, problem-solving and inquiry-based learning. With these techniques teachers improved their professional skills and increased their motivation as teachers show dedication to be in events and do not hesitate to be in activities.

In the frame of the research, the ICT competency of teachers working in kindergartens, primary schools, science and art education centers (BİLSEM), special education schools, Anatolian imam hatip high schools, secondary schools, imam hatip secondary schools, vocational technical and Anatolian high schools, regional boarding schools, science high schools, Anatolian high schools, multi-program high schools, social sciences high schools and private schools have been examined. As a result of the research, it was seen that teachers working in Anatolian Imam Hatip High Schools and Secondary Schools and BİLSEMs and special education schools use technology better in eTwinning projects than other schools in the list. Contrary to the outcome of this research, the research done by Çelik (2019) states that teachers working in high schools have higher technology literacy than teachers working in primary schools. Additionally, in the study of Çobanoğlu (2018), a significant difference has been reached in favor of primary school teachers regarding the use of technology in the lesson between teachers working in primary school and teachers working in secondary schools. Regarding the research done, as aforementioned, in terms of technology use in eTwinning projects, it is seen that teachers working in kindergarten, primary schools, BİLSEMs and Special Education Schools are better.

According to the research findings, it can be said that the use of technology in the eTwinning projects of the teachers working in the Marmara, Aegean, Mediterranean, Central Anatolia and Black Sea Regions is better than in the Southeast Anatolian Region. However, it can be said that the use of technology in eTwinning projects is similar in many regions of Turkey. These outcomes show that the location of teacher does not affect teachers' ICT competency level. However, it has been observed that teachers' use of technology in eTwinning projects differs according to the cities. Teachers working in the cities of Sinop, Bolu, Tunceli, Kilis, Giresun, Çorum, Osmaniye, Muğla, Mersin, Batman, use technology better in their eTwinning projects than Kars, Hakkari, Siirt, Sanlıurfa, Bayburt. Isparta, Ardahan and Artvin. It has been observed that the use of technology in eTwinning projects of teachers working in Amasya and Düzce cities are behind the group.

According to the results of the research, it is seen that the use of technology by the teachers making their projects at international level is better than the use of technology by the teachers who make projects at the national level. According to Gezgin and Çabuk (2021), eTwinning action has many contributions to teachers and students. The benefits can be interpreted as; teachers can share their experiences with their peers, develop their digital literacy skills and participate in national and international trainings for the work they do (Kearney and Gras-Velázquez 2015).

eTwinning, a network for teachers, aims to contribute to the increase of knowledge and skills of teachers and students through regional, national and international communication and cooperation by increasing the quality of their professional education (Bozdağ, 2017). Today, digital technologies are developing rapidly and the eTwinning activity, a social teacher network, updates teachers in terms of integration into education and increases the motivation of both teachers and students thanks to interactive web 2.0 tools (Gezgin and Çabuk, 2021). In their research, Erdem et al. (2021) concluded that teachers involved in eTwinning activities follow national and international innovations, get inspiration from the best practice examples. Hereby, they emphasize that this platform is extremely important for increasing the quality of education. In their research, F. Yılmaz (2012) and S. A. Yılmaz (2012) stated that with the eTwinning platform, teachers had the chance to get to know different cultures, cooperate with teachers in that country and thus contribute to their foreign language development. Another research was conducted by Bozdağ. Bozdağ emphasized that the projects included in the eTwinning activity are an important tool for technology integration in education (2017). In this way, students increase their digital literacy skills and communicate with their peers from various countries, get awareness of cultural diversity and increase their foreign language skills.

According to the data obtained from the research, it can be said that the teachers registered as member in the project use technology in eTwinning projects better than teachers who are founders and managers in the project group. When looked at the branches of teachers in terms of using technology in eTwinning, it is seen that the projects of pre-school, technology and design, classroom level and special education, use technology better than the teachers in branches of Visual arts, Turkish Language & Literature, Social Sciences and Physical Education. According to the student group where the teachers work, it is seen that the ICT competency level of teachers working with students in the 12-15 and 16-19 age groups are better than the other age groups.

When looked at the competency level of teachers in the projects, it is seen that teachers who have done 21 or more projects are better in using ICT than the teachers who have done 20 or less projects. Thanks to the projects carried out, students get to know their identities better, increase their confidence in their own abilities and foster the national and international citizenship perceptions (Gilleran, 2019). In eTwinning, it is expected that the teachers find partners by creating projects, share ideas by forming groups, use innovative teaching techniques with their students and interact with other schools and teachers at the national or international level (Avcı, 2021). During the project work, both teachers and students hold online meetings among themselves. At this point, the expected action from teachers and students in eTwinning projects is to carry out the studies they have planned with their partners in cooperation (Paz-Albo and Hervás, 2017).

The teachers who applied to the Turkish National Special Award get also some awards at National level. The teachers who applied to the STEM category, receive the Barrier-Free eTwinning, Vocational and Technical Education, Basic Education and Turkish Special Award from the Innovation and Entrepreneurship Category. It is seen that the teachers applying from the 2022 Theme Category and The New European Bauhaus category use technology better than the teachers applying from the Basic Education category and Turkish Special Award Innovation and Entrepreneurship Category award.

While some characteristics of teachers affect the use of technology in eTwinning projects, eTwinning project processes also affect the teachers' use of technology. Memişoğlu and Broutin (2018), Akıncı and Sağ's (2019) emphasize that eTwinning project applications contribute to students' foreign language skills, increase students' socialization and communication competencies, improve themselves in the use of web 2.0 tools, increase the motivation of students and increase their attendance rate, and it was also noted that the materials they produce in foreign languages contribute to the development of media literacy skills. In the social network analysis Ulutan (2020) made within the scope of eTwinning activity, states that the eTwinning activity facilitates the cooperation between teachers in different countries in Europe. It enables schools to find project partners to create projects, inspire teachers with good project practices and ideas, and support teachers' professional development. The analysis also states that it creates an environment where teachers and students can work together. In the research conducted by Başaran et al. (2020) done to 24 teachers, it was concluded that the eTwinning activity affected positively the professional development of teachers. There were also other outcomes of this research. Considering the other findings in this study; It has been concluded that the eTwinning portal increases teachers' professional competence, teachers can closely follow technology and innovation, teachers develop a sense of belonging to their schools and classes, teachers improve their creativity. And the platform increases teachers' motivation by providing information sharing among teachers. The platform also triggers the emotional intelligence and academic success of the students with the eTwinning projects

In the study conducted by Çevik et al. (2021) with 50 gifted children studying at Science and Art Centers, it was observed that students' ICT competency and academic success increased significantly. E. Demir (2021) and M. Demir (2021) stated in their research that eTwinning projects are a guide for teachers' professional development. In their study, Gezgin and Çabuk (2021), on the other hand, described the creation process of a project in the eTwinning activity and stated that the activity contributed to the education and training process on cooperation, interdisciplinary learning, media literacy, harmony with the curriculum, technology integration and critical skills. In Yılmaz's (2022) master's thesis, researching eTwinning schools in 6 schools, it was concluded that the eTwinning platform creates a technology-rich learning environment for teachers and students, enables more digital applications to be used in classrooms and develops students' creative skills and digital competencies.

Conclusion

At the end of the research, it was determined that female teachers use technology better in eTwinning projects. In the research, it is tried to compare teachers' ICT competency level of teachers working in the city and in the countryside. It is understood that teachers receiving quality label beforehand can use technology better. Additionally, teachers working in Anatolian Imam Hatip High Schools and Secondary Schools and BİLSEMs and special education schools use technology better in eTwinning projects than other schools. According to the results of the research, it is seen that the ICT competency level the teachers making projects at an international level is better than the use of technology when compared with the teachers having projects at national level. Add to these, teachers registered as a member in the project use technology in eTwinning projects better than teachers who are founders and managers in the project group. When looked at the level of students, it is seen that the ICT competency level of teachers working with students in the 12-15 and 16-19 age groups is better than the other age

groups. Furthermore, the competency level of teachers having 21 or more projects are better in using ICT than the teachers who have done 20 or less projects. While some characteristics of teachers affect the use of technology in eTwinning projects, eTwinning project processes also affect the teachers' use of technology.

Recommendations

According to the results of the research, support for the development of technology competency level of male teachers should be increased. Technology usage skills of teachers working in high school and private schools should be developed. The motivation of teachers in the international projects should be increased and the international projects should be encouraged in eTwinning projects. It should be ensured that the founders and managers in the projects use technology better and they are more involved in the process of projects. Though the competency level of students in the younger age group may not be very developed, the technology use skills of teachers working in this age group should be increased and the use of technology should be supported in projects realized in these age groups. As the number of projects done by teachers increases, the use of technology in projects also increases. For this reason, teachers should be supported to increase the number of projects they realized.

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