ATTITUDES, PROBLEMS AND SUGGESTIONS OF PRIMARY SCHOOL TEACHERS TOWARDS THE USE OF STEM IN THE CLASSROOM.

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Abstract

This study aims to understand primary school teachers' perceptions of the potential use of STEM education. It expresses teachers' attitudes towards science, technology, engineering and technology (STEM) before and after the implementation of STEM education and the contribution of STEM to students and teachers, also writes about the difficulties that teachers face when applying STEM in the classroom and the reasons for this difficulty. In addition, solutions to the problems regarding the adoption of STEM in education are also described. Quantitative methodology and random sampling technique used for description of this research study. As a result of descriptive statistics shown that, teachers had a very positive attitude toward S.T.E.M. education. However, teachers seem concerned about implementing these structures in the classroom and are willing to participate in related workshops. Overall, the results of this study are consistent with those of international literature and are expected to raise awareness of the relevant departments of the Ministry of Education.

Key words: *STEM education, attitude, implementation, workshop, teacher, school*

1. INTRODUCTION

Many studies have shown that students learn more effectively when they use a variety of teaching methods during their studies. To this end, there is a growing need to strengthen education in schools and universities using technology and information technology (ICT) tools that provide new teaching methods and improve the quality of education provided (Bell & Fogler, 1995). Science, Technology, Engineering, and Technology (STEM) education is critical to students' education and begins very early, in preschool age. A small amount of research has been done worldwide on educational robotics in primary education. Most of them relate to secondary and vocational education. Additionally, studies examining educators' attitudes and perceptions of the use of robotic technology in primary education are limited.

2. LITERATURE REVIEW

The Science-Technology-Engineering-Mathematics (S.T.E.M.) program attracts the attention of the educational community because it adds value to the educational process and provides many benefits not only about knowledge but also about the character of life. Many researchers like S.T.E.M. It is a collaborative learning environment where students can use real problems and situations to expand knowledge and learn through discovery, and creation and (Chatzopoulos et al., 2019; Chatzopoulos et al., 2022; Kanaki and Kalogiannakis, 2022). The purpose of a study conducted by Bal and Bedir (2021) was to ascertain teachers' views on implementing STEM education in classes. They also argued that STEM was a demand of the times and included basic skills. They also emphasized that STEM education improves student achievement, increases self-confidence, and makes learning easier and more consistent. It connects lessons with everyday life and promotes collaborative learning. However, while conducting these activities, teachers stated that the conduct of the event most often caused problems in classroom management due to the

lack of preparation level of the students and lack of equipment. Teachers participating in the study suggested hosting STEM education workshops to overcome these challenges, especially in preparation for the event.

The purpose of the Kanadli (2019) study was to study the opinions of teachers and students participating in STEM education. A very large percentage (80%) of survey participants said that a STEM education is best for teaching or learning topics related to the study of natural phenomena. They also noted that STEM education promotes life skills, psychomotor skills, problem solving, scientific processes, engineering and design skills, imagination, research skills, critical thinking skills, and 21st century skills. Regarding the contribution of STEM education to the emotional side, STEM education can attract attention and interest, arouse curiosity, provide a desire and motivation for learning, increase students' self-confidence, and realize how real-life problems are solved. It was emphasized that it helps. Additionally, STEM education has been found to be more helpful in increasing students' career awareness and making learning enjoyable, providing effective and sustained learning as well as collaborative and student-centered learning, ensuring active engagement and content relevance. This is a lecture for everyday life.

STEM education applications require a lot of time and budget. It was emphasized that the school where the competition will be held must have the minimum technological infrastructure. On the other hand, some teachers believe that expensive robotics kits are unnecessary for STEM education (Hebebci, 2021). This article is for S.T.E.M. and discusses the current teacher problem regarding the use of S.T.E.M Education (Papadakis et al., 2020). Limited S.T.E.M Education and the importance of a teacher's attitude towards effectiveness. (Ampartzaki et al., 2022; Kalogiannakis et al., 2018; Kastriti et al., 2022; Kalogiannakis & Papadakis, 2019a; 2019b; 2022). The framework has a positive impact, this quantitative research is needed to provide useful advice and assistance in the development and implementation of S.T.E.M. in classroom instruction. The purpose of this study is to explore the importance of the implementation of S.T.E.M. in Classroom instruction and developments regarding students' future learning.

STEM is a combination of four disciplines, supported by 21st century skills (Beheshti, M., et al 2017). STEM education effectively replaces traditional teaching methods with a more student-centered approach to teaching (Breiner, J. M., et al 2012), Through projects, approaches to inquiry and critical skills, students acquire new knowledge and solve problems presented by STEM through collaboration, but most importantly, student learning must be consistent with daily life.

2.1.S.T.E.M. education

STEM education refers to the teaching and learning of science, technology, engineering and mathematics. Nevertheless, S.T.E.M. is a collective term for educational programs, practices, policies, or activities. contains one or more of its fields. Education model S.T.E.M. is achieved through structured activities that resemble scientific laboratory research using project-based problem-solving methodologies (Kastriti et al., 2022). Purposeful, collaborative, hands-on and meaningful hands-on experimentation and S.T.E.M. This activity is applied according to a social constructivist learning approach that encourages "learning by doing" (Pellas et al., 2017). Recent research suggests that preschoolers may be able to perceive more scientific concepts than previously thought (Kalogiannakis & Papadakis, 2019).

Recent research also suggests that preschoolers can understand scientific concepts better than previously thought (Kalogiannakis et al., 2018). Through S.T.E.M. students (Ioanou and Bratissis, 2016; Morrison and Bartlett, 2009):

(1) Curiosity motivates the expression of creative ideas.
(2) Encouraged to think differently.
(3) Promote teamwork and belonging.
(4) Develop new skills and acquire technical knowledge.
(5) Be a competent problem solver, innovator, and logical thinker.

In STEM education, Pedagogical design is needed for flexible constructivist teaching approaches that improve student participation (Margot and Kettler, 2019). Furthermore, placing students at

the center of the learning process encourages them to engage in meaningful yet challenging problem situations, promoting higher levels of cognitive thinking (English, 2017).

2.2 The Importance of Teacher's Attitudes Towards STEM Education

STEM education is therefore an educational program that must be implemented in order to realize an ideal future that is in the national interest. Educators are the best people to deliver STEM education. They play an important role in student education [Lucietto, A., Russell, L., & Schott, E. (2018).]. Highly qualified STEM teachers are successful in providing STEM education effectively [. Dailey, D., Bunn, G., & Cotabish, A. (2015)], allowing students to enjoy learning with STEM subjects according to STEM goals. Teaching STEM subjects with an excellent STEM teacher is believed to reduce student anxiety. Teacher attitudes undoubtedly play an important role in curriculum transformation, even on the part of teachers. People either support (positively) or oppose (negatively) the reform. According to the causal theory of action, attitudes influence an individual's behavior. The teacher's attitude cannot be determined, but it translates into observable behavior (Alkhateeb, M. A. (2018). Therefore, her STEM teachers who want to integrate STEM education should have confidence and an optimistic attitude. Students with a positive perception of STEM are also influenced by optimistic behaviors and beliefs.

STEM teachers should be optimistic and open-minded in learning STEM, not easily discouraged by challenges, and enjoy exploring the unknown. Nonetheless, previous research findings suggest that teachers are concerned about student safety (Jamil et al. 2018) and lack confidence when asked to deliver STEM lessons [Bagiati, A., & Evangelou, D. (2015)]. . Teacher stress and depression affect the success of STEM education (Abdullah, A. H., et al 2017). Therefore, it is important to maintain a good attitude towards STEM education as you prepare to become a STEM teacher. On the other hand, teachers of different genders have different attitudes towards the implementation of STEM education. Previous studies have shown that male teachers are more confident in conducting STEM subjects than female teachers [Lee, M. H., Hsu, C. Y., & Chang, C. Y. (2019).]. Female teachers are also positive about implementing STEM training and education. Different perspectives on STEM adoption are influenced by gender. These differences may affect her STEM, and research should be conducted to examine the impact of this issue.

3. RESEARCH PURPOSE AND QUESTION

The purpose of this study was to investigate the attitudes of primary school teachers towards the implementation of STEM education in classroom education. We used questionnaires to understand teacher attitudes and attempted to answer the following key surveys questions:

(1) Does the teacher feel motivated to teach S.T.E.M. education in the classroom?

(2) Do teachers think S.T.E.M. is important? Will it improve the quality of teaching in student education?

(3) Does the teacher actively participate in her STEM-related educational seminars?

The research hypothesis is that primary school teachers use S.T.E.M. education is vital for skill development, critical thinking, etc.

4. METHODOLOGY

The study uses a survey design that is optimal for learning more about attitudes, opinions, behaviors, ideas, and other matters related to a particular phenomenon. The main purpose of this study was to analyze a primary school teacher’s attitude towards STEM education.

4.1 Sample

121 teachers both male and female selected from public and private schools by random sampling. Understand teachers' attitudes towards S.T.E.M. To determine this, anonymous surveys were submitted via the Google Forms platform in April -May 2023. In the context of our research, we followed national and international guidelines on research ethics (Petousi & Sifaki, 2020). Online data collection offers significant advantages such as rapid response and processing, low-cost automatic aggregation of results, and the ability to export data to IBM SPSS-compatible formats.

4.2 Measurement procedure

Descriptive analysis was used to describe the levels of attitudes of primary school teachers in S.T.E.M., per the needs of the proposed quantitative research. This analysis is commonly appropriate for recording a current situation or phenomenon. Respondents were asked to indicate their level of agreement on these points. 5-point Likert scale (1=strongly disagree, 5=strongly agree). Therefore, the higher the score, the more positive the teacher's attitude towards the implementation of S.T.E.M. Data analysed by using frequencies, percentages, means and standard deviations to calculate and analyze teacher responses regarding the effectiveness of STEM education. A measure of the mean (such as the median) represents the mean of each response (Field, 2013). Measures of distribution such as Standard deviation provide information about the distribution or variability of responses (Field, 2013). A higher variance indicates greater variability in response by using these statistics.

5. Results

5.1 Sample demographic

Sample N = 121 teachers, 74 women (61.2%) and 47 men (38.8%). All answers are considered valid. According to age, there are 15 people (12.4%) in the 24-35 age group, 42 people (34.7%) and 64 participants in the 36-45 age group and almost 52.9% respondent were age group of 46 year and above. Demographic profiles given in table 1.

5.2 Data analysis

In table 2 statistical data are used to show teacher's attitude toward stem education.

Table1.

Teacher's demographic statistics Variable	Gender	Sample size (N)	Percentage (%)
Gender	Women	74	61.2
	Men	47	38.8
	Total	121	100
Service years	0-5	20	16.5
	06-Oct	15	12.4
	>10	86	71.5
	Total	121	100
Age(years)	25-35	15	12.4
	36-45	42	34.7
	>45	64	52.9
	Total	121	100

Table2.

Gender frequency	Frequency	Percentage (%)	Valid percentage (%)	Cumulative percentage (%)
Women	74	61.2	61.2	61.2
Valid. Men	48	38.8	38.8	100
Total	121	100	100	

Statistics of research question

An independent sample t-test was conducted to examine the effects of demographic factors such as gender, age, and service years. Descriptive methods used for categorical variables such as mean, standard deviations, frequencies and percentages.

In table 3.the mean value 4.02 and strong value of standard deviation 0.83 indicates that most of teachers agreed that STEM education improves the overall process of education. Independent sample T-tests for gender differences and ANOVA for years of service showed that none of the above differences affected teachers' beliefs about improving the quality of education after using S.T.E.M. On the other hand, particularly the age groups 36-45 and above, influences teachers' belief that the quality of education improves with S.T.E.M implementation.

Independent sample T-test analysis of gender variables and ANOVA, years of service show that the above two variable showed that STEM education did not affect teacher's beliefs about succeeding in attracting students. Conversely, the age group, especially the 36-45+ age group teachers belief's that STEM education attracts the students, also standard deviation value 0.79 indicated positive impact of STEM education on students learning.

An independent-sample t-test analysis by ANOVA (ANOVA) for gender, years of service, found that these variables did not affect teachers' willingness to participate in S.T.E.M seminars/courses. Conversely, age, especially the 36-45 above age group, influences the willingness of teachers to participate in S.T.E.M seminars/courses.

Table 3

Table 3. Research questions	Sample size(N)	Min	Max	Mean	SD
I am confident that S.T.E.M. education improves the overall education process.	121	1	5	4.02	0.83
I believe that STEM Education can attract students.	121	1	5	4.13	0.79
I am ready to implement S.T.E.M. education in my classroom.	121	1	5	3.39	1.0
I am ready to attend STEM Education workshops / courses and seminars.	121	1	5	4.11	1.0

6. LIMITATIONS AND FURTHER RESEARCH

A major limitation of this study was that only anonymous questionnaires were used in a quantitative framework. While this is a conscious decision to explore settings for larger data sets, this approach also has its drawbacks. Respondents can give socially desirable answers but cannot further explain their answers. Therefore, future studies may benefit from additional teacher interviews, classroom observations, or other qualitative data. Considering the above it would be interesting to conduct a new sample survey using the constrained S.T.E.M. design. Conduct the S.T.E.M. in the classroom and record the pre- and post-deployment settings.

7. CONCLUSION AND DISCUSSIONS

This study was conducted to analyze the attitudes of primary school teachers towards STEM subjects. Contribute education to support the implementation of S.T.E.M. framework within the classroom. The results revealed teachers' attitudes towards S.T.E.M. at a positive level (many "agree" and "completely agree" responses). They are willing to collaborate with teachers from other disciplines and seem to embrace new learning methods. A teacher with a positive attitude and a high awareness of the importance of S.T.E.M. Education tends to introduce STEM subjects, promote S.T.E.M. more often. A positive attitude leads to positive actions, increased motivation and confidence when practicing S.T.E.M. education (Wei & Maat, 2020).

An important finding is that teachers have positive concern about the implementation of S.T.E.M. education. Regarding demographic factors such as gender, age group, and tenure, the statistical tests used in this study demonstrated that gender and tenure a) had no effect on her willingness to adopt S.T.E.M. education, b) Teachers' belief that the introduction of S.T.E.M. will improve the quality of education. c) Teacher's belief that S.T.E.M. provide important ability to engage students and d) Teacher's willingness to participate in S.T.E.M. seminars/workshops, specifically age Groups 36-45 and above teachers' belief that the introduction of S.T.E.M. Improved quality of education. Specific findings based on data analysis were made that teachers were uncertain about S.T.E.M education, because of the lack of education, lack of educational resources, social impact. (Papadakis, 2021; Scott and Martin, 2013; Kartal and Taşdemir, 2021; Yıldız et al., 2020; Mayes and Gallant, 2018). A positive attitude leads to positive behavior, such as increased motivation and confidence in implementing STEM education. Teachers' mindsets need to change according to the learning outcomes expected in STEM. The success of STEM education will depend on the efforts of all parties to make it more competitive for future generations.

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