RESEARCH ARTICLE

JTER Volume 18, Issue 1, 2023 Print ISSN: 0974-8210 Online ISSN: 2454-1664

Analysis of the Levels of Awareness of School Teachers toward STEM Education

Shweta Mishra[1] Satyendra Gupta[2]*

[1]M.Ed. Scholar, School of Education, Galgotias University, Greater Noida, Uttar Pradesh, India

[2]Professor and Dean, School of Education, Galgotias University, Greater Noida, G.B. Nagar, Uttar Pradesh, India

Abstract

STEM education, which stands for science, technology, engineering and math, has drawn a lot of attention recently because it has the ability to help kids develop their critical thinking, problem-solving, and innovative skills. Though teachers, who have a significant impact on how students learn, must be aware of and comprehend STEM education in order for it to be implemented successfully. The goal of this study was to examine how knowledgeable school teachers are about STEM education. The study looks at the variables that affect teachers' awareness, investigates the difficulties they encounter when adopting STEM education, and suggests methods to raise teacher awareness for successful STEM integration in the classroom environment.

Keywords: STEM, Levels of Awareness, Teachers' awareness

Journal of Teacher Education and Research (2023). DOI: 10.36268/JTER/18104

Introduction

STEM education, which stands for Science, Technology, Engineering, and Mathematics, has drawn a lot of attention recently since it strongly emphasises teaching students to think critically, solve problems and prepare for professions in STEM fields. The effectiveness of STEM education strongly depends on how well-informed and knowledgeable school teachers are of its guiding concepts, processes, and advantages. The purpose of this analysis is to gauge how well-informed school instructors are about STEM education and all of its facets. The phrase "STEM Education" is widely heard in the educational setting. Science, Technology, Engineering, and Mathematics are referred to as STEM. STEM education may aid in a nation's industrialization, competitiveness in the global market, and development of trained manpower in rapidly developing professional domains.

At a critical juncture when the Indian government is supporting programs like 'Make in India', 'Skill India', and 'Digital India' to boost manufacturing, the use of technology, and skill development in the nation, STEM is emerging as a key and fundamental part of our education (Malti 2017). The 'Million Minds Augmenting National Aspiration and Knowledge' (MANAK) initiative draws gifted young boys and girls to study science and work in research.

So, STEM can result in a workforce that is more diverse and is a group of people that work well together as a team. Recent developments in science and technology have had an impact on the economies, educational systems, and social structures of the countries and have sparked the development of new strategies. STEM approach can be divided into levels of awareness of school teachers toward it and all these levels need to be focused before utilizing it as a teaching method.

Objectives

The main objectiveof the present research was framed as "Analysis of the Levels of Awareness of School Teachers toward STEM Education".

Corresponding Author: Satyendra Gupta, Professor and Dean, School of Education, Galgotias University, Greater Noida, G.B. Nagar, Uttar Pradesh, India, e-mail: satyendra.edn@gmail.com

How to cite this article: Mishra, S.,Gupta, S. (2023). Analysis of the Levels of Awareness of School Teachers toward STEM Education. Journal of Teacher Education and Research, 18(1):18-21.

Source of support: Nil

Conflict of interest: None

Other objectives of the research studywere formulated as follows.

- To study and compare the level of awareness of science and art teachers toward STEM education.
- To study and compare the level of awareness of male and female teachers toward STEM education.
- To study and identify the level of awareness of school teachers within the dimensions of STEM education.

Delimitations

The present study was delimited with the following areas.

- a) Research was conducted in the Gautam Buddha Nagar district of Uttar Pradesh, India.
- b) Only 110 secondary school teachers were taken as samples for the study.

Research Design and Methodology

- This research adopteda quantitative approach to analyze the levels of awareness of school teachers toward STEM education.
- A cross-sectional survey design was used to collect the data from a representative sample of school teachers.

For the survey researcher made a questionnaire consistingof closed-ended questions to obtain specific information from the teachers related to their STEM education awareness.

A random sampling method was usedto ensure an adequate representation of teachers from various streams and the desired level of statistical significance.Informed consent was obtained from all participants, ensuring their voluntary participation and confidentiality of their responses. (See Figure 1)

The research was limited to a specific geographical area or a certain number of schools, which may affect the generalizability of the findings.The analysis was primarily focused on teachers' awareness levels and may not capture their actual implementation of STEM education practices.With the help of this research, it was possible to compare teachers in elementary and secondary schools who are male and female and work in urban environments.

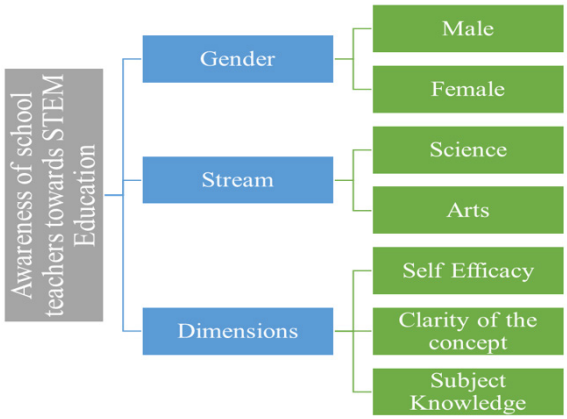

Figure 1: Distribution of sampl

The study aimed to provide insights into the levels of awareness of school teachers toward STEM education, contributing to the understanding of the current state of STEM education implementation.Gautam Buddha Nagar served as the source of the sample. To ensure that the samples chosen for the study were statistically representative. According to their affiliations, both public and private schools were fairly represented. The majority of the study's sample consisted of teachers from both public and private schools. For the survey, a total of 110 samples were collected. (See table 1)

Table- 1shows the number of teachers who participated in the survey as per the schools. Five schools have partaken in the survey. A total of 110 teachers participated in the survey. Among these, the number of teachers who contributed their part as per the schools is represented intable 1(See Figure 2).

Table-1: Teachers' participation as per stream

Sr. No.	Sample School	Science Stream	Arts Stream
1	School 1	13	15
2	School 2	12	10
3	School 3	9	11
4	School 4	18	2
5	School 5	16	4
Total	110	68	42

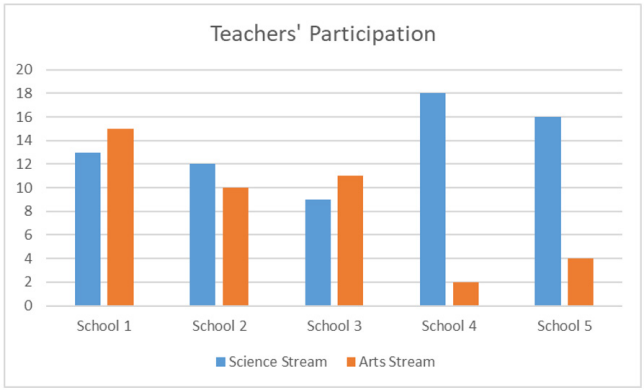

Figure 2: Teachers' participation as per stream

Objective 1: To study and compare the level of awareness of science and art teachers toward STEM education.

$H_0$1- There is no significant difference in the level of awareness between science and arts teacherstoward STEM education.

In this calculation,the value of the alpha (α) level α = 0.05 was taken(See Table 2). This means that the conclusions of this test are valid 95% of the time. Degrees of freedom came 4.

Table 2: Level of Awareness of Teachers as per the Streams

Level of Awareness	Science	Arts
High (146-200)	12 (18%)	6 (14%)
Average (55-145)	56 (82%)	34 (81%)
Low (0-54)	0	2 (5%)
Total	68	42

Table 3: The calculation forthe t-statistic

Levels of Awareness	Science(X)	Arts(Y)	d = X - Y	d^2
High (146-200)	12	6	6	36
Average (55-145)	56	34	22	484
Low (0-54)	0	2	-2	4
Total	68	42	26	524

t-statistic was equal to 1.04.In table 3 the computed t-statistic was less than the critical t-value. Therefore,the test concluded that there is no evidence of a statistically significant difference between the two populations. Therefore, we cannot reject the null hypothesis$H_0$1. Thus, we can say that there is no significant difference in the level of awareness between science and arts teacherstoward STEM education.

Objective 2: To study and compare the level of awareness of male and female teachers toward STEM education.

$H_0$2- There is no significant difference in the level of awareness between male and female teachers towards STEM education.

For the study of this objective collected data are shown in Tables 4 & 5 and Figure 2.

Table 4: Percentage of participation of Male and Female Teachers

Teachers Participation	Male %	Female %
Percentage of Teachers	13	87

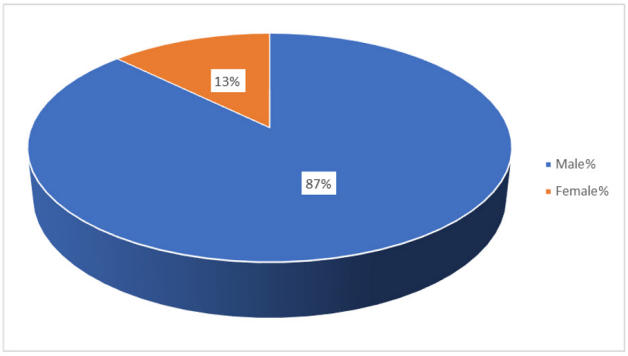

Figure 3: Percentage of the teachers on a gender basis according to Table 4

Table 5: Level of Awareness of Teachers on a Gender Basis

Level of Awareness	Female	Male
High (146-200)	10 (10.4%)	2 (14.3%)
Average (55-145)	80(83.3%)	10 (71.4%)
Low (0-54)	6 (6.3%)	2 (14.3%)
Total	96	14

For the calculation based on Table 5value of the alpha (α) level was taken as 0.05. This means that the conclusions of this test are valid 95% of the time.The degree of freedom is 4.

Table 6: The calculation for the t-statistic

Levels of Awareness	Female	Male	d = X - Y	d^2
High (146-200)	10	2	8	64
Average (55-145)	80	10	70	4900
Low (0-54)	6	2	4	16
Total	96	14	82	4980

Table 7: Calculation of the responseson the items related to thedimensions of STEM education

Question Category	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Clarity of the Concept	447	546	196	136	105
Self Efficacy	496	431	193	98	102
Subject Knowledge	629	495	219	184	123

Determined the variance of each dataset as per Table 6.Where the value of t came to 0.9046. Used the alpha and degree of freedom to find the critical t value in the t distribution table.Compared the critical t-value and the computed t-statistic.The computed t-statistic was less than the critical t-value. The test concludes that there is no statistically significant difference between the two populations. Therefore, null hypothesis$H_0$2is accepted. Thus, we can say that there is no evidence of a significant difference in awareness toward STEM education between male and female teachers

Objective 3: To study and identify the level of awareness of school teachers within the dimensions of STEM education.

Three dimensions of STEM education i.e.,Clarity of the concept, Self-efficacy and Subject knowledge were taken to study the level of awareness of school teachers toward STEM education. On these three dimensions, teachers' opinion was taken on a five-point scale related to their items. (See table 7)

Figure4 represents the distribution of the items in the tool on the basis of dimensions of awareness according to the ratings. This shows that the major ity of the teachers agreed that they are having good

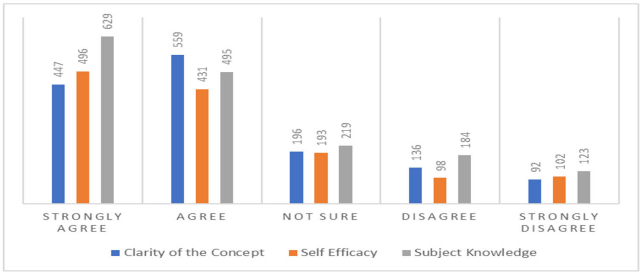

Figure 4: Calculation of the responses on the items related to the dimensions of STEM education based on Table 7

subject knowledge. Whereas in the case of clarity of the concept the majority of the teachers just agreed on it. While in the case of self-efficacy, the majority of the teachers strongly agreed with it.

Conclusion

The purpose of the present research work was to investigateteachers'knowledge, understanding, and perception towards STEM (Science, Technology, Engineering, and Mathematics) education.The analysis revealed a general positive awareness of STEM education among school teachers. While most teachers recognized the importance of STEM and its potential benefits for students.

There are challenges related to implementation, resource availability, and professional development for STEM education. Addressing these challenges through comprehensive support systems, adequate training, and collaboration with stakeholders can help teachers effectively incorporate STEM education into their classrooms and provide students with valuable learning opportunities. Additionally, efforts to promote gender equity and diversity within STEM education should be emphasized to ensure equal access and representation for all students.

REFERENCES

Breiner, J. M., Harkness, S. S., Johnson, C. C., & Koehler, C. M. (2012). What is STEM? A discussion about conceptions of STEM in education and partnerships. *School Science and Mathematics,* 112(1), 3–11.

Bybee, R. W. (2013). The case for STEM education: Challenges and opportunities. NSTA Press.

Chavatzia, T. (2017). Cracking the code: Girls' and women's education in science, technology, engineering, and mathematics (STEM). Paris, France: UNESCO.

Chen, Y. L., Hand, B., & Norton-Meier, L. (2010). Examining teacher practices for fostering students' creativity in STEM disciplines: A review of the literature. *Journal of Science Education and Technology*, 19(6), 553-561.

Christenson, N., & Chang, M. (2018). Teachers' awareness and self-efficacy regarding STEM education in K-8 classrooms. *Journal of STEM Education Research*, 1(1), 1-18.

Dare, E. A., Ring-Whalen, E. A., & Roehrig, G. H. (2019). Creating a continuum of STEM models: Exploring how K-12 science teachers conceptualize STEM education. *International Journal of Science Education*, 41(12), 1701-1720.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97-140.

English, L. D. (2016). STEM education K-12: Perspectives on integration. *International Journal of STEM Education*, 3(3), 1-8.

Garg, D., Dubey, N., & Bohara, H. (2019). STEM Education: 'An entail drift from Indian schools to Universities'.

Gonzalez, H. B., & Kuenzi, J. J. (2012). Science, Technology, Engineering, and Mathematics (STEM) Education: A Primer.

Kennedy, T., & Odell, M. (2014). Engaging students in STEM education. *Science Education International*, 25(3), 246-258.

Luft, J. A., Roehrig, G. H., & Patterson, N. C. (2017). Contrasting landscapes: A comparison of teachers' self-efficacy beliefs and the availability of resources in high and low SES US school districts.

Moore, T. J., Stohlmann, M. S., Wang, H. H., Tank, K. M., & Roehrig, G. H. (2014). Implementation and integration of engineering in K-12 STEM education. In *Engineering in Pre-College Settings: Synthesizing Research, Policy, and Practices* (pp. 25-45). Purdue University Press.

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. The National Academies Press.

Park, H., Byun, S., Sim, J., Han, H., & Baek Y. S. (2016). Teachers' perceptions and practices of STEAM education in South Korea.

Shidiq, G. A., & Chatree, F. (2020). Exploring the relationship of teachers' attitudes, perceptions, and knowledge towards integrated STEM. Ilkogretim Online - *Elementary Education* Online, 19(4), 2514-2531.

Yoon, S. Y., & Kim, M. (2017). A review of research on teacher knowledge in science, technology, engineering, and mathematics (STEM) education. *Journal of Science Education and Technology*, 26(4), 383-397.