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University Students Attitude Towards STEAM Pedagogy

Pampa Rani Mahata, Shaktipada Mahato, Laxmiram Gope

Department of Education, Sidho-Kanho-Birsha University, West Bengal, India

Email address:

Laxmiram.1122@gmail.com (Laxmiram Gope)

Abstract: STEAM pedagogy also known as STEAM education. Before STEAM it was STEM, Georgette Yakman is credited with updating STEM into STEAM by adding the Arts domain. It is an educational approach that integrates Science, Technology, Engineering, Arts and Mathematics into an integrated curriculum. The aims of the STEAM Pedagogy are to develop an all-round individual who can think critically, solve complex problem, adapt to technological advancement and contribute to society through innovation and creativity. The study mainly focuses on STEAM pedagogy and students' attitude towards STEAM. The study was mainly frame with five objectives which focused on the attitude towards SREAM among the PG Students. This study also categorized the attitude towards STEAM pedagogy according to demography variables like gender, stream and residential background of the learners (urban, rural). The study was used descriptive survey research design which covers 100 sample, selected through simple random sampling technique. Here the researchers used self-made Likert type five-point attitude scale for data collection and t- test was used for data analysis. The study provided many significant findings which mainly uncovered the attitude level of PG students towards STEAM pedagogy.

Keywords: Attitude, STEAM, Pedagogy, STEAM Pedagogy, Education

1. Introduction

Education is the vital tool through which we can bring change in every aspect in our life. Education helps us to acquire knowledge, attitude and skills. We are constantly faced with various problem in various fields of life and how educated help us to aware in this juncture to overcome these challenges. Education helps us to overcome any situations comes from the ability to make rational decisions and ale to get insight to particular problem. Education helps in shaping the character of a person. Through education it is possible to develop a person fully, means 360 Degree or all-round development possible through properly nourishment of the hidden talent of the children, that is it help in building the personality of the person and makes the person more confidence and self-reliant. Education is the paramount importance in the present society [1]. It serves as a driving force for economic growth, social cohesion, democracy, and sustainable development in all context i.e., economical, societal and environmental [2]. By equipping individuals with knowledge, skills, and values, education empowers them to lead fulfilling lives, contribute to their communities, and navigate the complexities of the modern world [3]. As we continue to progress as a society, it is essential to prioritize and invest in education, ensuring that every individual has equal access to quality education, regardless of their background or circumstances [4]. Only through a commitment to education can we build a more inclusive, prosperous, and enlightened society for future generations [5].

The place of pedagogy in education is utmost importance as it forms the foundation for effective teaching and learning practices [6]. Pedagogy shapes the overall educational experience by providing a framework for educators to design and deliver instruction in a purposeful and meaningful manner [7]. It guides the selection of appropriate teaching strategies, learning activities, and assessment methods that facilitate students' intellectual, social, and emotional growth [8]. It provides a framework for educators to design, implement and evaluate instructional practices that promote deep understanding, critical thinking, students' engagement, and inclusive learning environments [9]. Pedagogy guides educators in adapting instruction to meet the diverse needs of students, integrating technology into the classroom, and assessing students learning effectively [10]. By embracing pedagogical principles and approaches, educators create rich

and meaningful educational experiences that empower students to become lifelong learners and active participants in their own education [11].

2. Steam Pedagogy

STEAM Pedagogy is a teaching strategy as well as discipline. The contribution of pedagogy to improve the quality of education is undeniable. Students become more enthusiastic and interested if the teaching process happened with STEAM. Through STEAM a teacher can promote the innovative and creative thinking among the students. Students can able to solve the problem and achieved the all-round development with the help of cultivating the knowledge.

In the present juncture, we live in knowledge era, now our goals are to achieved the SDGs 2030 agenda. Technology driven society in our age, societies are in a constant race in technology and science. Countries realize their development and growth through the advance in science and technology [12].

3. History of Steam Pedagogy

STEM was introduced in 2001 by the scientific Administrator of the US National Foundation which previously used the acronym SMET. In the 1990's Science, Technology, Engineering, and Math (STEM) was seen as an essential learning field in the 21st century, added to art as the basis for developing creativity, so the term STEM was modified to STEAM. Before STEAM it was STEM, Georgette Yakman is credited with updating STEM to STEAM by adding the Arts. STEM has grown to represent a unique approach to teaching and learning, one that centers around individual students's learning styles and interests. This means STEM education has something to offer every student. STEM is an educational discipline. The aim is to instill interest in Arts and science in children from an early age. Science, Technology, Engineering, Arts and Maths. so that students can be creative without using a few methods to investigate and the skills relevant to the subject will help the students to become innovators in the present world scenario.

Which is very important for his own future life and the future of the country.
STEAM is a holistic education that integrates science, Technology, Engineering, Art and mathematics as an interdisciplinary learning model that can stimulate inquiry and creative thinking [13].

3.1. Objectives of the Study

a) To find out the attitude towards STEAM pedagogy among the girls and boys PG level students in SKB University.
b) To find out the attitude towards STEAM pedagogy among the urban and rural PG level students in SKB University.
c) To find out the attitude towards STEAM pedagogy among Arts and Science PG level Students in SKB University.
d) To find out the attitude towards STEAM pedagogy among the Arts female and science female PG level students SKBU University.

3.2. Hypothesis

a) There is no significant difference in the attitude towards STEAM pedagogy among the Girls and Boys P. G level students in SKB University.
b) There is no significant difference in the attitude towards STEAM pedagogy among the Urban and Rural PG level students in SKB University.
c) There is no significant difference in the attitude towards STEAM pedagogy among the Arts and Science PG level students in SKB University.
d) There is no significant difference in the attitude towards STEAM pedagogy among the Arts Female and Science Female PG level students in SKB University.

3.3. Population of the Study

In the Sidho-Kanho-Birsha University have approximately 3000 students. So here 3000 students are considered as a population of the study in this study.

3.4. Sample and Sampling Technique of the Study

From the entire population researcherss selected 100 samples by the stratified Random sampling methods / techniques. Researches classified the sample on the basis of the various strata such as urban, rural, male, female and arts, science and so on.

3.5. Data Collection Tool

Researchers was collected the data through self-made five-point Likert type attitude scale and besides the attitude scale researchers also collected data from the books, journal, article, newspaper etc.

4. Analysis and Interpretation of Data

Here researchers analysis the data on the basis of objectives. There are five objectives so researcherss divided the findings on various sections.
Objective: 1 To find out the attitude towards STEAM pedagogy among the Girls and Boys P. G level Students in SKB University.

In this section researcherss set a null hypothesis for find out the attitude towards STEAM pedagogy of PG level students. The null hypothesis is 'There is no significant difference in the attitude towards STEAM pedagogy among the Girls and Boys P. G level students in SKB University.'

For testing the null hypothesis researcherss help of a t- test, firstly researcherss divided the score in two group like Male and Female and calculate the mean in two groups and then calculate the unpaired t value. The t test (score) is showed in the following table:

Table 1. t value and mean different between Male and Female attitude towards STEAM education.

Groups	N	Mean	Σ	df	Calculated t- value	Critical t- value	Ns/S
Male	45	120.18	13.42	98	t = 1.1252	At 0.05 = 1.661	Ns at 0.05 level
Female	55	117.45	10.79			At 0.01 =2.365	Ns at 0.01 level

So, researcherss shows that calculated t value is 1.1252 and critical table t value is in 0.05 significant level is 1.661, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to gender.

Researcherss also test in 0.01 significant level, calculated t value is 1.1252 and critical table t value is in 0.01 significant level is 2.365, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to gender.
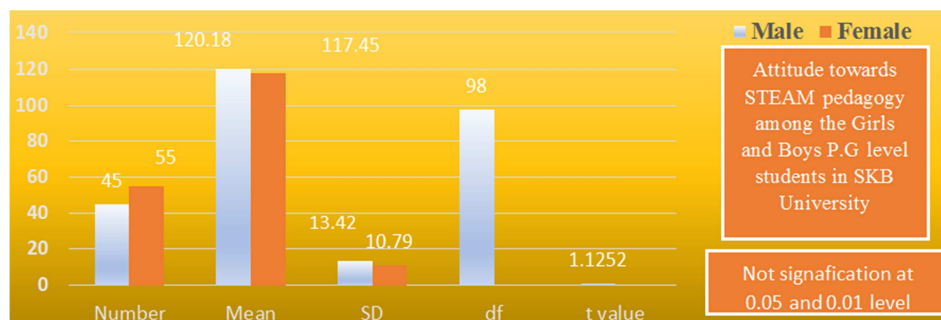
[A bar graph for attitudinal difference between male and female towards STEAM education PG level students.]

Figure 1. Bar diagram Male and Female attitude towards STEAM education.

Objective: 2 To find out the attitude towards STEAM pedagogy among the Urban and Rural PG level students in SKB University.

In this section researchers set a null hypothesis for find out the attitude towards STEAM pedagogy of PG level students. The null hypothesis is 'There is no significant difference in the attitude towards STEAM pedagogy among the Urban and Rural PG level students in SKB University.'

For testing the null hypothesis researcherss help of a t test, firstly researcherss divided the score in two group like urban and rural and calculate the mean in two groups and then calculate the unpaired t value. The t test (score) is shown in the following table.

Table 2. t value and mean different between Urban and Rural attitude towards STEAM education.

Groups	N	Mean	Σ	df	Calculated t- value	Critical t- value	Ns/S
Urban	44	120.86	11.74	98	t = 1.6184	At 0.05 = 1.661	Ns at 0.05 level
Rural	56	116.96	12.33			At 0.01 =2.365	Ns at 0.01 level

So, researchers shows that calculated t value is 1.6184 and critical table t value is in 0.05 significant level is 1.661, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to urban and rural.

Researchers also test in 0.01 significant level, calculated t value is 1.6184 and critical table t value is in 0.01 significant level is 2.365, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to urban and rural.
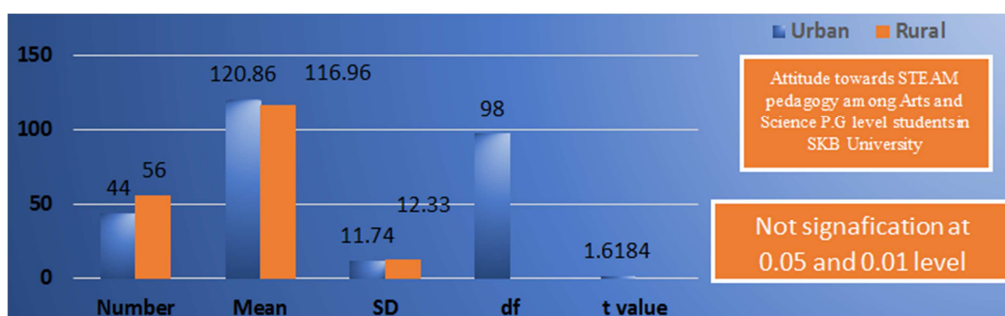
[A bar graph for attitudinal difference between Urban and Rural towards STEAM education PG level students.]

Figure 2. Bar diagram Urban and Rural attitude towards STEAM education.

Objective 3: To find out the attitude towards STEAM pedagogy among Arts and Science PG level students in SKB University.

In this section researchers set a null hypothesis for find out the attitude towards STEAM pedagogy of PG level students. The null hypothesis is 'There is no significant difference in the attitude towards STEAM pedagogy among the Arts and Science PG level students in SKB University.'

For testing the null hypothesis researchers help of a t test, firstly researchers divided the score in two group like Arts and Science and calculate the mean in two groups and then calculate the unpaired t value. The t test (score) is shown in the following table:

Table 3. *t value and mean different between Arts and Science attitude towards STEAM education.*

Groups	N	Mean	Σ	df	Calculated t- value	Critical t- value	Ns/S
Arts	51	118	13.40	98	t = 0.5734	At 0.05 = 1.661	Ns at 0.05 level
Science	49	119.39	10.57			At 0.01 =2.365	Ns at 0.01 level

So, researchers shows that calculated t value is 0.5734 and critical table t value is in 0.05 significant level is 1.661, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to Arts and science.

Researchers also test in 0.01 significant level, calculated t value is 0.5734 and critical table t value is in 0.01 significant level is 2.365, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to Arts and science.
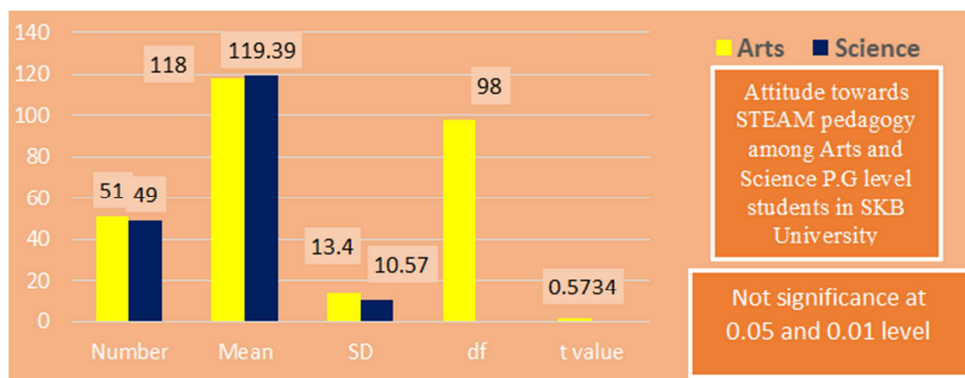
[A bar graph for attitudinal difference between Arts and Science towards STEAM education PG level students.]

Figure 3. *Bar diagram Arts and Science attitude towards STEAM education.*

Objective 4: To find out the attitude towards STEAM pedagogy among the Arts female and Science female PG level students in SKB University.

In this section researchers set a null hypothesis for find out the attitude towards STEAM pedagogy of PG level students. The null hypothesis is 'There is no significant difference in the attitude towards STEAM pedagogy among the Arts Female and Science Female PG level students in SKB University.'

For testing the null hypothesis researchers help of a t test, firstly researchers divided the score in two group like Arts female and science female and calculate the mean in two groups and then calculate the unpaired t value. The t test (score) is shown in the following table:

Table 4. *t value and mean different between Arts Female and Science Female attitude towards STEAM education.*

Groups	N	Mean	Σ	df	Calculated t- value	Critical t- value	Ns/S
Arts Female	29	117.76	12.71	55	t = 0.2552	At 0.05 = 1.673	Ns at 0.05 level
Science Female	28	117.04	8.08			At 0.01 = 2.396	Ns at 0.01 level

So, researchers shows that calculated t value is 0.2552 and critical table t value is in 0.05 significant level is 1.673, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to Arts female and science female.

Researchers also test in 0.01 significant level, calculated t value is 0.2552 and critical table t value is in 0.01 significant level is 2.396, calculated t value lower than table value so the null hypothesis is accepted, now we can say that there is no significant difference in the attitude of PG students towards STEAM education in respect to Arts female and science female.
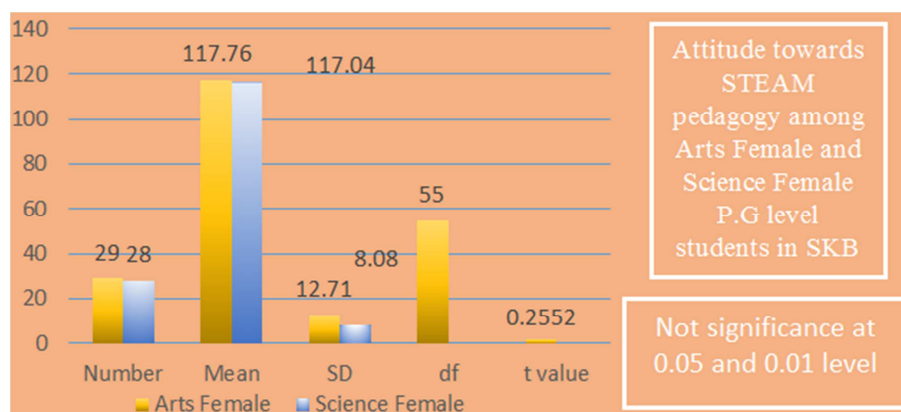
[A bar graph for attitudinal difference between Arts Female and Science Female towards STEAM education PG level students.]

Figure 4. Bar diagram Arts Female and Science Female attitude towards STEAM education.

5. Summary of the Study

The current study was carried out in the SKB University of the Purulia district in West Bengal. The purpose of the study was to know about that STEAM pedagogy and the attitude of PG students towards STEAM. The study based on the critical review which may help to build the pathway of the study. More over critical review of the related literature was conducted and knowledge gap was established on the issues related STEAM pedagogy. Here the researchers collected the data from 100 students from different stream which help to fulfil the objectives. The sample was selected through the simple random sampling method to achieve the research objective.

Particularly descriptive survey design was employed in this study to enable the researchers to come up a valid finding. Specifically, data was gathered data from PG students with different demography background like stream, gender, residents. Close ended questionnaire was used as research instrument for getting the appropriate data related to the objectives. Finally inferential analysis was used for data analysis involving t-test and descriptive statistics (mean, median, SD) was also used. Hence the researchers analyses the data and get the valuable findings.

Major Findings

Objective -1: To find out the attitude towards is STEAM pedagogy of the girls and boys PG level students in SKBU University.

Findings: Through the testing of null hypothesis researchers reveals that there is no significant difference among the girls and boys PG level students' attitude towards STEAM pedagogy in SKB University. It is indicated that the both male and female both have favorable attitude towards STEAM.

Objective-2: To find out the attitude towards STEAM pedagogy among the urban and rural PG level students in SKB University.

Finding: Through that testing of null hypothesis researchers reveals that there is no significance difference among the urban and rural PG level students' attitude towards STEAM pedagogy in SKB University.

Objective-3: To find out the attitude towards STEAM pedagogy among Arts and science PG level students in SKB University.

Findings: Through the testing of null hypothesis researchers reveals that there is no significance difference among Arts and science students' attitude towards STEAM pedagogy in SKB University.

Objective-4: To find out the attitude towards STEAM pedagogy among the Arts female and Science female PG level students in SKB University.

Findings: Through the testing of null hypothesis researchers reveals that there is no significance difference among the Arts female and science female PG level students' attitude towards STEAM pedagogy in SKBU University.

Therefore, above findings indicated that the all P.G. Students do possess the favorable attitude towards STEAM Pedagogy and all are very much deserved towards STEAM.

6. Discussion

On the basis of above findings researchers reveals that the Male P. G students and Female P. G students have no different attitude toward STEAM. According to their attitudinal expression both they want to incorporate STEAM pedagogy in educational sector in our country.

In another objective it was also explored that the Urban and Rural students both are opined positive attitude regarding STEAM because STEAM is an emerging area of knowledge, which is crucial for making people empowered with knowledge, action and value.

It was also reveals that the science P. G Students and Arts P. G Students both have express the positive/favourable attitudes towards STEAM pedagogy. Because they thought that if STEAM pedagogy is incorporated in our teaching learning process, then it will equally benefit to all the students and teacher and teaching will become more joyful and meaningful.

In another objective it was reveals that the Arts female and science female students does not possess any different regarding introducing STEAM pedagogy in our education process/ educational system with special reference to higher education.

Therefore, in this discussion selection research juxtaposed the results or finding in terms of qualitatively and reported that the STEAM become an emerging future for success educational process. Here through STEAM learning, it is was explored that a child must be content creator or knowledge developer rather than knowledge seeker and knowledge transformer.

7. Educational Implication

Everyone benefits from STEAM based pedagogy right from primary to higher education. Following are some importance of STEAM based Education.

1. *The students love for learning process is created:* As STEAM projects are fun, students easily participate in the learning process and develop a love for learning.
2. *Helps to develop new skills:* STEAM activities are designed to encourage younger students in learning areas that helps them to develop new skills and the newer skills are developed in the field of education, the more efficient and effective the educational process income.
3. *Creates a positive attitude toward education:* Imparting STEAM education to children at an early age inculcated a positive attitude towards education which in turn makes it easier for them to transition into higher education later on. Helps students to build confidence: Since STEAM activities are enjoyed by the students s themselves, not only will the love of the learning process be awakened in the students, but also in the students' confidence in their own abilities.
4. *Development of critical thinking power:* This method is completely out of rote learning where students know how to learn. As they do their own work, their thinking power develops and the more students engage in thinking activities, the newer information in the field of education is discovered that is very useful for them and for the future.
5. *Develop Creativity:* An important element of STEAM is creativity. Almost all intelligent people in the world are creative thinkers to solve their problems. STEAM activities help children and adults become imaginative and creative. Teaches students to think differently, how to find solutions to problems in ways and with new materials.
6. *Holistic Learning:* STEAM pedagogy encourages a holistic approach to education by integrating multiple disciplines. It recognizes the interconnectedness of various subjects and promotes cross-curricular learning experiences. This approach helps students develop a well-rounded understanding of real-world applications and fosters critical thinking skills.
7. *Engagement and Motivation:* By incorporating hands-on, project-based activities, steam pedagogy promotes students' engagement and motivation. The emphasis on practical application and problem-solving enables students to connect theoretical concepts to real-life situations, making learning more relevant and meaningful.
8. *Collaboration and Communication:* Steam pedagogy often involves collaborative group work and projects. This cooperative learning environment cultivates teamwork and effective communication skills. Students learn to share ideas, negotiate, and work together towards a common goal, reflecting the collaborative nature of many professional fields.
9. *Creativity and Innovation:* The integration of Arts within steam pedagogy encourages creativity and innovation. By incorporating artistic elements, such as design and aesthetics, students are encouraged to think outside the box, explore new ideas, and develop their creative potential. This fosters an entrepreneurial mindset and prepares students for a rapidly evolving workforce.
10. *Career Readiness:* STEAM pedagogy aims to equip students with the skills and knowledge required for future careers. By focusing on science, technology, engineering, Arts, and mathematics, it aligns with the demands of the modern job market, where proficiency in these areas is highly sought after. Steam education can help bridge the skills gap and prepare students for a wide range of career paths.
11. *Inclusivity and Diversity:* STEAM pedagogy promotes inclusivity and diversity by providing opportunities for students with different strengths and interests to excel. It recognizes that individuals have diverse talents and encourages interdisciplinary collaboration, allowing students to explore their passions and strengths within the framework of steam education.
12. *Lifelong Learning:* STEAM pedagogy fosters a culture of lifelong learning by nurturing curiosity and a growth mindset. It instils a love for learning, encourages self-directed exploration, and prepares students to adapt to an ever-changing world. The interdisciplinary nature of steam education also supports the development of transferable skills that can be applied across various domains throughout one's life.

8. Conclusion

The conclusion of STEAM pedagogy is that it offers a powerful and effective approach to education that integrates the disciplines of Science, Technology, Engineering, Arts and Mathematics by incorporating interdisciplinary and hands on learning experiences, STEAM pedagogy aims to foster creativity, critical thinking, problem solving skill, ability and innovation in students. STEAM pedagogy offers a comprehensive and dynamic approach to education by integrating science, technology, engineering, Arts and mathematics. It fosters holistic learning promotes engagement and motivation, prepares students for future careers, embraces inclusivity, diversity and cultivates a lifelong long love for learning.

Therefore, in this concluding remark researchers express that the majority of Students attitude towards STEAM, particularly Post Graduate students have Positive Attitude towards STEAM Pedagogy and learning approaches. In respect of Gender, Stream and Semester all post graduate students express favourable attitude towards STEAM

Pedagogy and they thought that if STEAM Pedagogical approaches will introduce in our formal education process, education will be more meaningful, Goals oriented and need based. No unemployability will be occurred in through our education process, really, we will be able to generate a vibrant workforce in this juncture. Our policy maker and think tank also think over the serious issue or matter for incorporating STEAM Pedagogy into formal education.

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