



## STEAM: Momentous Approach of Teaching Learning

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### Abstract

Globally, learning approaches that mingle various scientific fields are in great need today in education form to improve the product of education. The International Society for Technology in Education (ISTE) requires institutional education to acclimatize to rapid technology and train students to compete internationally by using e-learning medium in the classroom. The purpose of the study is to support every argument about STEAM education. The method used is previous studies based on STEAM. Data is collected through articles based on STEAM, STEAM education, and learning models based on STEAM. Databases used for searching include, Elsevier, Emerald, Springer, Research Gate, Academia Edu, Google Scholar. The result of the study is that STEAM builds human assets who can think critically, logically, and systematically and have universal competitiveness. Implementing STEAM based pedagogical learning in education enables students to comprehend the importance of integrating various disciplines. Moreover, learners can progress their logical thinking through STEAM approach, it will provide inclusive opportunities for students to practice their thinking skill, experiential learning.

**Keywords:** STEAM learning, Significance.

### 1. Introduction

Rapid development in the digital era is a new technology that intensely impacts teaching students (Glaze, 2018). The International Society for Technology in Education (ISTE) requires institutional education to adapt to rapid technology and prepare students to compete internationally by using e-learning methods in the classroom. Educators must work together with social group to improve practice (Utaminingsih et al., 2023) discover and share ideas, and make changes (Chung et al., 2022). Teachers' decision to use expertise in the classroom will influence students' scientific abilities (Lu et al., 2022) One of the fundamental process in education is learning. It is critical to experiment with a teaching strategy that helps students learn content, ideal their skills, and develop positive disposition qualities for the demands of 21st-century employment. The knowledge of the 21st century was split into traditional and modern knowledge, followed by the

skills that were cultured, such as critical thinking, collaboration, and creative thinking (Annisa et al., 2018). Additionally, mindfulness, curiosity, courage, flexibility, morals, and leadership are considered necessary traits in the 21st century (Bialik et al., 2015; Lestari, 2021; Padmadewi et al., 2018). It will be indispensable for these three dimensions to exist worldwide as well as in the national community. In order to be capable of solving the problems of the day, one must have the required skills, knowledge, and character. That is because information in the 21st century is escalating, widening, and moving more rapidly, necessitating a management-ready education (Erdem, 2019). STEAM is one of the learning models that uses an appropriate approach by studying the phenomenon that occur around us (Imamah & Muqowim, 2020). [1] Five disciplines—Science, Technology, Engineering, Art, and Mathematics—are pooled to form STEAM. This STEAM approach



to education is distinct from conventional instruction, which exclusively emphasizes multidisciplinary. By combining several disciplines, STEAM strives to give students insights into choosing their occupations so they can practice careers across a variety of fields as outcomes of the skills they have acquired (Mu'minah et al., 2020). [2-8] STEAM concept has attracted a lot of attention from various researchers in the field of education worldwide (Chung & Li, 2021). STEAM is an educational approach incorporating "art" into existing STEM which comprise science, technology, engineering, arts, and mathematics (Herro & Quigley, 2016; Milara et al., 2020). STEAM have the potential of being able to make learning easier to remember, increase cognitive intelligence, and train time management. (Perignat & KatzBuonincontro, 2019). STEAM not only helps to teach concepts but also make students to think innovative with art concepts (Lin & Tsai, 2021). In addition, it can also inspire them to become creative thinkers in interdisciplinary (How & Hung, 2019). STEAM education positively influences students' learning process (Bertrand & Namukasa, 2020). STEAM refers to teaching and learning in the fields of science, technology, engineering, art, and mathematics (Gonzales & Kuenzi, 2012). It usually includes educational activities at all grade levels, from pre- school to post-doctoral. STEAM learning is considered as learning that can integrate skills (hard and soft) that are needed by children. The term STEAM originated from STEM, which encourages children to build knowledge about the world around them through observation, investigation and asking questions (Ata Aktürk, Çetin et al. 2017). STEAM is considered as a valuable approach of teaching-learning for children. Teachers and educators believe that with such learning, students will be more active and more able to think critically in building their knowledge (Tippett & Milford, 2017). The addition of the 'arts' (leading to the acronym STEAM) will give children the opportunity to describe the STEM concept in creative and imaginative ways (Radziwill & Moellers, 2015). STEAM is utilized to focus on understanding the integrated nature of scientific, technological, engineering, artistic and mathematical disciplines, and their importance in the long-term

academic success of children, economic well-being (Herro, 2016) and community development (Han, Rosli, 2016). STEAM approach of education include designing of instructions, imparting methods of teaching with technology amalgamation and inclusive outdoor learning.

## **2. Method**

The method used is previous studies based on STEAM. Data is collected through articles of STEAM, STEAM education, and learning models based on STEAM. Databases used for searching include Elsevier, Emerald, Springer, Research Gate, Academia Edu, Google Scholar.

## **3. Literature Review**

Mutakinati, Anwari & Yohisuke(2018) investigated students' critical thinking skills by STEM Education project based learning. Sample consisted of first grade 160 Japanese middle school students. Four classes divided into 9 groups. Six lessons were framed on clean up wastewater. Worksheets were designed on basis of understanding concepts, critical thinking and to explore students' initial knowledge about wastewater. Students were asked to design product for wastewater. Results found that mean gain score of students' critical thinking scale was 2.82%. Advanced thinker was considered high thinker with gain score ,41.6%. Practicing thinker as average with gain score,30.6%. thinker Beginning thinker as average thinker with gain score of 25%. Challenged thinker as lower thinker with score of 2.8%. Study concluded that practicing thinker is the stage of critical thinking development and students have attained enough skill to construct the power of solving problems as their own. Yang & Wang (2019) constructed the STEAM curriculum design model and explained how the model is implemented in preschool education. It is found fruitful to provide rich learning experiences and to solve problem solving ability of kids of China. Rana & Muhannad (2020) investigated the effect of applying STEAM approach on motivation among students of grade 10 in private school in Amman. [9-15] Quasi Experimental Method was used with sample of 32 high school students including Experimental Group consisted of 13 students using STEAM approach and 19 students studying geography by conventional



method of teaching. It was found that there was no significant difference on motivation towards learning except class anxiety which was in the favor of experimental group and concluded that providing training to teachers in STEAM approach helps in meaningful learning. Zahiroh (2020) explored the experts opinion about Fred Rogers STEAM teaching approach and five themes were identified by four experts including inquiry based learning, learning by doing activities, interesting and systematic teaching strategies. This analysis involved semi structured interviews and found benefitted in selecting teaching strategies based on expert's opinion. Ali & Yazan (2021) designed a need based integrated framework for primary schools of Bahrain. A STEAM based activity was designed and attempted to provide how math and science curricula can be integrated in pedagogical knowledge based framework and found math science courses support primary education teachers to implement STEAM in curriculum. Rahmawati, Taylor, Ridwan et.al(2022) investigated ethical dilemma story pedagogy in STEAM teaching model by engaging students in value based chemistry learning. Case study was carried out in four high secondary school chemistry classes in Jakarta, Indonesia. It was found that ethical dilemma stories reflected students in exploring real world environment, deeper understanding of chemistry, critical thinking decision making and also aware how to protect environment. It was suggested, more research to be carried out on broad topics of science. Istianah(2023) described importance of STEAM learning in elementary schools. Two public elementary schools in Sidoarjo were taken for study. Miles and Huberman technique was used to identify implementation of STEAM in elementary schools. Stages like data reduction, data presentation, conclusion and data verification were used for analyzing. Findings indicated that STEAM learning occurred but teachers faced challenges due to lack of STEAM facilities and recommended that quality learning to be improved in primary schools. Erol & Basaran (2023) examined effect of STEAM education activities with tales on problem solving skills and creativity. 68 students of average age 6-7 years of public school located in Gaziosmanpasa

district of Istanbul were the participants of study. Quasi-Experimental method of research was used with pre-test and post-test control group. Early childhood creativity scale and problem solving skill scale were used. Data was analyzed through t-test and Pearson co-relation. Results found that STEAM activities designed with engineering and tales improved students' problem solving skills and creativity. Tan, Ong, et al (2023) examined how STEAM provide opportunities for learners to inquiry, understanding concepts and reasoning skills. 113 students of six classes of eighth grade students were taken for study. Researcher hypothesized that by connecting science with practical inquiry makes comprehensive learning. Crop yield topic of science was taken for solving problem by engaging students in classroom talk and teachers conducted three-hour video recordings. Content analysis was done and problems were solved by applying everyday experiences of students and teachers, high order conceptual skills with scientific knowledge. [16] Cevik & Temiz (2024) investigated effects of out of school learning environment on teachers' STEM awareness and 21<sup>st</sup> century skills. 23 science elementary maths, technology and design teachers working in public middle school were taken. A six day program was conducted and seven different STEM integrated out of school activity were carried out in Anatolian region in Turkey. Semi-structured interviews were conducted with teachers participating in project and transferring knowledge to students. Acquisition of knowledge and skills supported students to think analytically, solve problems and also increased their self-esteem. Study recommended that out of school learning environment should be used more to increase learning towards STEM and 21<sup>st</sup> century skills. [17-22]

#### **4. Significance of Pedagogical STEAM Learning**

Through the accomplishment of strategies in learning, STEAM enhances the combination of interdisciplinary knowledge (Ozkan & Topsakal, 2021) and student's project skills (Atiaturrahmaniah et al., 2022). Amalgamation of STEAM can develop students' project proficiency and learning inspiration (Baek et al., 2022) STEAM model is an orientation



for teachers implementing interdisciplinary curricula (Kartini et al., 2023) and making the learning curriculum enjoyable. However, it still follows learning outcomes (Iskariyana & Ningsih, 2021). Students' skills, competencies and learning motivation can be enhanced through activities such as discussions (Izzania et al., 2021), training, and argumentation by integrating STEAM through digital based or learning approaches (Graham, 2020). STEAM promotes novel thinking, originality, and analytical techniques to solve problem, all of which are essential for the employees of the future. Students who are exposed to STEAM topics in the early hours are more likely to pay attention in them. It gives them the chance to explore and interact with scientific phenomenon, technology, engineering principles, and mathematical concepts, creating a firm foundation for successive learning and potential career pathway. India is a nation on the move, gradually making its place among the pinnacle nations of the world. One of the biggest challenges facing this emerging power is the science education of its substantial juvenile population. A majority of India's population still lives in economically difficult conditions. [23-27] Under such situation, it is hard for educational institutions to keep pace with scientific and technological innovation is a challenge in itself. More importantly, including latest developments in STEAM in their curricula in a holistic manner keeping in mind both students' employability as well as social development is a key challenge. Today's students are tomorrow's leaders. STEAM-based education builds human assets who can think critically, logically, and systematically and have global competitiveness (Bilgiler et al., 2020). STEAM education involves students in self-activities (Graham, 2020). STEAM education enable students to investigate, find out, analyze, and draw conclusions related to daily life problems (Azizah et al., 2020). [28-32]

### **Conclusion and Further Recommendations**

Based on this review, it can be concluded that education in the 21st century, which has entered a disruptive 4.0 digital era, must continue to innovate. Early childhood education, as one of the knowledge institutions, must also be prepared to answer the

challenges of this era. [33] This type of education needs to make changes to both curriculum and learning methods. STEAM learning is considered to integrate the skills needed by children. [34] For example, a study carried by Zahiroh (2020) explored the expert's opinion about Fred Rogers STEAM teaching approach and five themes were identified by four experts including inquiry based learning, learning by doing activities, interesting and systematic teaching strategies. This analysis involved semi structured interviews and found benefitted in selecting teaching strategies based on expert's opinion. Thus, the results of this concept study provide information about the benefits of STEAM in the education sector. In addition, the study's main conclusion is to help teachers, the principal, administrative, and teacher training institutions to find out the needs of students during learning, and the benefits of involving STEAM in the learning process, so that they can develop learning that suit the students. [35] It is further suggested that more STEAM based research should be carried out at all levels of education.

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