

Development of Steam Innovation Learning Against Conventional Methods of Teachers in Islamic Boarding Schools

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Abstract

The presence of information and communication technology does not escape the impact on the education system in Indonesia, especially in learning and learning, the presence of technology in the field of education has an impact on the convenience in the process of delivering learning to know from teacher centered to student centered learning, of course by utilizing information and communication technology media, students and teachers can find learning resources and references very easily through information and communication technology media. The style of pesantren life can be seen from the structure of the teaching provided. From the structure and systematics of the teaching, you will find repeated levels from one level to another without seeing the end. The issues taught are often discussions that have been repeated over a period of years, although the textbooks used are different. It starts with a small book (mabsuthât) containing simple, concise texts, then moves to a medium book level (mutawassith). The lessons are given in recitations that take the form of open lectures, where the kiai reads, translates and explains the issues mentioned in the text being studied. Therefore, in order to solve the problem of learning methods, a new breakthrough in learning is needed. This research aims to describe the literature on steam innovation learning approaches to conventional methods in Islamic boarding schools. This study is a research and development study using a mixed approach (Mixed Method) which aims to determine the effectiveness of the development of steam innovation learning training on conventional methods of teachers in boarding schools. By using the ADDIE model, analysis, design, development, implementation and evaluation. This research was conducted at Ponpes Darul Huffaz Pesawaran, the sample of this study amounted to 30 teachers. The research technique used interviews, observation, documentation and assessment instruments. As well as data analysis using quantitative data from pretest and posttest scores which are then tested using the N-Gain statistical formula. By adopting the STEAM innovation learning approach, boarding schools can provide teachers with the skills needed in the future. In addition, this approach can also help teachers to develop creativity, critical thinking, and problem solving, which can help them in everyday life and the future. overall total results with an average of 0.75 with a high classification as well as the effective effectiveness level of STEAM innovation learning development training against conventional methods of teachers at Darul Huffaz Pesawaran boarding school.

Keywords: Assessment Instrument, Higher Order Thinking Skills (Hots), Measuring the Knowledge Dimension Physics



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PENDAHULUAN

The era of the industrial revolution 4.0 brings very significant changes, especially in human life, the results of information and communication technology certainly make it easier for humans to carry out daily activities, such as long-distance communication, e-commerce, learning, and many more benefits that can be obtained from the advancement of information technology. The presence of information and communication technology does not escape the impact on the education system in Indonesia, especially in learning and learning, the presence of technology in the field of education has an impact on the convenience in the process of delivering learning to know from teacher centered to student centered learning, of course by

utilizing information and communication technology media, students and teachers can find learning resources and references very easily through information and communication technology media.

One of the unique characteristics of Industry 4.0 is the application of artificial intelligence. The implication of the progress of the industrial revolution 4.0 is that it has a huge impact on various fields without exception in the field of education. Educational institutions today also face challenges that are not light. (Setiadi, 2019). The changes caused by the presence of ICT are not only in the joints of human life, but have proceeded to institutions and institutions in Indonesia both in the health, economic and even educational fields. These institutions have felt the impact of replacement. employee engagement from the presence of ICT in the midst of the institution. As the field of service has begun to be replaced by the presence of smart tools, mechanics are replaced by robots, so that the role of humanizing humans begins to fade from convergence which is actually absolutely necessary for humans.

The increasing progress of ICT has implications for the order of human behavior whose role has begun to be replaced (Hendrik, 2020), suggesting that Industry 4.0 has brought about a revolution of change so rapidly in various parts of the outside world, including the world of education. In the current season, the field of education is required to be able to equip students with 21st century skills, including many fields of work that should be filled by SMK graduates left behind are replaced by new technologies with artificial intelligence such as automatic machines and robots. The impact of this is that many SMK graduates are threatened with unemployment where what should be SMK graduates can immediately work is replaced by machine power (Setiawan, 2020). The skills that must be possessed to welcome the Big Data Era stimulate the Indonesian government through the ministry of education and culture to improve the quality of Human Resources (HR) who must have digital skills and creative thinking. In addition, the government is also trying to reduce the national unemployment rate by synchronizing education with the world of work and industry, so that college graduates are work-ready graduates with fields of expertise and the needs of the world of work (Baharuddin, 2021).

The role that is replaced in the field of Vocational High School does not escape the Madrasah Aliyah education level (boarding school) as an Islamic religious institution that teaches the order of human life as a perfect creation of Allah SWT. The independent curriculum promoted by the Minister of Education and Culture of the Republic of Indonesia actually marks that the industrial revolution 4.0 has entered the education system, learning methods that tend not to be varied (monotonous), innovation and creativity produced by educators and students who are far from satisfactory indicate the lack of success of the education system that refers to the 2013 curriculum. The presence of digital media in the process of learning and learning in the field of education, making a new view for an educational institution is no exception to the education system at the ponpes or madrasah level.

The style of pesantren life can be seen from the structure of the teaching provided. From the structure and systematics of the teaching, you will find a repetitive level from one level to another without seeing the end. The issues taught are often discussions that have been repeated over a period of years, although the textbooks used are different. It starts with a small book (mabsuthât) containing simple, concise texts, then moves to a medium book level (mutawassith). The lessons are given in recitations that take the form of open lectures, where the kiai reads, translates and explains the issues mentioned in the text being studied. This empirical reality actually describes the condition of traditional pesantren, which in other

terms is called salafi, in Indonesia. However, when entering the modern world, this condition gradually changes and seeks another cultural identity, which is more modern, professional, and with a more systematic learning curriculum (Kharlie, 2019).

The problem that is often present from the style of learning in Islamic boarding schools lies in the output produced, it is not uncommon for alumni to feel confused when faced with real things, such as the use of information and communication technology media, lack of knowledge of innovation and creativity from 21st century skills making the learning system in Islamic boarding schools monotonous, so it is not uncommon for students to lag behind both cognitive, affective and psychomotor. Educators are facilitators in designing learning that is used to achieve the goals of the vision and mission that has been set, in order to achieve these goals, of course, educators can innovate and be creative in conveying learning messages to students by not diluting the identity of the pondok pesanteren institution, for that educators are expected to be able to solve problems related to 21st century learning.

The teacher as the main subject who plays a role is expected to be able to be a driving force to take actions that provide positive things to students. Education is one of the most important factors in determining the quality of human resources and the progress of a nation. The educational process is able to give birth to creative, innovative ideas in the dynamics of the times. Curriculum development is an instrument to improve the quality of education. The correct education policy will be seen through the implementation of the applied curriculum because "the curriculum is the heart of education" which determines the ongoing education (Ade Aransyah & Herpratiwi, 2023). Learning in schools no longer needs to use the doctrine system (influencing) but rather the process of providing knowledge and understanding of the postulates or basis of everything known, so that learning in the classroom is nothing more than teaching how to live to students. Thus, a learning approach is needed that is able to provide an understanding of the meaning of life and also provide ample space for students to build and develop their mindset (Adha, 2012).

Education must always be designed to be ready to face the times. The presence of the industrial revolution 4.0 requires the world of education to be able to use technology in the learning process in order to have the ability (skill) and be able to compete in the world of work. In this context, then the world of education applies 21st century learning which is identical to technological developments. One of the things that affects the learning process is learning media. Learning Media basically aims to create an environment that supports the teaching and learning process and distributes messages so that learning objectives are achieved (Eva et al., 2020). One alternative that can be used by the ponpes or madrasah education system is to use the STEAM (Science, Technology, Engineering, Art and Mathematic) approach. STEAM creates an active learning system because all five aspects are needed at the same time to solve problems, the solution also shows that this learning approach can unite abstract concepts from all aspects.

According to Ninit (2020), the complexity of the 21st century demands abilities from various fields and STEAM-based learning can be a preparation and practice to face them all. The implementation of STEAM in learning in Indonesian schools is intended to prepare students to be able to solve problems and make decisions and be able to communicate and collaborate. According to Mufidah (2019) STEAM learning provides considerable benefits for students, namely making students problem solvers, inventors, innovators, independent, logical thinkers, technology literacy, connecting historical culture with education and connecting STEAM education.

STEAM is an integrated learning between science, technology, engineering, art and math as a platform to develop students' inquiry activities, communication skills and critical

thinking in learning. STEAM is a combination of learning between science, technology, engineering, art and mathematics to develop students' creativity in learning, especially in the boarding school learning system. Based on the background explanation above, the researcher wants to explain the effectiveness of STEAM innovation learning development training on conventional methods of teachers in boarding schools.

RESEARCH METHODS

This research is a research and development study using a mixed approach (Mixed Method) which aims to determine the effectiveness of the development of steam innovation learning training on conventional methods of teachers in boarding schools. By using the ADDIE model, analysis, design, development, implementation and evaluation. This research was conducted at Ponpes Darul Huffaz Pesawaran, the sample of this study amounted to 30 teachers. The research technique used interviews, observation, documentation and assessment instruments. As well as data analysis using quantitative data from pretest and posttest scores which are then tested using the N-Gain statistical formula.

RESEARCH RESULTS AND DISCUSSION

Research Results

This research uses the ADDIE approach which consists of 5 stages, namely:

1. First stage Analysis. At the analysis stage, the researchers conducted observations and needs analysis related to the problem. The problem that occurs is the tendency of teachers to apply conventional learning methods, causing the implementation of learning to be monotonous and not conducive. Based on the needs analysis of 10 teachers, the need for modern learning methods and procedures as evidenced by the distribution of questionnaires is known:

Table 1. Needs Analysis

No	Question Item	Options		Percentage
		Yes	No	
1	do you tend to use conventional methods in learning ?	8	2	80
2	have you ever attended training related to modern learning methods?	0	10	100
3	do you need a facilitator in developing learning ?	0	10	100
4	whether students need digital learning media ?	10	0	100
5	have you ever used digital media in learning ?	8	2	80

Source: Excel Data Processing

Based on the data above, it is known that 10 teachers of Darul Huffaz Islamic boarding school need training with a percentage value of 100%, the tendency of teachers to use conventional methods also has an impact on students with the desire of students to need digital learning media with a value of 100%, then teachers have difficulty in developing learning using digital media with a percentage of 80%.

2. Second stage Design. The design stage is designing a training model carried out by researchers based on the potential and conditions for developing training at Darul Huffaz Islamic boarding school in, by determining the activities and implementation time, as follows:
 - a. STEAM innovation learning development training design against conventional methods of teachers in Pondok Pesanteren Darul Huffaz Pesawaran
 - b. Implementation time is carried out for 3 (three) consecutive days starting at 08.30 WIB until 14.00 WIB

- c. The implementation material is:
- 1) The first day explained materials related to modern learning methods with STEAM innovation, digital media in learning and provided examples of digital learning media development.
 - 2) The second day the audience started to design digital-based learning media.
 - 3) On the third day, the audience presented the implementation procedures of the developed product to be applied to students.
3. Third Stage of Development. At the development stage, teachers presented the products to the facilitators of the training activities.
4. Fourth Stage of Implementation. At this stage the teacher implements learning by using STEAM innovation learning in the classroom.
5. Fifth stage Evaluation. The evaluation stage is the final stage of implementing learning development by looking at the advantages and disadvantages of the products developed by teachers during the training. In this final stage, researchers gave formative tests in the form of pretest and posttest questionnaires, which are as follows:

Table 2. Results of Pretest And Posttest Scores

No	Respondent Name	Value		N-Gain	Classification
		Pretest	Posttest		
1	Respondents1	52	88	0,75	High
2	Respondents 2	58	86	0,67	Medium
3	Respondents 3	62	88	0,68	Medium
4	Respondents 4	60	88	0,7	High
5	Respondents 5	60	96	0,9	High
6	Respondents 6	76	92	0,67	Medium
7	Respondents 7	54	88	0,74	High
8	Respondents 8	58	86	0,67	Medium
9	Respondents 9	74	90	0,62	Medium
10	Respondents 10	52	88	0,75	High
11	Respondents 11	58	90	0,76	High
12	Respondents 12	62	88	0,68	Medium
13	Respondents 13	60	88	0,7	High
14	Respondents 14	78	96	0,82	High
15	Respondents 15	48	86	0,73	High
16	Respondents 16	40	86	0,77	High
17	Respondents 17	76	96	0,83	High
18	Respondents 18	42	88	0,79	High
19	Respondents 19	48	88	0,77	High
20	Respondents 20	50	90	0,8	High
21	Respondents 21	78	98	0,91	High
22	Respondents 22	56	88	0,73	High
23	Respondents 23	72	86	0,5	Medium
24	Respondents 24	80	100	1	High
25	Respondents 25	50	86	0,72	High
26	Respondents 26	50	88	0,76	High
27	Respondents 27	52	88	0,75	High
28	Respondents 28	48	90	0,81	High
29	Respondents 29	76	96	0,83	High
30	Respondents 30	44	90	0,82	High
Total		1774	2696	22,63	
Average		59,13	89,87	0,75	
Minimum		40	80	0,5	
Maximum		80	100	1,00	

Source: Data Processing (Attached)

Classification and effective effectiveness level. From the STEAM innovation learning development training on conventional methods of teachers at Darul Huffaz Pesawaran boarding school

Discussion

Based on the results of the training, it is known that the definition of education in general is a conscious and planned effort to create a learning atmosphere and learning process for students to actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves and society. education is a learning process as a conscious and systematic effort for learners to be able to understand, understand, and make humans more critical in thinking. Also, any experience that has a formative impact on the way learners think, feel, or act can be considered education. Education is expected to provide knowledge that enables people to cope with life's problems in professional tasks and in everyday life. However, in today's rapidly changing life conditions, it is often the case that the knowledge we have cannot be applied to address the problems that arise.

The STEAM (Science, Technology, Engineering, Art, and Mathematics) innovation learning approach combines concepts and practices from several different disciplines, with the aim of improving students' abilities in problem solving, creativity, and critical thinking. In Islamic boarding schools, this learning approach can be an alternative to combine religious knowledge with science and technology knowledge. Compared to conventional learning methods, the STEAM innovation learning approach emphasizes students' hands-on experience in creating and developing innovative and creative projects. This can help students to gain a deeper understanding of the subject matter and strengthen skills in science and technology. Islamic boarding schools, as traditional educational institutions in Indonesia, tend to adopt conventional methods in learning. However, with the development of technology and industry, the STEAM innovation learning approach is becoming increasingly relevant to equip students with the skills needed in the future.

The implementation of the STEAM innovation learning approach in Islamic boarding schools can also help overcome challenges in religious learning, especially in terms of motivating students to learn and understand religious concepts in a more interesting and practical way. However, in implementing the STEAM innovation learning approach in boarding schools, it is necessary to consider several factors such as the availability of adequate resources and infrastructure, teachers' knowledge and skills in science and technology, and support from related parties such as parents and boarding school administrators. Ultimately, the STEAM innovation learning approach can be an effective way to enrich learning in boarding schools and improve students' skills and understanding in science and technology, while maintaining religious and cultural values.

This study refers to research conducted by Taufan Febriyanto, Alifia Dityasari, Ika Kartika with the title science-technology islam society (STIM) as an integrated science learning innovation-Interconnection in 2016. The study aims to (1) develop a Science-Technology-Islam-Masyarakat (STIM) based science module (2) determine the feasibility quality of the Science-Technology-Islam-Masyarakat (STIM) based science module that has been developed (3) determine the response and implementation of students on the Science-Technology-Islam-Masyarakat (STIM) based science module developed. Research and development (R&D) research uses the development procedure by Thiagarajan, Semmel, and Semmel through 4 stages namely Define, Design, Develop, and Disseminate. This research is limited to the develop stage by producing Science-Technology-Islam-Masyarakat (STIM)-

based science modules on optical devices for boarding school students. The results of the module quality based on the assessment of material experts, graphical experts, integration-interconnection experts, and science teachers have a very good category (SB) with an average score of 3.62; 3.63; 3.33; and 3.63 respectively. Students' responses to the module in the limited trial and broad trial had an Agree (S) category with an average score of 0.97 and 0.97 respectively (Sinensi, 2016).

Furthermore, research conducted by Arini Rahmadan, Oki Sandra Agnesa with the title description of Steam Implementation (Science, Technology, Engineering, Art, Mathematic) and integration of Steam "ART" aspects in high school biology learning, in 2022. The purpose of this study was to describe the form of implementation and implications of STEAM in high school biology lessons. It is a literature research by analyzing 13 studies with a time span of 2017-2022. The results show that STEAM is implemented in the form of: learning approaches, group project activities, real problem solving activities, and activities to hone 21st century skills. STEAM has a positive effect on 21st century skills such as critical thinking skills, creativity and others. It was also found that STEAM is implemented on multidisciplinary topics such as, biotechnology, ecology/ecosystems/environmental change. Researchers and practitioners view STEAM as a multidisciplinary science, where they try to bring biology topics by integrating the five aspects of STEAM, especially for the art aspect, most of them still interpret the art aspect visual a forms, aesthetics and creativity (Rahmadana & Agnesa, 2022).

Yuyun Estriyanto also stated that after participating in the training, participants had a high enthusiasm for STEAM, a good understanding of the concept of STEAM-based learning, seeing the suitability of thematic learning in elementary schools. However, participants still need further assistance to realize it in learning (Estriyanto, 2020). Research conducted by Hani Ulfayani, Jeranah, Nur Asrawati with the title Effectiveness of the STEAM learning approach on student learning outcomes in class VII mathematics learning MTs Nurul Aziz DDI BAROBBO in 2022 Based on data from the application of the STEAM learning approach to learning outcomes in class VII mathematics learning. A MTs Nurul Azis DDI Barobbo which became the research sample after applying the STEAM learning approach 100% was in the high category with an average of 72.47, the percentage of student activity 86% was in the good category, the percentage of student responses 84.6% was in the good category and the implementation of learning 91.6% was in the excellent category. The average value of learning outcomes was 72.47 exceeding the KKM value of 70 with 100% classical completeness. This research has proven that the STEAM learning approach is able to improve students' math learning outcomes so that it can be used as an alternative in learning (Azis & Barobbo, 2022).

Furthermore, research conducted by Iik Nurhikmayati, in 2019 with the title STEAM Implementation in Mathematics Learning. In the field of education, one of the educational breakthroughs in Indonesia that seeks to develop humans who can create a science and technology-based economy is STEAM learning. STEAM as a learning approach is a means for students to create science and technology-based ideas through thinking and exploring activities in solving problems based on five integrated disciplines. STEAM implementation in learning is a process of applying ideas, ideas and concepts contained in meta-disciplines in a lesson that is expected to improve the ability both in cognitive, affective and psychomotor aspects of students in facing technological advances. In this study, it will be discussed how the implementation of STEAM in learning in schools, especially in learning mathematics and how the example is. This research aims to provide the benefits of knowledge related to STEAM and its implementation in learning mathematics in schools, both for teachers and lecturers as learning actors (Nurhikmayati, 2019).

Research conducted by Meida Afina Putri, Cahyorini Wulandari, Annisa Rizky Febriastuti, in 2021 with the title implementation of the STEAM learning approach made from loose parts in developing 21st century skills in early childhood, the results of the study described The progress of global market development has a significant impact on various fields of life, including in the field of early childhood education. As a future leader of the nation in the future, a child needs to be equipped with various knowledge and skills. The existence of the STEAM (Science, Technology, Engineering, Art, Mathematics) learning approach model with loose parts is expected to be a bridge to improve 21st century skills in early childhood. In this research, researchers used a qualitative method with analysis using literature study techniques. Furthermore, the results of the research are analyzed and described using precise and systematic language. From the results of the analysis that has been carried out, it is concluded that the STEAM learning approach using loose parts can improve the abilities and skills of early childhood in the 21st century because by using loose parts, children can freely express their creative ideas (Et, 2021).

Ade Putri Tania with the title learning strategy through tutoring for students of the Darussalamah Margomulyo Puncu Islamic boarding school during the Covid-19 Pandemic in 2021. The existence of COVID-19, which is still hitting the territory of Indonesia until the month of August 2021, has a bad impact on education in Indonesia, especially children who are still in elementary school (SD). This makes learning, which initially used a face-to-face system, must be changed to distance education or education taken from home (Online). In order for learning to continue optimally, of course, educators must be able to apply different, innovative and creative learning strategies. The type of research used is descriptive qualitative which is used to obtain information on the obstacles and consequences of the COVID-19 pandemic on the teaching and learning activities of students who are still studying at the Darussalamah Islamic Boarding School. The research subjects/respondents for this study were the santri guardians and the students themselves, totaling 5 starting at the elementary school level. Data collection techniques in the form of interviews. The application of this learning strategy is mostly done offline or can be called Offline in Pondok classes.

Although the teachers of the students during the COVID pandemic taught them by learning at home (online and offline methods). Online learning is carried out through online networks such as, social media WhatsApp (WA) Group in the form of text messages or telephone calls and using the GoogleMeet application occasionally to replace face-to-face learning. Sometimes it is also done offline with school teachers who come to the Pondok. But with the teacher's efforts like that, there are still many students (Santri who attend school) who do not quite understand the meaning of the lesson discussion or even the students often complain that they are bored with this two-year learning. Therefore, the students who conducted this research wanted to convey that there is a learning strategy for elementary school children and to arouse the motivation of the students to study harder. The results of this study will be useful as a reference for elementary school teachers who have implemented learning during the COVID-19 pandemic (Tania, 2021).

Aji Sofanudin, Nugroho Eko Atmanto, and Rahmawati Prihastuty, in 2021 with the title Best Practice Management of Islamic Boarding School-Based Madrasah Ibtidaiyah in Yogyakarta. The description of this research aims to find out the best practices of madrasah management in Yogyakarta. This research was conducted using a qualitative method of case study at MI Wahid Hasyim Yogyakarta. The results showed that the management of MI MI Wahid Hasyim was integrated with the Wahid Hasyim pompes. This madrasah follows all the policies implemented by the education office, the policies of the ministry of religion office, and the rules of Wahid Hasyim Islamic Boarding School. MI Wahid Hasyim was established in

1966, with the name MI Ma'arif Gaten under the management of LP Ma'arif. In 1995 it changed to MI Wahid Hasyim under the management of the pesantren. Since 2018 the MI Wahid Hasyim study room has moved from the pesantren, Jl Wahid Hasyim No 3 to the new MI building on Jl Cendrawasih No 1 Condongcatur occupying village land. The number of MI students is 224 children; some follow full day learning and some (around 40%) are boarders. The number of teaching and education personnel formally totals 24 teachers, but factually there are more because they are assisted by PP Wahid Hasyim mahasantri. Based on document data, it is obtained that learning at MI Wahid Hasyim uses STEAM (science, technology, engineering, art and mathematics) in cross-science which can form a logical and systematic mindset in order to achieve the vision of "moslem generation, future leader" (Sofanudin et al., 2021).

CONCLUSION

By adopting the STEAM innovation learning approach, boarding schools can provide teachers with the skills needed in the future. In addition, this approach can also help teachers to develop creativity, critical thinking, and problem solving, which can help them in their daily lives and the future. overall total results with an average of 0.75 with a high classification as well as the effective effectiveness level of STEAM innovation learning development training against conventional methods of teachers at Darul Huffaz Pesawaran boarding school.

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