Steam-Based Distance Learning on Early Childhood Education Centers in Central Java

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Abstract. This study aimed to define distance learning that integrates STEAM in Early Childhood Education centers in Central Java. It is a quantitative descriptive study using a survey methodology. In this study, the population and sample were teachers (n=140) at Early Childhood Education centers in Central Java. According to data processing and analysis, distance learning incorporating STEAM has primarily been implemented in Early Childhood Education centers in Central Java. Distance learning that STEAM educates children to develop higher-order thinking skills. According to the descriptive analysis calculations results, the percentage of distance learning containing STEAM received the highest score of 89 with a percentage of 64%. As a result, it is possible to conclude that distance learning incorporating STEAM has a high level of effectiveness and the belief that children will be better able to solve problems to be more effective. Many parents in this study do not understand early childhood development and the learning process during distance learning. As a result, the purpose of this article would be to explain the significance of strengthening STEAM-loaded distance learning in children to provide children with a practical learning experience by increasing cooperation between teachers and parents.

Key words: distance learning; steam; central java.

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INTRODUCTION

According to Ministerial Circular Letter No. 4 of 2020, was issued on March 24, 2020, regarding the implementation of education policies during the emergency phase of the spread of the coronavirus disease (COVID-19), one of the contents of which is learning from home with online or distance learning activities. Almost worldwide, online learning has been carried out during the pandemic (Goldschmidt, 2020). As a result, during the Covid-19 pandemic, every school conducted educational activities through distance learning.

The Covid-19 pandemic is a global health emergency that has mainly affected every country globally (Purwanto et al., 2020). This pandemic has affected a variety of disciplines, including education. Numerous countries have decided to close schools and campuses temporarily during the COVID-19 pandemic. Each country develops policies to address current issues. One way to tackle the Covid-19 pandemic outbreak in all countries is to take actions, one of which is to conduct social distancing movements. Social distancing movements aimed to minimize people's interaction in the broader community (Wilder-Smith & Freedman, 2020). The practice of social distancing contributes to learning at school and prevents face-to-face teaching. It also affects the implementation of educational activities.

Education, which was recently done face-to-face in educational institutions, has been changed to online learning and is now conducted from home to stop and prevent the COVID-19 virus. The policy is applicable at all levels of education, from Early Childhood Education to Higher Education. It is a proactive step by the government because learning does not have to occur face-to-face; it can occur via social media, technology, and applications. This type of education is referred to as online education (Adiwijaya, 2020).

The proper learning when distance learning is by using STEAM-charged learning. According to the Ministry of Education and Culture's Repository (2019), STEAM is a collaborative learning environment that fosters motivation and innovation, fostering creative individuals and communities that are not limited to scientific disciplines. The term STEAM is used to emphasize the interconnected nature of the disciplines of science, technology, engineering, arts, and mathematics and their significance for children's long-term academic success and economic well-being (Quigley & Herro, 2016). STEAM learning content has several effects on early childhood, including increasing children's interest and understanding of technology and their ability to solve real-world problems (Thuneberg, Salmi, & Bogner, 2018). Following Kofac (2017), STEAM encompasses scientific

technology-based learning and the ability to solve real-world problems.

STEAM-based education (Science, Technology, Engineering, Art, and Mathematics) can assist students in stimulating their thinking processes and preparing them to face the globalization era's challenges (Henriksen, 2017; Sheffield, Koul, Blackley, Fitriani, Rahmawati, & Resek, 2018). STEAM education is now a priority in education (Kang, 2019; Sheffield et al., 2018). Thus, the application of STEAM in the classroom can result in complex and perfect learning products that contribute to improving educational quality (Henriksen, 2014). The teacher is responsible for various assignments during the STEAM learning process, including observation, providing stimulus through questions, offering opinions and suggestions, and evaluating the children's work. Meanwhile, children working in a study group develop an understanding of the STEAM concepts (Yakman & Lee, 2012)

STEAM learning can help children develop curiosity, an openness to experience, and the ability to ask questions, all of which help children build knowledge by exploring, observing, discovering, and investigating the world around them (Perignat & Katz Buonincontro, 2019). And ask questions to build knowledge around them by exploring, observing, discovering, and discovering things around them (Munawar, 2019).

Additionally, STEAM is used because of its advantages, namely that well-integrated learning content enables programs through social discourse that incorporate complementary learning theories as desired (Kelley & Knowles, 2016). This statement can be interpreted to mean that a well-integrated STEAM program has the potential to create programs that integrate complementary theories via social media. Schools are urged to integrate STEAM-based learning effectively and develop their pedagogical capabilities to fully utilize STEAM's potential for children (Margot & Kettler, 2019; Estapa & Tank, 2017).

According to STEAM learning, STEAM is an acronym for science, technology, engineering, art, and mathematics. STEAM has a variety of effects on early childhood, including increasing children's interest and understanding of technology and their ability to solve real-world problems. Additionally, the five aspects represent a systematic way of thinking that enables children to comprehend science and apply it to their daily lives.

According to field observations and interviews with teachers and principals of Playgroup - Hidayatullah Islamic Kindergarten and Cahaya Ilmu Semarang City Islamic Kindergarten, teachers can still implement STEAM learning into distance learning, and children will learn without realizing it. It is because STEAM is packaged as enjoyable children's games. Especially during a pandemic, how to interpret effective learning is critical because, without direct teacher assistance during learning, STEAM learning is expected to facilitate parental activities with children at home. In other situations, it is hoped that children's learning will be effective.

There must be significant support and cooperation between the school and parents to ensure distance learning that integrates STEAM, such as the availability of learning media that children can use while studying at home. The school has anticipated it, which has made efforts to provide play materials that parents can take to school to support STEAM-related activities while studying at home. Additionally, as part of the assessment of distance learning, the school requests parent-child help and support in assessing children's life skills at home via a google form sent to parents.

Additionally, this article will describe STEAM distance learning for early childhood in Early Childhood Education centers throughout Central Java, emphasizing increasing collaboration between teachers and parents as partners in the home learning process.

METHODS

The research design used is descriptive quantitative research, which describes the subject or object of study in its current state based on the facts as they exist or are. According to Sugiyono (2018), quantitative descriptive research is conducted to assess the existence of independent variables, either one or more (independent) variables, without comparing or connecting them to other variables. The problems studied are apparent and fixed in nature; reality is viewed as a single entity, and deductive thinking patterns are observed. This research uses a survey method in which the researcher tests a sample of people (respondents) about the information required by the author. The survey method is implemented through the use of the google form link. This study aimed to determine the effectiveness of distance learning utilizing STEAM in Early

Childhood Education centers throughout Central Java.

The study's population consisted entirely of teachers employed in Early Childhood Education centers throughout Central Java. The population of Early Childhood Education centers in Central Java (n=140) was studied in this study, with a sample of four teachers from each district/city. A distance learning questionnaire containing STEAM was used as the instrument. The questionnaire was created using a google form, and respondents were only required to complete the questionnaire that the researcher provided online. The questionnaire is intended to allow for a holistic view of the respondent's response, allowing researchers to analyze distance learning that integrates STEAM. For additional information, the steps involved in data collection are as follows:

a. The author went to the school for initial observations and presented the principal with a permission letter for observation from the university.
b. Collaboration with teachers at Early Childhood Education centers in Central Java through regional teacher coordination groups and requesting their willingness to assist researchers in finding necessary data on distance learning incorporating STEAM in Early Childhood Education centers in Center Java.
c. The author enters existing data using the instrument's guide sheet that was previously created.
d. Verify the data recorded in the instrument sheet, just if something is incorrect or missing data.

The analysis technique used in this quantitative descriptive study uses observation, interview, documentation, and questionnaire techniques.

The analysis is descriptive quantitative, involving the various types of data obtained from the instrument sheet. The following are the steps involved in data analysis:

1. Data collection from respondents.
2. Once the data was gathered, use the following formula to determine the percentage of distance learning that is STEAM-based:

$$P = F/N \times 100\%$$

Description :
P = Prosentase
F = Ideal data frequency
N = The amount of data is ideal and not ideal

RESULTS AND DISCUSSION

This study, conducted at Early Childhood Education centers in Central Java, found that STEAM-based learning significantly impacts children's learning at home. Based on the distribution of calculated data, the following descriptive analysis is performed:

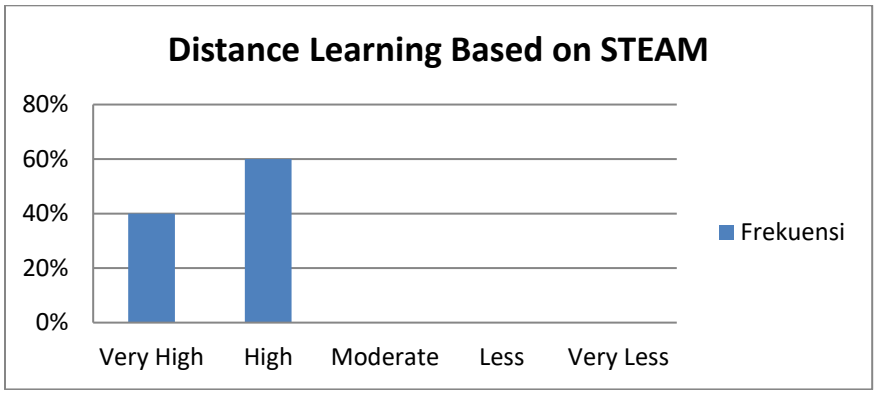

Figure 1. Descriptive analysis of the proportion of distance education that incorporates STEAM

As illustrated in Figure 1, Early Childhood Education has begun to integrate STEAM into learning 64% of respondents indicated that they fell into the high category. It is demonstrated by the acquisition of scores from 140 respondents, obtained as a percentage of the analysis of respondents' instrument responses with a very high score category of 24%, a high score category of 64%, a moderate score category of 12%, a low score category of 0%, and a deficient score category of 0%. Thus, a descriptive analysis of distance learning incorporating STEAM demonstrates that Early Childhood Education in Central Java has begun to integrate STEAM into

learning at a high level, scoring 64% and falling within the 60-80 interval. According to the data analysis findings outlined above, the researchers conclude that distance learning with STEAM content rises into the high category, with a percentage value of 64%.

The results of data analysis show that the image of distance learning containing STEAM in Early Childhood Education centers in Central Java has begun to integrate STEAM in learning. However, these findings require further discussion to provide a more detailed interpretation of the research findings concerning the previously stated theories and frameworks. The teacher made the following efforts in response to a research survey in the field of distance learning with STEAM content:

a. The teacher encourages children to develop higher-order thinking skills and provides opportunities for children to observe events occurring around them.
b. The teacher makes various media or tools available for developing STEAM fields available.
c. The teacher can arouse those who support the inquiry process in children, but the theme may disappear at times.
d. There has been a collaboration between teachers and children in exploring and experimenting to produce a work.
e. The availability of learning media facilitates children's comprehension of mathematical concepts through play activities such as number recognition, shape recognition, and pattern recognition.

The findings of this study corroborate those of previous studies such as Arsy, I., & Syamsulrizal, S. (2021) and Wahyuningsih, S. et al. (2019), which all support the hypothesis that STEAM learning enables children to solve problems more effectively. STEAM (Science, Technology, Engineering, Arts, and Mathematics) is an acronym for Science, Technology, Engineering, Arts, and Mathematics. The STEAM learning model has several effects on early childhood, including increasing children's interest and understanding of technology and their ability to solve real-world problems (Thuneberg, Salmi, & Bogner, 2018). As Kofac (2017) explains, STEAM includes scientific technology-based learning and the ability to solve real-world problems.

Additionally, the STEAM learning model encourages children to develop curiosity, an openness to experience, and the ability to ask questions, allowing children to build knowledge about the world around them through exploration, observation, discovery, and investigation (Munawar, 2019). STEAM is centered on creation, specifically the final product and manufacturing process. The manufacturing process is more significant than the final product, as it incorporates exploration, creative thinking, independence, engineering design, creative expression, evaluation, and redesign (Perignat & Katz-Buonincontro, 2019). The STEAM model can be used to teach children to process information through observation, play, pattern recognition, and practice of creative thinking skills, as well as collaboration and communication skills between children while completing a task or project assigned by the teacher (Guyotte, KW, Sochacka, NW., Costantino, TE, Walther, J., & Kellam, 2014).

This study discovered various challenges, including numerous parents unfamiliar with the task of child development and the child's learning process during distance education. This article discusses the importance of strengthening STEAM-based distance learning in children to ensure a practical learning experience for children through increased collaboration between teachers and parents.

CONCLUSION

The pandemic has altered almost every aspect of life, including education. However, to support children's education, schools and teaching staff should immediately set up optimal distance learning programs. Although each school has its policies, using STEAM content learning can be a practical step in distance learning. Furthermore, the acronym STEAM, which stands for science, technology, engineering, art, and mathematics, increases children's ability to solve problems more effectively. Early Childhood Education teachers must be able to design innovative, creative, and technological STEAM learning activities and attract and encourage children's curiosity to learn about their surroundings, all while maintaining active communication with parents. It is hoped that parents will accompany their children in the learning process and be actively involved in providing STEAM learning stimuli to children, ensuring that all aspects of their development are well stimulated.

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