
Analysis of Elementary School Teachers' Knowledge of Scratch Learning Media: Insights from an Islamic Education Perspective

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Abstract: The rapid advancement of technology has influenced all aspects of human life, including education. In the teaching and learning process, technology plays a crucial role in achieving learning objectives more effectively. Scratch is a simple coding platform that supports the development of students' computational thinking and creativity. Teachers' knowledge is essential for the effective implementation of such media. This study aimed to analyze elementary school teachers' knowledge of Scratch learning media in public and private elementary schools in Pekanbaru, Indonesia. Using a quantitative descriptive survey design, data were collected from 40 classroom teachers across Grades 1 to 6, selected purposively to represent diverse experiences and school types. A structured questionnaire with 15 items was distributed both online and offline to gather data on teachers' knowledge, experience, and perceptions of Scratch. The collected data were validated and analyzed using descriptive statistics with SPSS version 25, including frequency and percentage distributions. The results revealed that 68% of teachers had never attended Scratch training, 20% had developed Scratch-based learning media, and 67% faced difficulties in creating their own media. However, 97% supported the integration of Scratch into the teaching process, and 95% expressed the need for Scratch as an alternative medium to enhance computational thinking and digital literacy. These findings highlight the importance of targeted training programs and institutional support to enhance teachers' competence in using Scratch effectively in elementary classrooms.

Keywords: Teachers' knowledge; scratch; learning media; elementary education.

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INTRODUCTION

Society 5.0 is a concept of human life that uses technology-based education and social interaction (AI, Robot, Scratch)(Amla, 2021; Jayanthi et al., 2023; Legi et al., 2023; Syarif, 2020; Yaras & Öztürk, 2022). This can be seen during the last pandemic when the concept of education no longer has to be done face-to-face. Technology is developing rapidly and significantly (Daniel, 2020), So, various aspects of human life are also undergoing rapid changes, including the educational aspect.

This is a challenge for adjusting the educational aspect to the development of technology which is often done in line with the ease of accessing technology and information nowadays. Technology and information can improve the quality of education, which indeed should change so as not to be monotonous (Farsakhanova & Alibekov, 2020; Gulyaeva et al., 2020; Huynh et al., 2020). Changes can be seen in the teaching and learning process that used to be teacher-centered. Besides, technology and information also cause

changes in the curriculum to prepare superior human resources to achieve globally competitive human resources. Technological advances have affected the way we acquire knowledge and learn. acquire knowledge from the Internet and focus on finding information quickly (Nafi'a et al., 2020; Szymkowiak et al., 2021; Yusuf, 2019).

Indonesia, in particular, is dominated by generations X, Y (Millennials), and Z—groups that are generally technology literate and highly adaptive to digital environments. The mastery of technology among these generations is achieved through continuous learning processes that must be rigorously tested and evaluated. To realize an education system that effectively promotes technological competence, technology integration must be embedded across all levels of education—from elementary to tertiary (Huynh et al., 2020). Within this framework, the alignment between educational objectives and the content of teaching materials is essential. Education should not only focus on producing graduates who can operate technology but also nurture individuals who are critically aware, ethically grounded, and capable of using technology responsibly (Mulyani & Haliza, 2021).

In this context, the role of educators becomes central to ensuring that students gain knowledge and skills that are relevant to their needs and aspirations. Teachers act as facilitators who guide learners in exploring, applying, and constructing knowledge through technology-based media (Kravarusic, 2021; Szymkowiak et al., 2021). The integration of moral and digital media is expected to enhance students' learning outcomes by promoting engagement, comprehension, and motivation (Budiyo, 2009; Camilleri & Camilleri, 2017; Namiroh et al., 2018; Rahma et al., 2024). Research has shown that teachers who effectively utilize learning media can simplify complex subject matter, leading to improved academic performance. When learning outcomes improve, educational objectives are achieved more optimally. Furthermore, the use of interactive learning media helps shift the dependency away from teachers as the sole source of information, aligning with the 2013 Curriculum's principles that emphasize learner autonomy and active participation (Wahyuningtyas & Sulasmono, 2020).

Among the various digital tools available, Scratch stands out as a visual programming platform specifically designed for children and beginners. Scratch introduces programming concepts in a way that is simple, intuitive, and meaningful (Liao, 2022; Ouahbi et al., 2015; Ozoran et al., 2012; Plaza et al., 2018; Romero & Artal-Sevil, 2021; Zubaidi et al., 2021). The idea used in the Scratch Application is to change the language from the code and syntax forms, the code is synthesized by dragging and stacking graphic tiles according to the instructions (Stoumpa et al., 2022) into easy and attractive object forms to use for learning (Poobalan et al., 2019). Completing challenges in educational games can stimulate students to think critically and think computationally because computational skills are competencies that are increasingly being developed and have many benefits and are skills that students need in the 21st century (Plaza et al., 2021; Threekunprapa & Yasri, 2020; Widiningrum et al., 2021).

In programmatic education, it is necessary to convey clearly the needs, objectives and contents and benefits of education (Oh, 2017). Computational Thinking (CT) can be defined as the skills of solving problems, designing systems, and understanding human behavior based on computer science concepts. Significant improvement in results on all tests has been measured, supporting the use of metaphors and Scratch to teach computer programming concepts to Elementary Education students to develop their computational skills (Angeli & Giannakos, 2020; Pérez-Marín et al., 2020; Wei et al., 2021)

Based on research Papadakis (2019) explaining that the use of Scratch is able to encourage and produce computational skills in students, then According to (Plaza et al., (2019) scratch has great potential as a solution or tool for students who are just starting knowledge related to STEM and is used as a alternative learning media (Kobsiripat, 2015; Sutikno et al., 2019). Seeing the importance of media in the learning process, research results (Ahn et al., 2011; Fidai et al., 2020) state that scratch media has an overall positive effect ($d = 0.67$ (CI: 0.40, 0.95) on achievement students and can be implemented as a cross-curricular (Sáez-López et al., 2016)

Scratch is a visual language, which is the creation of projects using an intermediary in the form of images (Jannah et al., 2021). It is in the form of an application designed to introduce simple computer programming concepts, so it can be understood by anyone from various backgrounds and can be used to create applications, animations, and games (Durak & Guyer, 2019; Fagerlund et al., 2021; Fatourou et al., 2018; Funke et al., 2017; Sikwebu & van Greunen, 2020). Scratch is a programming language involving the icon-based assembly of command blocks. Learning using educational games will train students to think more broadly and encourage them to be more involved in learning activities (El-Shamy, 2023; Hamari et al., 2016; Westera, 2019; Zeng et al., 2020). By providing educational games to students, they will be able to release all their abilities to complete the challenges in the game. In completing these challenges, students are stimulated to think critically and computationally. Providing educational game-based learning to students will make students absorb 90% of learning faster compared to learning only by giving videos or other media. This is in accordance with the theory of Edgar, it can be seen that learning that is carried out by playing roles, doing simulations, and doing real things will make students absorb 90% of learning faster than learning that is carried out by other methods (approaches) (Wanda Wibawanto, 2018). Therefore, by providing educational game-based learning, it will be included in the learning by doing real things category, so it can make students absorb 90% of learning better (and faster).

Given these considerations, it can be concluded that Scratch-based learning media plays a vital role in modern education, especially in promoting computational literacy and active learning among young students (Amalia & Sukasih, 2025; Dwilestari et al., 2024; Maola & Irianto, 2023; Sekarsari & Karimah, 2025). Its integration into classroom practice represents not merely the adoption of a new tool but a transformative pedagogical shift toward creativity, collaboration, and innovation. Based on this background, this study focuses on analyzing elementary school teachers' knowledge of Scratch learning media, which serves as a crucial foundation for effective implementation of technology-enhanced education in the context of the Society 5.0 era.

METHOD

This research is a survey study (Fink, 2003) and falls under the quantitative category using a descriptive statistical approach. The purpose of this design was to obtain an overview of elementary school teachers' knowledge, experiences, and perceptions regarding the use of Scratch learning media in the teaching and learning process. A survey method was considered appropriate because it allows for the systematic collection of data from a relatively large number of respondents within a specific population, providing a comprehensive depiction of existing conditions without manipulating variables.

The study was conducted across several public and private elementary schools in Pekanbaru, Indonesia. These schools were selected based on their initial exposure to or

implementation of technology-based learning media in classroom instruction. The inclusion of both public and private schools aimed to ensure the representativeness of the findings across different institutional contexts and resource settings.

The participants in this study consisted of 40 classroom teachers representing various grade levels—from Grade 1 to Grade 6. A purposive sampling technique was employed to select participants who had at least basic experience with digital or computer-assisted learning tools. This approach was intended to capture diverse perspectives based on differences in teaching experience, educational background, and school type. Such diversity among participants provided a more holistic understanding of teachers' readiness and attitudes toward integrating Scratch into the curriculum.

Data collection was carried out using a structured questionnaire consisting of 15 items covering aspects of teachers' knowledge, experience, and perceptions of using Scratch learning media. The questionnaire was distributed both offline during school visits and online through digital links to provide flexibility for the participants.

All collected data were validated to ensure completeness and consistency of responses. The data were then analyzed using descriptive statistical techniques with SPSS version 25, including the calculation of frequencies, percentages, and data distributions to describe teachers' levels of knowledge, experience, and needs regarding the use of Scratch as a learning medium.

The results of this analysis provided valuable insights into the extent to which elementary school teachers understand, apply, and value Scratch as a technological learning tool. Moreover, the findings serve as an empirical foundation for further studies exploring the integration of computational thinking and digital literacy in primary education settings in Indonesia.

RESULT AND DISCUSSION

The researchers conducted a study to analyze elementary school teachers' knowledge of Scratch as learning media. The demographics of elementary school teacher respondents are presented in Table 1 below.

Tabel 1. Demografi Responden

Variables	Category	f	%
gender	female	32	80
	male	8	20
Pengalaman kerja	1-5 years	20	50
	5-10 years	3	7.5
	10-15 years	17	42.5
School Type	National	17	42.5
	Private	23	57.5

The knowledge aspects included participating in developing the Scratch learning media training, developing the Scratch learning media, difficulties in developing learning media, and using IT with the Scratch learning media in learning. The results of the analysis of the elementary school teachers' knowledge questionnaire on Scratch are presented in the following Table 2.

Table 2. Knowledge of Scratch

No	Asked aspect	Teacher's Response
1	Gain experience or participate in training in making the Scratch learning media	68% of elementary school teachers had no experience in participating in training in making the Scratch learning media
2	Develop the Scratch learning media	20% of elementary school teachers have developed the Scratch learning media
3	Have difficulty making their learning media	67% of elementary school teachers have difficulty making/developing their learning media
4	Use IT with the Scratch learning media in learning	97% of elementary school teachers agree with the use of IT with Scratch in the teaching and learning process
5	The need for the Scratch learning media as an alternative learning to improve computational thinking and scientific literacy	95% of elementary school teachers need the Scratch learning media as an alternative learning

Based on Table 2, it can be seen that 68% of elementary school teachers did not have experience in participating in training in making the Scratch learning media. Meanwhile, of the total sample, 20% have developed the Scratch learning media. Furthermore, it can also be seen that elementary school teachers who have difficulty making their learning media were 67%. Of the total sample, 97% agree with the use of IT with Scratch in the teaching and learning process, and 95% need the Scratch learning media as an alternative learning.

The results of this study showed that most of the *elementary school* teachers and students already knew about Scratch. Scratch is a programming language that makes it easy for users to create stories, animations, games, music, and art interactively—Scratch programming developed for children consists of different code blocks and graphics that are easy to understand, as well as a feature to add sounds (Zubaidi, 2021). Scratch's focus is on creating multimedia products and sharing them in a large and active online community hosted by the project's website. This is intended not only to enable and develop children's creativity but also to introduce them to programming in a fun way (Pratama, 2018).

Some researchers state that when using the Scratch learning media, students become more interested and want to learn more about coding, and hope that coding material can also be included in the school curriculum (Santoni, Mayanda Mega, 2021). Therefore, it is very important to know the level of teachers' knowledge and perception of Scratch. The rapid development of computer technology has become a driving force for teachers to prefer computer-related media (Sutikno et al., 2019). It is recommended for schools today to provide Coding Education both in school education and university education (Timur et al., 2021).

The learning process that uses technology has a good impact on the quality of learning. Many studies have proven that the learning process using technology can improve student learning outcomes (Zakir Hussain, 2018; Verschaffel et al., 2019; Kristinawati et al., 2018). This is in accordance with research (Suwastika, 2018) which states that the development and use of technology can increase student motivation in the learning process, and technology is also used as a medium of two-way communication. Technology is also very effectively used when learning remotely (Pakpahan & Fitriani, 2020). In its development, technology has a positive impact and also has many benefits such as its free use anywhere and anytime, especially in the field of education, however it needs to be considered in its use to avoid negative impacts (Mulyani & Haliza, 2021).

Besides challenges related to teachers' experience in attending Scratch training, there are various other obstacles that can affect the effectiveness of using Scratch as a learning media. One main challenge is limited technological infrastructure in schools, such as insufficient computers and unstable internet connections. This becomes a significant barrier for teachers and students to conduct Scratch-based learning optimally, especially when computer labs have to be shared, limiting students' practice time.

Students' initial understanding of technology and programming varies greatly. Some students have basic experience, but most are new to Scratch and need more time to understand programming logic and code blocks. This variability demands teachers give extra attention to support students who struggle, so no one falls behind and all benefit maximally.

The limited time allocation in school schedules often is insufficient to explore Scratch features in depth. This causes less than optimal conceptual understanding and coding practice, especially in creating complex projects and comprehensive computational thinking. Additional time or supportive sessions are needed for students to truly master coding with Scratch.

Besides technical and scheduling factors, motivation and support from families and schools play crucial roles in teaching coding using Scratch. Students encouraged and supported by parents and teachers tend to be more motivated and better able to overcome coding challenges. Lack of such support can reduce interest and learning outcomes.

Considering these challenges, enhancing teachers' capacity through continuous training, improving technological facilities, and adjusting flexible and inclusive learning models are necessary to optimize Scratch's benefits as a learning medium. Collaborative support from schools, governments, and education communities is essential to create a conducive, sustainable coding learning ecosystem.

Overall, Scratch is an effective tool not only for developing computational skills but also for enhancing scientific learning and literacy in primary education. With appropriate teacher training, resources, infrastructure, and supportive environments, Scratch can greatly contribute to better learning outcomes and engagement in elementary schools

CONCLUSION

Based on the results and discussion, this study concludes that the majority of elementary school teachers in Pekanbaru lack formal training and practical experience in using Scratch as a learning medium, as indicated by 68% who have never attended related training and only 20% who have developed Scratch-based media. Additionally, 67% of teachers reported difficulty in creating their own learning media, highlighting a significant need for capacity building. Despite these limitations, there is strong positive perception and readiness among teachers, with 97% supporting the integration of Scratch in the teaching and learning process and 95% expressing the need for Scratch as an alternative medium to enhance students' computational thinking and digital literacy. These findings indicate that teachers' limited training and technical barriers hinder the optimal implementation of Scratch in classrooms. To address this gap, structured training programs, institutional support, and continuous professional development are essential to build teachers' competencies and confidence in applying Scratch effectively. Future studies should involve a larger and more diverse sample, include inferential statistical testing to

examine predictive relationships, and evaluate the direct impact of Scratch integration on students' learning outcomes.

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