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Education Management for Islamic Teacher in the Digital Era: Integrating Innovation and Child Development Needs

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ABSTRACT. The digital era has transformed the way children interact with the world, including in the context of early childhood education (ECE). This study examines the principles of sound early childhood education in the digital era, including the role of technology, social interaction, and the roles of educators and parents in supporting children's learning. Emphasis is placed on the importance of balancing technology use with the development of children's socio-emotional, cognitive, and motor skills. This study uses a quantitative descriptive approach utilizing the SAMR (Substitution, Augmentation, Modification, Redefinition) framework to evaluate technology integration in ECE learning in Mojokerto. Data were collected through a Likert-scale questionnaire from 55 ECE teachers and analyzed to determine the extent to which the implementation of technology supports learning transformation. This study also employed SEM-PLS to examine the respondents' answers and the relationships between variables. More respondents were needed for the SEM-PLS analysis because the study included more than three constructs. For the SEM PLS analysis, the sample consisted of 158 ECE teachers. The results indicate that, although challenges remain in the initial stages of substituting and redesigning learning, most teachers demonstrate a high acceptance of the use of innovative technology that supports child engagement. This study provides practical and conceptual insights for educators and policymakers in designing learning strategies that align with digital development and children's developmental needs.

Keywords: *SAMR model, ECE teachers, digital era, technological innovation, SEM PLS*

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INTRODUCTION

Changes in digital lifestyles have had significant implications for education, including at the earliest level, Early Childhood Education (ECE). Digital devices are now a part of children's lives, necessitating adjustments to pedagogical approaches to early childhood education. In this context, a deeper understanding is needed of how technology should be integrated without sacrificing the essence of social interaction-based learning and sensorimotor exploration, the foundation of early childhood education (Rokhman et al., 2023). Therefore, this research not only highlights the challenges of technology use but also seeks to answer how ECE teachers can utilize technology to improve the quality of learning that is appropriate, precise, and meaningful.

Early childhood education (ECE) is a crucial foundation in developing children's cognitive, social, and emotional abilities. In today's digital era, technology has become a part of children's daily lives, even from an early age. Therefore, it is crucial to review childcare practices to remain relevant while still addressing the needs of children's holistic development (Chalim et al., 2024; Marsh et al., 2015). Technology can be an effective tool in the learning process when used appropriately. The use of educational apps designed with child development principles in mind can increase learning motivation and understanding of basic concepts such as numbers and letters (Neumann, 2018). However, excessive use of technology or the lack of adult supervision can disrupt children's social-emotional development and reduce active play time (Radesky, Schumacher, & Zuckerman, 2015). Social interaction remains a crucial element in early childhood education. Children learn through play, communication, and relationships with adults and peers. Studies show that digital learning accompanied by direct interaction with teachers or parents results in better understanding than passive learning (Zosh et al., 2017).

Several previous studies have highlighted the use of digital technology in the context of Early Childhood Education (ECE). Marsh et al. (2015) emphasized that digital technology has become a part of children's lives from an early age, so educational practices must adapt without neglecting their holistic development. Neumann (2018) found that educational apps appropriate to a child's developmental stage can improve early literacy skills and basic cognitive skills. However, Radesky, Schumacher, & Zuckerman (2015) warned about the risks of excessive device use, such as reduced social interaction and active playtime for children. Furthermore, Zosh et al. (2017) emphasized that effective digital learning must be combined with direct interaction with teachers or parents, so that children are not simply passive consumers of technology. Another study by Plowman, McPake, & Stephen (2010) showed that parental involvement in technology use plays a crucial role in shaping children's meaningful learning experiences. Pratiwi (2020) examined the use of interactive digital media in early childhood education (ECE) and found that technology can increase children's interest in learning, but teacher readiness remains a major challenge. Meanwhile, Rahmawati & Kusuma (2021) emphasized the need for learning models that combine sensorimotor exploration with digital media to avoid reducing the quality of children's social interactions.

This study examines learning models for early childhood in the digital era by optimizing the use of information technology. The SAMR (Substitution, Augmentation, Modification, Redefinition) model was used to measure teacher readiness to use technological innovations in the digital era. The research was conducted with the help of a Google form to distribute 15 questions to 55 teachers at ECE level schools as respondents. Based on previous studies, most studies emphasize the benefits and risks of digital technology, as well as the role of parents in accompanying children. There are not many studies that specifically assess the readiness of ECE teachers in integrating technology with the SAMR (Substitution, Augmentation, Modification, Redefinition) model framework. Thus, this research has novelty in two main aspects, namely; (1) Focus on ECE teachers as the main subject, not only on children or parents, so that it can provide a real picture of the readiness of educators in adopting digital technology, and (2) The use of the SAMR model as an analytical tool, which is rarely used in research in the ECE context in Indonesia, so that it can provide a new perspective in assessing how technology is actually utilized in early childhood learning practices. Meanwhile, to measure teacher readiness and participation in optimizing the use of information technology, the SEM-PLS method was used on 158 respondents. This method is highly sought after by many researchers because it allows model estimation with many constructs, indicator variables, and structural paths without imposing distributional assumptions on the data (Hair J.F., et al, 2019). SEM-PLS is a predictive causal approach that emphasizes prediction in estimating statistical models and its structure is designed to provide causal explanations. PLS-SEM can overcome the usual monotonous explanations emphasized in academic research or predictive statistical research that often serves as the basis for developing managerial implications (Hair J.F., et al, 2014).

METHOD

In this study, we chose the SAMR (Substitution, Augmentation, Modification, Redefinition) model as our early childhood education analysis model. The research was a quantitative descriptive study conducted with 55 teachers at early childhood education (ECE) level schools in Mojokerto. The following table lists the quantitative research questions based on the SAMR model, and to answer all questions, a Likert scale was used to simplify the answers to each question. The Likert scale allows researchers to capture the complexity of individual perceptions with a consistent and easy-to-understand answer structure (Joshi et al., 2015; Boone & Boone, 2012).

Table 1. SAMR model questions in research

Parameters	Questions
Substitution	1. Do you use digital technology to replace traditional learning tools in your early childhood education classroom? 2. Can you provide support when replacing manual learning activities with digital tools without changing their function? 3. What is your main reason for choosing to replace conventional methods with digital technology? Is it for convenience?
Augmentation	4. In your experience, how has digital technology not only replaced but also enhanced the effectiveness of children's learning? 5. Do you agree that digital devices can add value to conventional learning activities with a touch of technology? 6. How do you assess the increase in children's engagement when technology is used in learning? Do you agree?
Modification	7. Have you redesigned learning activities because of digital technology? 8. Has digital technology influenced the way you design or evaluate children's learning processes, moving from conventional to digital methods? 9. Do you see any significant changes in teacher-child or child interactions when technology is actively used in learning activities?
Redefinition	10. Have you ever created a learning activity that was previously impossible without technology? 11. How has technology helped create new, more meaningful learning experiences for children? Do you agree? 12. What is the biggest challenge in designing activities that truly redefine the learning process with the support of technology? Do you agree?
Closing Questions (General Reflection)	13. How do you determine the level of technology use in your daily learning? Do you agree? 14. What support do you need (training, policies, infrastructure) to be able to use technology at a modified or redefined level? Do you need it? 15. In your opinion, how can technology be optimally used to support early childhood development? Do you agree?

All of the questions above are exploratory and semi-structured, suitable for in-depth interviews. However, this study was conducted using a questionnaire with a Likert scale. The data collected from these questions were used to analyze the extent to which early childhood education teachers integrate technology according to the SAMR framework. A Likert scale is a type of psychometric measurement scale often used in questionnaires to measure respondents' attitudes, perceptions, or opinions regarding a statement. This scale was first introduced by Rensis Likert in 1932. Respondents are asked to indicate their level of agreement or disagreement with a given statement. A common example of a 5-point Likert scale is: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5). This scale can be adjusted to 4, 5, 7, or even 10 points depending on the research needs.

Likert-type scales are frequently used in research because they allow for the measurement of attitudes, values, and opinions in a standardized manner (Joshi et al., 2015). The advantages of the Likert scale include being able to measure attitudes or opinions quantitatively, being easy to analyze statistically, providing flexibility in developing research instruments, and increasing the reliability and validity of data if developed properly.

SEM (Structural Equation Model) is a field of statistical study that can test a series of relationships that are usually difficult to measure simultaneously. SEM is a multivariate analysis technique that combines factor analysis and regression analysis (correlation), with the aim of testing the relationship between variables in a model, both between indicators and their constructs and the relationship between constructs. In analyzing questionnaire results, there are easy-to-use software that generally requires little technical knowledge of statistical analysis methods, such as PLS-Graph and SmartPLS (Ringle et al., 2010). Meanwhile, more complex tests for statistical computing software environments, such as R tests, can also be run by PLS-SEM.

Table 2. SEM PLS model questions in research

No	Questions	
1	**Substitution**	
	1	Replace traditional learning tools
	2	Provide support when replacing manual learning
	3	Substitution for convenience
2	**Augmentation**	
	1	Enhanced the effectiveness
	2	Digital devices can add value
	3	Assess the increase in children's engagement
3	**Modification**	
	1	Redesigned learning activities
	2	Influenced to design or evaluate learning processes
	3	Significant changes in teacher-child interactions
4	**Redefinition**	
	1	Created a newest learning activity
	2	Technology helped create learning experiences
	3	Truly redefine the learning process
5	**General Reflection**	
	1	Determine the level of technology use
	2	Training, policies, infrastructure to use technology
	3	Optimally used to support early childhood development

RESULT AND DISCUSSION

Result of The SAMR

The SAMR (Substitution, Augmentation, Modification, Redefinition) model, introduced by Puentedura (2006), provides a framework for evaluating the level of technology integration in learning. A study by Disney et al. (2019) found that many digital learning practices in early childhood education (ECE) are at the Augmentation level, where technology is used to enhance learning functions without fundamentally changing teaching methods. However, some practices have reached the Modification and Redefinition level, where technology enables significant transformations in the teaching and learning process. The Connectivism Theory model, developed by Siemens and Downes, emphasizes that learning occurs through a network of connections between individuals, information, and technology. In the ECE context, this theory is relevant for understanding how children learn through interactions with various digital information sources and how they construct knowledge through these connections (Siemens, 2005).

In this study, interviews were conducted with 55 ECE teachers using the questions in Table 1 above. All questions represent each parameter in the SAMR model by adding closing questions as a general reflection of all SAMR parameters that have been asked previously..

Calculating the Total Score

The total score is calculated using the following formula:

$$\text{Total Score} = (f_1\times1) + (f_2\times2) + (f_3\times3) + (f_4\times4) + (f_5\times5)$$

Where fn is the frequency of respondents choosing the nth value. Each group of answers will be given a weight, such as the answer "strongly disagree" with a weight of 1, while "strongly agree" gets a weight of 5. This is done to provide a total score that is then calculated based on the number of respondents' answers and their answer weights. For example, for question 1, about "Do you use digital technology to replace traditional learning tools in your early childhood education classroom?" and the results of the data calculation are as follows:

$$\text{Total Score} = (25\times1) +(15\times2) +(7\times3) +(5\times4) +(3\times5) = 25+30+21+20+15 = 111$$

The total answers from respondents for answers 1-5 will be calculated by entering the questionnaire results into the following table, the example above is the result of calculating Q1 with 25 respondents answering 1 point, 15 respondents answering 2 points, 7 respondents answering 3 points, 5 people answering 4 points and 3 respondents answering 5 points. The score result is each answer multiplied by the number of respondents who answered the score as shown in table 3.

Interpretation of results

Interpretation of the results can be done by looking at the highest and lowest values of the total score, highest scores shown below:

- Q10: *"*Have you ever created a learning activity that was previously impossible without technology?*"* → 233
- Q14: *"*What support do you need (training, policies, infrastructure) to be able to use technology at a modified or redefined level? Do you need it?*"* → 231
- Q9: "Do you see any significant changes in teacher-child or child interactions when technology is actively used in learning activities?" → 210
- Q11: "How has technology helped create new, more meaningful learning experiences for children? Do you agree?" → 206

These results indicate that the level of acceptance and use of technology is very high, and the need for support is greatly felt in efforts to increase the creativity of ECE teachers.

Tabel 3. Result calculation from respondent answer

Questions	1	2	3	4	5	Total Score
1	25	15	7	5	3	86
	25	30	21	20	15	*
2	27	17	5	3	3	103
	27	34	15	12	15	*
3	20	12	5	5	13	144
	20	24	15	20	65	**
4	10	8	10	15	12	176
	10	16	30	60	60	**
5	7	5	9	11	23	203
	7	10	27	44	115	***
6	20	15	15	3	2	117
	20	30	45	12	10	*
7	5	10	10	14	16	191
	5	20	30	56	80	**
8	12	11	5	12	15	172
	12	22	15	48	75	**
9	5	5	6	18	21	210
	5	10	18	72	105	***
10	2	3	5	15	30	233
	2	6	15	60	150	***
11	5	7	8	12	23	206
	5	14	24	48	115	***
12	25	15	7	5	3	111
	25	30	21	20	15	*
13	19	18	8	7	3	122
	19	36	24	28	15	*
14	2	3	5	17	28	231
	2	6	15	68	140	***
15	25	19	5	4	2	104
	25	38	15	16	10	*

Note: * low, * middle, *** high

As for the lowest values in the research, they are as follows:

- Q1: "Do you use digital technology to replace traditional learning tools in your early childhood education classroom?" → 111
- Q12: "What is the biggest challenge in designing activities that truly redefine the learning process with the support of technology? Do you agree?" → 111
- Q2: "Can you provide support when replacing manual learning activities with digital tools without changing their function?" → 103

The questions above relate to the direct replacement of traditional methods with digital learning and the challenges of redesigning educational activities, indicating that total replacement or redesign remains a major obstacle or challenge. More concrete efforts are needed to ensure that teachers at the early childhood education level (ECE) have the appropriate competencies, particularly in developing digital teaching media for preschool-age students.

Result of The SEM PLS

In this study, there are 4 parameters offered to the respondent which mean similar with SAMR model; substitution, augmentation, modification and redefinition. Partial Least Square (PLS) is becoming a powerful method of analysis because it reduces dependence on the scale of measurement such as measurements requiring interval or ratio scales, sample size, and distribution of residuals (Chin, 1998). Indicators in PLS can be formed with reflexive or formative types. The structural model describes the relationship between the independent (exogenous) latent variables and the dependent (endogenous) latent variables with the following equation (Wold, 2013).

$$\eta = B\eta + \Gamma\xi + \zeta \qquad (1)$$

η *(eta)* is a random vector of endogenous latent variables with size mx1. ξ *(xi)* is a random vector of exogenous latent variables with size nx1, and B is the coefficient matrix of the endogenous latent variable of size mxm and Γ matrix of exogenous latent variable coefficients, which shows the relationship of ξ to η of size mxn. While, ζ (zeta) is a random error vector of size mx1. The assumptions of the latent variable structural model equation include: $E(\eta) = 0$, $E(\xi) = 0$, $E(\zeta) = 0$, and ζ is not correlated with ξ and (I - B) is nonsingular matrix. Evaluation of the model in PLS includes two stages including evaluation of the measurement model and evaluation of the structural model. The evaluation of the measurement model was conducted using several criteria and stages of analysis as follows (Hair JF, 2013., Vinzi et al, 2010):

1. Indicator reliability. This shows how many indicator variants can be explained by latent variables by paying attention to the loading value. If the loading value is less than 0.4, then the indicator must be eliminated from the model.
2. Internal consistency or Construct reliability. This can be calculated through a composite reliability (ρ) value of more than 0.6
3. Convergent validity. In general, it is examined with the average variance extracted (AVE), where the minimum AVE value is 0.5 to indicate a good measure of convergent validity.
4. Discriminant validity. This is evaluated by comparing the AVE root value which must be higher than the correlation between constructs or the AVE value higher than the square of the correlation between constructs.

Meanwhile, to evaluate the structural model, the following criteria can be used:

1. State the percentage of variance that can be explained by endogenous latent variables
2. Path coefficient; describes the strength of the relationship between constructs.
3. Effective value of f2; shows whether endogenous latent variables have a major influence on exogenous latent variables. R2-include is R2 which is calculated by involving exogenous latent variables while R2-exclude is calculated without involving exogenous latent variables. The interpretation of the values is 0.02 (weak exogenous latent variable), 0.15 (moderate exogenous latent variable), and 0.35 (strong exogenous latent variable).
4. Stone Geisser Q2 grades; indicates the predictive capability of the model when it is above 0.
5. Goodness of Fit (GoF) Index; used in evaluating the overall structural and measurement model. Communalities values are obtained by squaring the loading values with the criteria 0.1 (GoF small), 0.25 (GoF moderate), and 0.36 (GoF large).

The bootstrap method was developed by Efron as a tool to help reduce the unreliability associated with errors using the normal distribution and its use (Efron B, et al 1998). In bootstrap, pseudo data (shadow data) is created using the information and properties of the original data so that the shadow data has characteristics similar to the original data (Fauzian et al, 2018). In the bootstrap method, sampling is also carried out by returning the sample data (resampling with replacement).

To analyze the preferences of the early childhood teacher in choosing digital technology for learning activities using SEM PLS, data were collected from 158 respondents. Respondents consisted of adults aged between 20 – 55 years. Figure 4 is the value of the loading factor after eliminating indicators. Some composite values show a value that is smaller than 0.6 and this shows that the variable has no effect. This shows that in choosing a digital technology for early child education, the teachers do not like this variable.

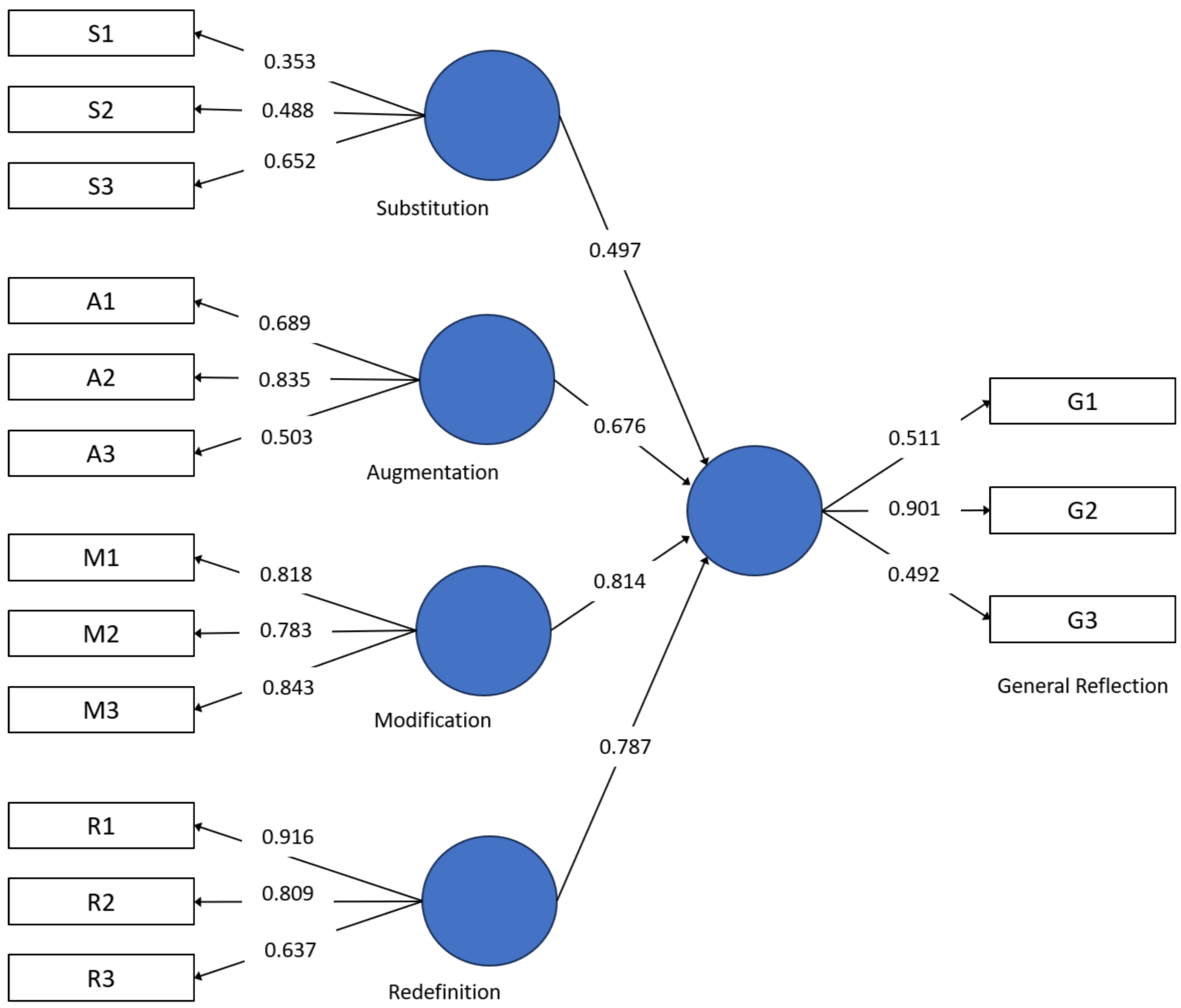

Figure 1. Loading Factor Value After Indicator Elimination

The variable values that are less than 0.6 include replace traditional learning tools (0.353), provide supports when replacing manual learning (0.488), Assess the increase in children's engagement (0.503), Determine the level of technology use (0.511), and optimally used to support early childhood development (0.492). Meanwhile, the variable value that more than 0.6 are substitution for convenience (0.652), Enhanced the effectiveness (0.689), digital devices can add more value (0.835), redesigned learning activities (0.818), influenced to design or evaluate learning processes (0.783), significant changes in teacher-child interactions (0.843), created a newest learning activity (0.916), technology helped create learning experiences (0.809), and truly redefine the learning process (0.637).

Based on the composite reliability values presented in Table 4, it shows that the five latent variables have a composite reliability value above 0.6. That is, the indicators that have been set are able to measure each latent variable (construct) properly or it can be said that the five measurement models are reliable.

Table 4. Composite Reliability and AVE Measurement Model Values

	Composite reliability	AVE
Substitution	0.715	0.497
Augmentation	0.798	0.676
Modification	0.943	0.814
Redefinition	0.859	0.787
General Reflection	0.875	0.635

The better Convergent validity value is shown by the higher correlation between the indicators that make up a construct. The AVE values in Table 4 shows that the five latent variables have AVE values above the minimum criterion or 0.5, so that the measure of convergent validity is good or it can be said that they have met the convergent validity criteria.

Table 5. Correlation between variables

	Substitution	Augmentation	Modification	Redefinition	General Reflection
Substitution	1	0,892	0,705	0,667	0,574
Augmentation	0,892	1	0,652	0,637	0,726
Modification	0,705	0,652	1	0,334	0,878
Redefinition	0,667	0,637	0,334	1	0,839
General Reflection	0,574	0,726	0,878	0,839	1

The next criterion is discriminant validity by comparing the correlation between constructs and AVE roots as shown in table 5. The structural model (inner model) is a model that describes the relationship between latent variables which are evaluated using the path coefficients, R2, f2, Q2 and GoF. The results of the path coefficients and t-statistic values obtained through the bootstrapping process with a total sample for resampling of 158 respondents are shown in Table 6 as follows:

Table 6. Structural Model Path Coefficient Values

	Standard Error	*T- Statistic*	*P-value*
Substitution → General Reflection	0.185	1.662	0.069*
Augmentation → General Reflection	0.169	3.056	0.076*
Modification → General Reflection	0.189	2.839	0.088*
Redefinition → General Reflection	0.157	1.657	0.005*

The next is the model feasibility test using the R2 value. The R2 value for selecting an evacuation site is 0.835. This figure explains that the variability of the endogenous variables which can be explained by the variability of the exogenous variables is 83.5%. In addition to examining the R-Square, an examination is also carried out regarding the effect of endogenous variables on exogenous variables which are known based on the value of the effect size f2 presented in the table below. The GoF value obtained is 0.710 (large), which means that the model has a high ability to explain empirical data. So overall, it can be said that the model formed is valid. The Q2 value obtained is 0.835 (above 0) so that the structural model obtained has a relevance prediction. Thus, the resulting equation is as follows:

Preference of ECE teacher = 0.583 Substitution + 0.321 Augmentation + 0.792 Modification + 0.203 Redefinition + ζ

Therefore. It can be said that the preference of the ECE teacher in choosing digital technology in learning activities is parameter that is very significantly influenced by substitution, and modification. In this study, it is known that digital technology has the greatest impact on learning activity in all preparedness of learning process in the class, especially in terms of transformation from conventional to digital technology.

Discussion

Most respondents responded positively (categories 4 and 5) to questions about innovation and creativity support (Q10, Q14, Q11). Meanwhile, questions related to direct technological support or readiness (Q1, Q2) tended to have lower responses. The use of digital technology in early childhood education (ECE) classrooms is considered highly promising and has created positive changes, particularly in learning creativity, child engagement, and efficiency. However, challenges remain, including infrastructure readiness, teacher training, and the difficulty of redesigning activities that are truly integrated with technology.

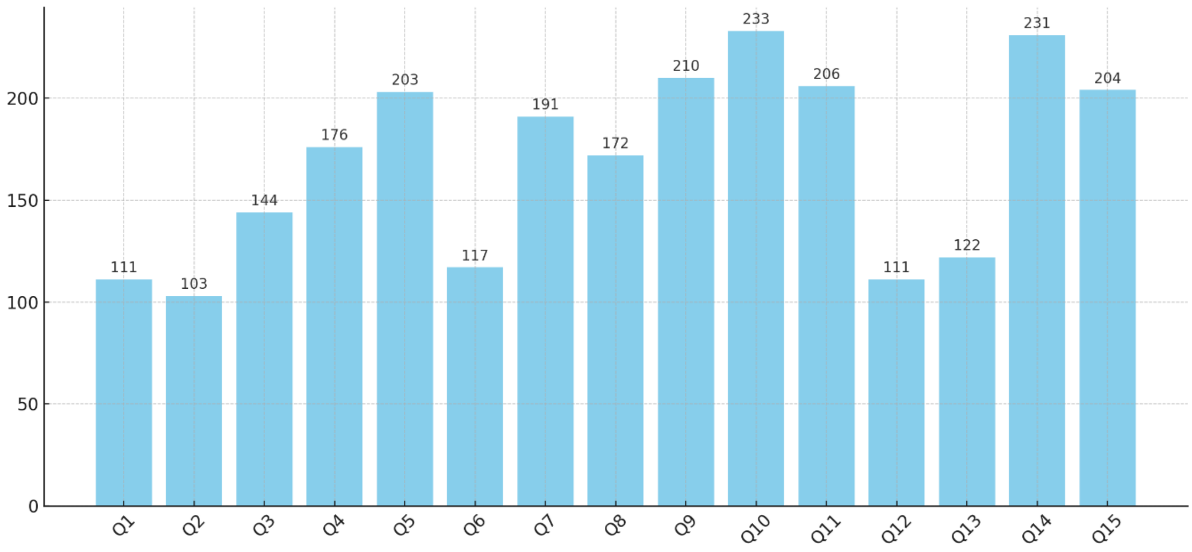

Figure 2. The data collected of SAMR model

Figure 2 shows the results of the respondent data calculations, referring to Table 1. Looking at Table 1 and Figure 2, respondents still maintain conventional teaching methods. However, the desire to maximize the benefits of technology also drives them to learn how to optimize the role of technological innovation in the digital age. The SAMR (Substitution, Augmentation, Modification, Redefinition) model explains how technology can transform the way teachers design learning activities, from simply replacing outdated tools to creating previously impossible learning experiences (Puentedura, R.R., 2010). Meanwhile, the TPACK (Technological Pedagogical Content Knowledge) model states that technology integration in learning must consider the relationship between technology, pedagogy, and content (Mishra, P., & Koehler, M.J., 2006). Understanding content significantly helps educators understand how to combine digital technology with appropriate teaching strategies to support holistic child development (Wang et al., 2018).

Technology is not only changing the tools used, but also the way children learn and teachers teach. The use of appropriate educational applications can improve early childhood engagement and learning outcomes (Yelland, 2005). Research shows that teachers desire to optimize the use of technology in the digital age, but teacher-student interaction is still essential, particularly during early childhood development. Therefore, teachers prioritize conventional learning processes that optimize face-to-face interaction and intensive interaction with students. For early childhood education management, teachers still need technological support related to the rapid development of science and knowledge, especially in the current digital era.

The results of the SEM-PLS analysis further strengthen the findings obtained from the SAMR model by revealing the relationships between the latent variables that shape teachers' preferences in adopting digital technology in early childhood education (ECE). The measurement model evaluation showed that all constructs (Substitution, Augmentation, Modification, Redefinition, and General Reflection) had acceptable levels of reliability and validity, as indicated by composite reliability values above 0.7 and AVE values above 0.5. This indicates that the indicators used were consistent and accurately represented each construct in the model.

The outer loading analysis revealed that indicators related to creativity and innovation, such as *"creating new learning activities"* (loading = 0.916) and *"influenced to design or evaluate learning processes"* (loading = 0.783), were the strongest contributors to the Modification and Redefinition constructs. This shows that teachers are not only replacing old learning tools but are actively transforming the learning process through digital innovation. In contrast, indicators such as *"replace traditional learning tools"* (loading = 0.353) and *"provide support when replacing manual learning activities"* (loading = 0.488) had lower loading values, indicating that teachers were less focused on simple substitution and more on transformation-oriented practices.

The structural model results demonstrate a strong relationship between the constructs, with $R^2 = 0.835$, meaning that 83.5% of the variance in teachers' preferences for technology adoption can be explained by the four main constructs of the SAMR model. The Goodness of Fit (GoF) value of 0.710 and $Q^2 = 0.835$ indicate that the model has high explanatory power and strong predictive relevance. Among the constructs, Modification (path coefficient = 0.792) had the greatest influence on teachers' preferences, followed by Substitution (0.583), Augmentation (0.321), and Redefinition (0.203). This suggests that teachers tend to adopt digital technology when it helps them modify or redesign their learning processes rather than merely replace traditional tools.

The path analysis also shows that all four constructs have a positive and significant relationship with General Reflection ($p < 0.1$), meaning that teachers' perceptions and experiences with technology strongly affect their overall readiness and willingness to integrate it. This aligns with previous research by Hair et al. (2019) and Schriever (2021), which emphasize that teachers' confidence and perceived usefulness of technology are key determinants in successful digital learning implementation.

In practical terms, this finding implies that professional development programs for ECE teachers should not only focus on basic digital literacy but also on transformational pedagogical skills—how to redesign and redefine learning activities to take full advantage of digital tools. The emphasis on modification and redefinition suggests that when teachers are empowered to innovate, they can create learning environments that enhance children's creativity, engagement, and holistic development. However, the relatively low factor loadings in substitution-related indicators underscore the continuing need for institutional support, training, and infrastructure to ensure that digital integration can occur evenly across different levels of technological readiness.

CONCLUSION

This study found that technology integration through the SAMR Model framework in early childhood education not only serves as a substitute for traditional tools but also opens up the possibility for more meaningful learning transformation. The results showed that teachers were more enthusiastic at the Modification and Redefinition stages, where technology enabled the creation of previously unfeasible learning activities. This challenges the long-held assumption that technology is merely complementary and instead opens up new discussions about the role of digital innovation in supporting children's engagement and creativity. The results of this study emphasize the importance of teachers' role in managing technology integration in early childhood education classrooms in a gradual and reflective manner. Although the use of digital technology has reached the substitution stage, it still faces challenges in its development. The findings indicate that teachers were more enthusiastic at the stage that allows for the redefinition of innovative learning activities using digital technology.

This study reinforces previous findings regarding the benefits and risks of technology in early childhood education and introduces the use of the SAMR Model specifically to assess teacher readiness to use digital technology. The study's focus on early childhood teachers as the primary subjects provides an important contribution to the literature, as most previous studies have focused on children or parents. Thus, this research enriches the scientific discussion in the field of Islamic education management, particularly in the context of technology integration, teacher readiness, and learning innovation in the digital era. The results of the SEM-PLS analysis reinforce the findings from the SAMR model by providing statistical evidence that teachers' digital technology adoption in early childhood education is significantly influenced by the Modification and Substitution stages. The model achieved a high explanatory power ($R^2 = 0.835$) and strong predictive relevance ($Q^2 = 0.835$), indicating that 83.5% of teachers' preferences toward technology use can be explained by these constructs. The Goodness of Fit (GoF) value of 0.710 further confirms that the model is robust and well-suited to empirical data. Among the constructs, Modification had the strongest path coefficient (0.792), demonstrating that teachers are most responsive to technologies that enable them to redesign and improve learning processes rather than merely replace traditional tools. This finding highlights that successful digital integration in early childhood education depends on teachers' ability to transform learning practices creatively and meaningfully through technology.

This study was limited to transformation from conventional learning activity to digital technology. Variations in other factors such as teacher background, differences in geographic context, gender, and child age were also not explored in depth. Furthermore, the research focused on teacher perspectives without directly measuring their impact on children's learning outcomes. Therefore, further research with a broader scope, involving additional variables, and using a mixed methods approach is urgently needed to provide a more comprehensive understanding of technology integration in early childhood education.

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REFERENCES

Boone, H. N., & Boone, D. A. (2012). Analyzing Likert data. *Journal of Extension*, 50 (2), 1–5. https://doi.org/10.34068/joe.50.02.04

Bronfenbrenner, U. (1995). Developmental ecology through space and time: A future perspective. In P. Moen, G. H. Elder, Jr., & K. Lüscher (Eds.), *Examining lives in context: Perspectives on the ecology of human development* (pp. 619–647). American Psychological Association. https://doi.org/10.1037/10176-018

Chalim, S., Usman, F., Rokhman, M., Rusydi, I., Rahmat, & Zamawi, B. (2024). Children's Education in the Metaverse Era: Between the Rapid Growth of Information Technology and Self-learning of Generation Z. Nazhruna: Jurnal Pendidikan Islam, 7(3), 608–627. https://doi.org/10.31538/nzh.v7i3.19

Efron, B., & Tibshirani, R. J. (1998). An Introduction to the Bootstrap (2nd ed). New York: Chapman & Hall

Fauzian Prima Aditya Putra Rachman, Rito Goejantoro, and Memi Nor Hayati (2018), Determining the Number of Bootstrap Replications Using the Pretest Method on Independent Sample T Test, Exponential Journal, Volume 9, Number 1, pp. 35-40

Hair, J.F., Risher, J.J., Sarstedt, M., Ringle, C.M, (2019), When to use and how to report the results of PLS-SEM, European Business Review., Vol. 31 No. 1, pp. 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, J.F., Sarstedt, M., Hopkins, L. and Kuperwasser, V.G., (2014), Partial least squares structural equation modelling (PLS-SEM): an emerging tool in business research, European Business Review., Volume 26 No. 2, pp. 106-121.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Editorial Partial Least Square Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. ELSEVIER, 1-12.

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British Journal of Applied Science & Technology*, 7(4), 396–403. https://doi.org/10.9734/BJAST/2015/14975

Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J. C., Lahmar, J., & Scott, F. (2015). *Exploring play and creativity in pre-schoolers' use of apps: Final project report*. University of Sheffield. https://doi.org/10.13140/RG.2.1.3402.2488

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Neumann, M. M. (2018). The effects of interactive e-books on preschoolers' literacy and language skills. *Journal of Early Childhood Literacy*, 18(4), 593–616. https://doi.org/10.1177/1468798416652449

Plowman, L., McPake, J., & Stephen, C. (2010). The technologisation of childhood? Young children and technology in the home. Children & Society, 24(1), 63–74. https://doi.org/10.1111/j.1099-0860.2008.00222.x

Pratiwi, D. (2020). Pemanfaatan media digital interaktif dalam meningkatkan minat belajar anak usia dini. Jurnal Pendidikan Anak Usia Dini Indonesia, 5(2), 101–110.

Puentedura, R. R. (2006). Transformation, technology, and education. Retrieved from http://hippasus.com/resources/tte/

Radesky, J. S., Schumacher, J., & Zuckerman, B. (2015). Mobile and interactive media use by young children: The good, the bad, and the unknown. *Pediatrics*, 135 (1), 1–3. https://doi.org/10.1542/peds.2014-2251

Rahmawati, A., & Kusuma, H. (2021). Integrasi teknologi digital dalam pembelajaran anak usia dini: Tantangan dan peluang. Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini, 6(1), 45–56.

Rokhman, M., Usman, F., Usman, F., Kassim, A. B. H., & Muslihun, M. (2023). Consideration of Parents in Choosing Islamic Schools in the Digital Era. Nazhruna: Jurnal Pendidikan Islam, 6(3), 403–419. https://doi.org/10.31538/nzh.v6i3.4026

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1). Retrieved from http://www.itdl.org/Journal/Jan_05/article01.htm

Schriever, V. (2021). Early childhood teachers' management of their changing roles regarding digital technologies in kindergarten: A grounded theory study. *Australasian Journal of Early Childhood*, 46(1), 6–19. https://doi.org/10.1177/1836939120979065

Usman, F., Wrdhani J., Sari I., Chalim S (2023)., Assessing Trauma Healing Methods for Volcanic Disaster Evacuees in Indonesia, Assessing Trauma Healing Methods for Volcanic Disaster Evacuees in Indonesia, *Journal Européen des Systèmes Automatisés*, Volume 56 (6), 1019-1025., https://doi.org/10.18280/jesa.560612

Vinzi, V. E., Chin, W. W., Henseler, J., & Wang, H. (2010). Handbook of Partial Least Squares. Berlin: Springer.

Wang, L., Ertmer, P. A., & Newby, T. J. (2018). Increasing preservice teachers' self-efficacy beliefs for technology integration through lesson planning. *Australasian Journal of Educational Technology*, 24(4). https://doi.org/10.14742/ajet.1234

Yelland, N. (2005). The future is now: A review of the literature on the use of computers in early childhood education (1994–2004). *Australian Educational Computing*, 20(1), 9–22. https://doi.org/10.3316/aeipt.145032

Zosh, J. M., Hirsh-Pasek, K., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2017). Learning in and through play: A review of the evidence. *LEGO Foundation*. https://doi.org/10.13140/RG.2.2.15887.18084