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Analysis of Technology-Based CRE Learning Models Using a Deep Learning Approach for High School Students

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Abstract

The development of digital technology in the modern era has brought major changes to the world of education, including Christian Religious Education (CRE). The CRE learning process in various schools still tends to be conventional, teacher-centered, and does not make optimal use of technology. This condition has resulted in low student engagement and a lack of reflective understanding of the values of faith. This study aims to analyze technology-based CRE learning models using a deep learning approach for high school students. The method used is descriptive qualitative with a library research study through a review of relevant books, scientific journals, and previous studies. The results of the study show that of the five technology-based learning models studied, namely e-learning, blended learning, mobile learning, multimedia learning, and gamification. The gamification model is the most effective choice to be applied with a deep learning approach. The application of gamification supports the three main dimensions of deep learning, namely meaningful learning, mindful learning, and joyful learning. Through the integration of digital technologies such as gamification, reflective videos, and other interactive media, students not only understand the material cognitively, but are also able to internalize religious values and apply them in their daily lives. This approach has proven effective in developing the potential of high school students cognitively (critical and reflective thinking), physically (active and motivated), and socially (collaborative and empathetic). Thus, technology-based CRE learning with a deep learning approach not only improves academic learning outcomes but also shapes Christian character that is faithful, creative, and responsible amid the challenges of the digital age.

Keywords: Technology-Based Learning, Deep Learning, Gamification, Christian Religious Education, High School Students

INTRODUCTION

The rapid development of technology in the modern era has brought significant changes to various aspects of human life. Technological development and the 21st-century educational paradigm demand innovation in learning models, including Christian Religious Education (CRE). CRE is no longer sufficient to be delivered through a conventional teacher-centered approach but needs to integrate learning approaches that encourage students to think deeply, reflectively, and apply the values of faith they have learned.

Based on the results of observations, researchers found several problems in high schools that formed the basis of the study. First, the CRE learning model is still centered on the teacher's role as a where the teaching and learning process focuses more on the teacher or instructor. Based on the results of Simeon Sulistyo's study, it was found that the CRE learning process in various Christian schools in Indonesia still tends to be teacher-centered. This study cited a number of schools, including Satap Langiryang Public Junior High School located in East Sumba Regency, East Nusa Tenggara Province, Rehobot Oebelo Christian Junior High School in Kupang Regency, East Nusa Tenggara Province, and Damang Batu Senior High School 1 in Gunung Mas Regency, Central Kalimantan Province. This revealed that teachers play a central role in learning, while students remain passive and lack active involvement. This learning model makes teachers the sole source of knowledge and the only

ones who guide the learning process. This results in a conventional, one-way learning process for CRE that lacks participation and is unable to foster reflective thinking skills and an understanding of faith that is contextual to the lives of students (Sulistyo & Waruwu, 2023).

Second, many teachers still have low digital literacy, making it difficult for them to operate digital learning devices and applications. Based on the results of the study, there is data showing that several teachers have low digital literacy. According to Kristiawan et al, the results of the study show that the level of teacher literacy is relatively low, especially in the use of online learning platforms at SDN 67/5 Ta in Bone Regency, South Sulawesi. Only 44.4% of teachers understand how to use Google Classroom, while 33.3% and 66.7% of teachers do not understand the functions of Google Classroom. This shows that no teachers have ever developed or participated in training on the use of Learning Management Systems (LMS), so that teachers' ability to integrate media and technology is still low and has not been used creatively and innovatively in the learning process. Based on data from the Workshop on Improving the Digital Literacy Competence of High School and Special Needs School Teachers in North Sulawesi, it shows that the level of teachers' technological literacy in the region is still low. Based on the 2022 Indonesian Digital Literacy Status survey released by the Ministry of Communication and Information, North Sulawesi Province has a low Digital Literacy Index of 3.4, which is below the national average of 3.54, and has experienced a decline from the previous year. Based on the above data, it shows that low digital literacy and understanding of deep learning among teachers is one of the main obstacles in optimizing the use of learning technology (Kemendikdasmen, 2023).

Third, the deep learning approach in learning is still limited. There are problems with the application of the deep learning approach in elementary school learning, especially in Mataram City, the capital of West Nusa Tenggara Province, which still faces challenges with the deep learning approach. Research shows that the deep learning approach is being implemented in four schools, namely: first, SDN 45 Ampenan; second, SDN Cakranegara; Third, SDN 24 Cakranegara, and fourth, SDN 22 Mataram. These limitations are due to the lack of supporting infrastructure, the lack of teacher training in the use of technology, and the uneven implementation of deep learning-based learning policies in all elementary schools. According to research by Chen et al, one of the main challenges in implementing deep learning in schools is the lack of adequate training for teachers to use this technology. Many teachers still find it difficult to adapt to the use of deep learning-based software or applications, even though they recognize its great potential in improving the quality of learning (Muttaqin et al., 2025). Based on the results of the evaluation of community service activities at Pulau Satu Atap 01 Pulau Pari School, several important points were noted, namely that the deep learning approach in learning is still limited to the conceptual and training levels. It has not been fully implemented in classroom learning practices. The data shows that facilitators obtained the highest scores in material mastery (94.3%), material delivery (92%), and student active participation (86.4%). This indicates that the deep learning process has not been optimally implemented (Aulia et al., 2025). Overall, the deep learning approach in Indonesia still faces major challenges in rural and remote areas. The lack of technological facilities and limited human resources who are proficient in technology are

significant obstacles in mapping teachers based on technological excellence (Abdullah & Yahya, 2025).

THEORY

The development of information technology has driven innovation in education towards interactive and learner-centered learning. In the context of CRE, technology plays a role not only as a medium but also as a means of shaping faith and reflecting Christian values (Ndruru, 2024). For technology-based learning to produce deep understanding, an approach that emphasizes the active involvement of learners in constructing the meaning and value of learning experiences is needed. To understand the comprehensive application of this approach in CRE learning, the following will outline the theories underlying the technology-based CRE learning model with a deep learning approach.

Technology-Based CRE Learning Model

The technology-based CRE learning model is an approach that integrates information and communication technology to make learning more effective, interesting, and relevant. This strategy connects conventional, modern, and creative elements with the aim of increasing the effectiveness of CRE learning based on human responsibility to use technology according to God's will, so as to enrich the learning experience while shaping the character, morals, and spirituality of students (Friyanti & Windarti, 2024).

The use of information technology in CRE learning opens up great opportunities to expand students' access to CRE learning, increase flexibility in terms of time and place of learning, and provide a variety of methods that suit students' learning styles. Digital media such as educational videos, animations, and interactive podcasts can facilitate the understanding of abstract religious concepts while fostering interest in learning. In addition, technology enables social interaction and online collaboration as part of the learning process that supports the cognitive, affective, and psychomotor development of students (Kurnia Saputra, 2024).

The challenges faced in implementing technology-based CRE learning models include infrastructure limitations, the digital divide, and low teacher competence in utilizing technology optimally. Therefore, capacity building and teacher training are important so that technology can be used optimally to achieve meaningful and relevant learning in the digital age. Thus, technology is not only a tool, but an integral part that strengthens the CRE mission.

The challenges of implementing technology-based CRE learning are closely related to theological and ethical aspects that need to be considered by teachers. The challenges and opportunities in utilizing technology in faith education must be rooted in Christian theology, so that the use of digital media does not lose its spiritual meaning. Teachers need to ensure that technology is not used to replace personal relationships between teachers and students, but to strengthen communication of faith, love, and Christian values in the digital learning space.

Types of Technology-Based Learning Models

Learning models can be categorized into several types based on their approach. First, the *direct instruction* model, which is teacher-centered with structured learning characteristics and is oriented towards achieving academic goals. Second, the *cooperative learning* model, which emphasizes cooperation between students in small groups to achieve common goals. Third, *problem-based learning,* which uses real-world problems as a learning context. Fourth, *project-based learning,* which provides opportunities for students to explore learning content through various meaningful ways. Fifth, *discovery learning,* which encourages students to discover concepts and principles through direct experience (Fauzi, 2024).

Technology-based learning models incorporate information and communication technology into the learning process to improve the effectiveness and efficiency of learning. According to Munir, technology-based learning is learning that uses information and communication technology as a medium to deliver material, facilitate interaction, and evaluate learning outcomes. Digital methods enable the creation of a more interactive, personalized, and flexible learning environment (Wahyuni et al., 2025).

Types of technology-based learning models that are commonly used in the context of teachers. First, e-learning, which utilizes the internet to deliver learning materials online. Second, blended learning, which combines face-to-face learning with online learning to optimize the advantages of both approaches. Third, mobile learning, which utilizes mobile devices such as smartphones and tablets to support flexible learning. Fourth, gamified learning, which integrates game elements into learning activities to increase student motivation and engagement. Fifth, multimedia-based learning, which uses a combination of text, audio, video, animation, and graphics to present learning materials in an interesting and comprehensive manner (Uzzahra et al., 2024).

Based on the description of the types of technology-based learning models, this study focuses on the gamification learning model as a form of innovation to be examined through a deep learning approach. According to Tri Padila Rahmasari, gamification is an innovative approach because it can turn learning activities into *joyful* and meaningful *ones*. Rahmasari explains that the use of game elements such as points, *badges*, and levels can increase student engagement and motivation to learn. Through this, students are able to construct more active learning meanings and understand concepts in depth in accordance with the principles of deep learning, which emphasizes cognitive, emotional, and reflective engagement (Rahmasari, 2025).

There are several reasons for choosing a gamification model with a deep learning approach for high school students: first, gamification provides high motivation and is suitable for the challenges of the digital generation, which are often experienced with conventional methods. According to Samodra and Sidhi, gamification-based learning application designs can significantly increase engagement (Yazdi et al., 2024). Second, the deep learning approach in learning is not only exciting through games, but also meaningful, reflective, and contextual, which is very much needed in CRE so that values of faith and character are truly understood and internalized. According to Rahmawati and Inayah (2025), gamification is designed to support meaningful, mindful, and joyful aspects, so it must be able to facilitate

deep learning. Third, at the high school level, CRE material often leads to character development, values, and real-life applications, so interactive, reflective, and technology-based models such as gamification with a deep learning approach are very suitable for improving the quality of learning and relevance in students' lives. Thus, the proposed research is: an analysis of technology-based CRE learning models with a deep learning approach for high school students, focusing on the application of gamification in CRE and becoming research.

Biblical Basis for Teaching with Variation

In the Bible, Jesus Christ is known as the Great Teacher who taught with wisdom and used various contextual and interactive teaching methods. Jesus' teaching style was not monotonous, but tailored to the needs and backgrounds of his listeners. Matthew 13:3 reads, "He spoke many things to them in parables, saying: 'A sower went out to sow (Indonesia, 2018). This verse illustrates that Jesus used parables (parable teaching) to explain spiritual truths in simple and easy-to-understand language. In addition, in Luke 24:27, Jesus used expository and reflective dialogue methods when interpreting the Scriptures to the two disciples on the road to Emmaus, helping them understand the spiritual meaning of their life experiences.

Jesus used various teaching models and methods, such as storytelling, discussion, questioning, setting an example, and sending disciples to practice directly. This shows that the Lord Jesus placed his students (disciples) as active subjects in learning. Therefore, CRE in the digital age must emulate Jesus' teaching methods by using various interactive, reflective, and relationship-building methods, including through modern technology (Sidjabat, 2019).

Jesus often used parables and stories taken from everyday life to explain His teachings. This shows that teaching must be delivered in a way that is easy to understand and relevant to the context of the listeners. In this digital age, technology can be used to convey biblical teachings through attractive and accessible media, such as digital Bible applications, videos, and online learning platforms. In this way, technology becomes an effective tool for conveying biblical messages in a contextual and relevant manner.

Jesus encouraged His disciples to actively engage in the learning process through discussion, question and answer sessions, and personal reflection. This reflects the importance of participatory and interactive learning. In the context of technology-based learning, this can be implemented through interactive features such as online discussion forums , quizzes, and collaborative assignments that allow learners to actively participate in the learning process (James et al., 2015).

In conclusion, Jesus Christ used a variety of learning methods that were contextual and learner-centered. Although technology as we know it today did not exist at that time, the principles and approaches used by Jesus are still relevant for adaptation in modern learning. Jesus taught by emphasizing deep understanding, active involvement, and the application of spiritual values in everyday life. Therefore, CRE learning in the digital age needs to emulate Jesus' teaching style by utilizing various technological media creatively and meaningfully.

Technology is not just a tool, but a means to revive the spirit of Christ's teaching, which is interactive, reflective, and builds the transformation of the learners' faith.

Characteristics of Technology-Based Learning Models

The technology-based learning model is a pedagogical approach that integrates digital technology to create an interactive, adaptive, and learner-centered learning process. According to Rosnaeni, technology-based learning models have the main characteristics of flexibility in time and place, high interactivity, and the ability to adapt to students' learning styles. This is in line with the demands of 21st-century education, which emphasizes collaboration, creativity, and digital literacy (Rosnaeni, 2021).

One effective technology-based learning model is the use of quizzes (Quizizz). This model allows teachers to assess student understanding in real-time, so they can determine the extent to which students understand the material being taught. With a direct feedback mechanism, students can identify their mistakes and quickly improve their understanding, making the learning process more dynamic and interactive (Putri, 2021).

Technology-based quizzes such as Quizizz can increase student motivation and engagement in learning. Through quiz results, teachers can identify areas that require further attention. Data from quizzes helps teachers adjust their teaching strategies, provide additional explanations, or design special exercises for topics that are still difficult for students to understand (Apriyanti et al., 2023).

Deep Learning Approach

The deep learning approach in CRE learning does not only refer to artificial intelligence, but also to deep and meaningful learning. This approach focuses on a learning process that encourages students to understand meaning, relate religious values to real life, and build contextual spiritual reflection through the use of learning technology. Deep learning helps students not only memorize religious teachings, but also understand and internalize them personally and be able to apply them in real actions in the school and community environment (Kerimbayev et al., 2023).

The deep learning approach is understood as a learning strategy that emphasizes deep understanding, interconnections between concepts, and the development of analytical and problem-solving skills. This approach focuses on three main aspects, namely meaningful learning, mindful learning, and joyful learning. Through these three aspects, students are not only required to memorize information, but also to connect knowledge with real life, be actively involved in the learning process, and feel enthusiastic and motivated (Arif et al., 2025).

The deep learning approach in the context of education is explained as an approach that focuses only on deep, reflective, and meaningful learning processes. Deep learning emphasizes not only the ability to remember information, but also conceptual understanding and application in real situations. Students are guided to construct meaning, think critically, and develop analytical and self-reflective skills.

The application of deep learning encourages students to participate in activities such as group discussions, collaborative projects, problem-based learning, and the use of digital technology for knowledge exploration. This allows students to think critically, reflect on their learning experiences, and collaborate effectively with their peers. With this approach, the learning process becomes relevant, interactive, and meaningful, while fostering students' interest in learning on an ongoing basis.

In addition, this approach is also in line with Piaget and *Vygotsky's* constructivism theory, which emphasizes learning through direct experience and social interaction. By integrating collaboration, discussion, and joint problem solving, students not only understand concepts but are also able to apply them in their daily lives. Although its implementation faces challenges in Indonesia, such as limited teacher training and differences in local contexts, deep learning has great potential to create meaningful, enjoyable learning experiences that are relevant to the needs of students in the 21st century (R. Putri et al., 2024).

Development and Characteristics of Learners Aged 16-18

Learner development is the process of becoming more perfect (in terms of personality, mind, knowledge, etc.). Development is a continuous and interrelated process of change that occurs towards perfection and maturity. According to Agustina, growth is commonly defined as the process of psychological change in showing how learners behave and interact with their environment. Students are members of society who strive to develop themselves through a process along a specific path, level, and type.

Development is a process of change towards maturity through growth and differentiation. Development cannot be measured. Furthermore, development is a change in skills, physical, emotional, and mental maturity towards adulthood. Human growth stops at adulthood, but emotional and mental development continues. Growth and development are physical, intellectual, and emotional.

High school students generally exhibit characteristics such as high curiosity, a desire for social recognition, and a need for independence. They begin to search for meaning in life and moral values that are in line with their personal beliefs. In learning, they prefer collaborative, applied, and real-world activities, including the use of technology. At this age, students are already capable of logical reasoning, critical thinking, and assessing truth based on rational arguments, not just the authority of others. Therefore, teachers need to be facilitators who encourage students' exploration and self-reflection.

The character of students includes patterns of behavior, attitudes, values, and habits possessed by individuals as a result of their nature and environment. This character is formed through interaction with the social environment, family, school, and community. According to Hamsah B. Uno, student characteristics are aspects or qualities of individual students that consist of interests, attitudes, learning motivation, learning styles, thinking abilities, and initial abilities (Hanifah et al., 2020).

The main purpose of character is to build a strong nation and noble character among all members of society. Mutual cooperation and tolerance are characteristics of Indonesian

society. This goal can be achieved through character education provided by teachers in each educational institution. The main foundations for this are religion, Pancasila, and local culture. The general function of education is to shape the character of students so that they have a good attitude, morals, resilience, good behavior, and a high level of tolerance. Character has the function of developing the basic potential within students so that it can be useful for strengthening and building the surrounding community and preparing a resilient generation on the global stage (Astyandini, 2024).

METHOD

This study uses a descriptive qualitative method with a library research approach. The qualitative approach was chosen because this study focuses on a deep understanding of the phenomenon of applying a technology-based CRE learning model with a deep learning approach for high school students, rather than on numerical or statistical data analysis. According to Sugianto (Sugiono, 2013), qualitative research aims to understand social phenomena by emphasizing the meaning, interpretation, and natural context of the data being studied. In this study, literature review was conducted by examining various written sources such as books, scientific journals, previous research results, and official documents relevant to the topic of technology-based CRE learning with a deep learning approach. This method was chosen because it was considered effective for exploring concepts, theories, and previous research results, which were then critically analyzed and linked to the focus of the research, resulting in a comprehensive understanding of the application of technology-based CRE learning models in the context of today's education.

This research was conducted through digital libraries and academic repositories that provide scientific sources, such as Google Scholar, Garuda (Garba Rujukan Digital), and the University of Indonesia's e-journal portal. The research was conducted from September to December 2025, covering the stages of literature collection, data analysis, and compilation of research results. Because this research is a library research study, the activities were not carried out in the field but focused on systematic analysis of relevant sources on the topic of technology-based CRE learning with a deep learning approach.

According to Sugianto, in qualitative research, the researcher acts as the main instrument because they are directly involved in the entire research process, from collection to analysis of literature, namely a tool in the form of a summary containing important information from each source (title, author, year, main results, and its relevance to the research). With this instrument, the process of analyzing library data can be carried out systematically, objectively, and in an organized manner (Sugiyono, 2019).

Data collection techniques were carried out through a literature review sourced from various scientific references such as books, journals, and previous research results relevant to the topic of technology-based CRE learning models with a deep learning approach. The data collection process included searching the literature through Google Scholar, Garuda, and university e-journal portals, followed by selection based on the relevance and credibility of the sources. The data obtained was analyzed using a literature analysis sheet to identify important concepts, theories, and findings that supported the research focus. According to

Bungin, data collection in qualitative research focuses on reading, examining, and interpreting credible scientific sources to gain an in-depth understanding of the phenomenon being studied (Bungin, 2020).

The data analysis technique used in this study is content analysis, a method that aims to identify, interpret, and synthesize the meaning of various literature sources related to technology-based CRE learning models with a deep learning approach. The analysis process was carried out in three main stages, namely data reduction, data presentation, and conclusion drawing. As explained by Miles and Huberman, this analysis was carried out systematically to find patterns, concepts, and theoretical relevance that support the application of technology and the deep learning approach in the context of Christian religious education in high schools (Sugiyono, 2019). In line with creswell's view, qualitative data analysis aims to understand and explain phenomena in depth through the process of interpreting data obtained systematically (Mackiewicz, 2018).

The technology-based learning models analyzed in this study consist of five types, namely *e-learning*, *blended learning*, *mobile learning*, *multimedia learning*, and gamification. Of the five models, gamification was chosen because it was most compatible with the deep learning approach, which emphasizes *meaningful*, *mindful*, and *joyful* learning. Through gamification, the learning process becomes interactive and experience-oriented. The element *of meaningfulness* is evident when students understand CRE values not only cognitively but also contextually in their daily lives. The *mindful* element emerges when students realize the spiritual meaning of each learning activity, namely how technology can be used wisely to glorify God. Meanwhile, the *joyful* aspect is seen through a fun, competitive, and collaborative learning atmosphere, which increases student motivation and active involvement.

High school students aged 16–18 are in the late adolescent stage of development, characterized by abstract, reflective, and critical thinking skills. Cognitively, they are able to analyze, evaluate, and relate concepts of faith to the realities of life. Physically, they have achieved motor maturity and high energy, which requires dynamic and challenging learning activities. Socially, they have a strong need to interact, be recognized, and be accepted in peer groups. Therefore, a gamification model that combines technology and game elements is very effective in accommodating these characteristics, as it provides space for active participation, cooperation, and reflection on faith through attractive and interactive digital media.

The material "Talents for the Nation and State" in Christian Religious Education focuses on the introduction and development of self-potential as a gift from God that must be used for the common good. Through *deep learning-based* gamification, students not only understand the concept of talent theoretically, but are also invited to reflect on how they can use their abilities and creativity to serve God and contribute to the nation. *Meaningful* learning fosters awareness that each individual has moral and spiritual responsibilities; *mindful* learning that is helps students understand the purpose of using their talents; and *joyful* learning makes the process take place with joy and gratitude.

From the analysis results, it can be concluded that the application of the deep learning-based gamification learning model in the "Talents for the Nation and State" material

is able to encourage the cognitive, physical, and social development of high school students. Cognitively, students are able to think critically and reflectively about the values of faith; physically, they are active and motivated to participate in various learning activities; and socially, they are trained to work together, respect differences, and apply the value of love in their interactions. Thus, technology-based CRE learning through gamification not only facilitates the understanding of faith concepts but also develops Christian character that is faithful, Creative, reflective, and responsible in the context of life.

RECOMMENDATIONS ON RESEARCH AND DEVELOPMENT

This study is expected to contribute both theoretically and practically to the development of CRE in the digital age. Theoretically, the results of this study contribute to strengthening scientific studies on the integration of technology-based learning models with a deep learning approach in the context of CRE. This study expands our understanding of how technology, when used in a meaningful, mindful, and joyful way, can deepen faith and help students internalize Christian values in their daily lives (Ndruru, 2024).

Practically, this research provides direct benefits for teachers, schools, and Christian communities. For CRE teachers, the results of this study serve as a reference in designing learning models that utilize digital technologies such as gamification, interactive videos, reflection, and student enthusiasm. For schools, this research can be used as a basis for developing technology-based learning policies and infrastructure that are in line with the spiritual and cognitive needs of students. For teachers, the deep-learning approach helps them to think reflectively, critically, and contextually about the values of faith and apply them in real actions (Sugiyono, 2019).

CONCLUSION

Based on the results of the theoretical study and literature analysis that has been carried out, it can be concluded that the technology-based CRE learning model with a deep learning approach has an important role in improving the quality of the learning process and outcomes of students at the high school level. This approach not only focuses on mastery of knowledge but also on the formation of a deep, reflective, and contextual understanding of faith. Through the application of digital technologies such as gamification, interactive videos, and online learning platforms, students are encouraged to understand a learning process that is meaningful, mindful, and joyful. In the context of Christian education, this model helps students integrate spiritual values into their real lives through active, collaborative, and reflective learning. Cognitively, students are able to think critically and understand the meaning of faith in depth; physically, students are more active and motivated to participate in the learning process; and socially, students are trained to work together, appreciate differences, and show love in their interactions with others. Thus, the deep learning approach serves as a means of forming a balanced Christian character between faith, knowledge, and morality in the digital age. Theoretically, this research enriches studies in the field of educational theology and Christian pedagogy by emphasizing the importance of technology integration in learner-centered learning processes. Meanwhile, in practical terms, the results of this study serve as guidelines for CRE teachers and schools. This enables them to design

creative learning that is relevant to the needs of the digital generation. Teachers can optimize digital media to create interactive and reflective learning, while schools can strengthen technological and spiritual support in the learning environment. This research is expected to inspire CRE teachers to continue developing technology-based learning models wisely. Through the deep learning approach, each student is expected to grow into a personal, who is steadfast in faith, critical in thinking, strong in character, and has a spiritual commitment to serve God and the nation amid the challenges of the digital world.

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