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The Influence of Seamless Learning on Learning Outcomes (Problem Solving and Procedural) in Religious Education Based on a Contextual Approach

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Abstract
This study aims to investigate the effect of seamless learning on learning outcomes (problem solving and procedural) in religious education courses based on a contextual approach. The LMS-assisted seamless learning strategy with the Zoom-assisted seamless learning strategy were compared through research using a quasi-experimental research design with a 2x2 factorial design. This study involved 73 students as research subjects. They are students in the religious education course in the first semester of the 2022/2023 academic year. Students were divided into two groups. The experimental group consisted of 37 students who carried out the learning process using the LMS-assisted seamless learning strategy, while the control group consisted of 36 students who carried out the learning process using the Zoom-assisted seamless learning strategy. This study used test instruments in the form of multiple-choice and essays. Data analysis used Multivariate Analysis of Variance (MANOVA). The results of the study showed that, first, there was a significant difference in problem-solving learning outcomes between students taught with LMS-assisted seamless learning and Zoom-assisted seamless learning. Second, there is a significant difference in procedural learning outcomes between students taught with LMS-assisted seamless learning and Zoom-assisted seamless learning.

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1. Introduction

The collaboration between the development of science and technology has helped humanity achieve ever-increasing levels of intelligence and prosperity. Currently, the level of IT penetration has reduced human interaction and digital-based human activities in various industries. Many activities have shifted to online, including e-learning, e-government, e-commerce, and other online-focused activities. The development of information technology creates opportunities to advance educational standards in line with technology to meet the demands of global growth, digital lifestyles, and understanding of religious education and local wisdom [1]. The latest views on learning using technology offer the potential for a new phase in the evolution of continuous learning, learning experiences in various learning situations. Seamless learning is the continuity of learning combined with location, time, technology, or social environment. This learning can be intentional, such as when learning activities begin in the classroom and continue through informal discussions with colleagues, or online at home [2]. Research on seamless learning has become a trending topic in Scopus journals. The results of the study [3] describe that 58 studies have been surveyed to determine the list of concepts in the list of journals, the most cited research, research methods and models, participants, data collection tools, and variables in this article.

The results of the study show a significant increase in the number of studies on the concept of seamless learning. Singapore is a leading country in seamless learning research. [4] In their study examined a total of seven articles, five of which were conducted on seamless learning from Taiwan and two of which were from Japan.

Seamless learning encourages learners to implement the learning material they learn in formal settings into their daily activities outside the classroom. Characteristics of seamless learning: Learning is 'bridging' multifaceted learning efforts across multiple spaces. Seamless learning enables students to learn in a variety of settings and allows them to transition smoothly from one setting or context to another (such as informal and formal learning, personal and social, and others) while using personal intermediaries. Therefore, in seamless learning, Learning allows learners to gain the same learning experience, even though they are in different locations [5]. Designing a suitable learning environment for seamless and distance learning is very important [6]. A seamless learning environment is a space that can be accessed anywhere via mobile or stationary devices and is equipped with technology that can meet learning needs. In seamless learning, learning devices are created to adapt learning content to suit the learner's context.

Learning objectives are achieved based on the results of learning evaluations. Evaluations conducted on students are focused on academic achievement, behavior, and attitudes. Behavioral descriptions in the classroom include following instructions or directions, listening to lessons, collaborating with friends, and using study time wisely [7]. Efforts to solve every problem are fundamental activities carried out by humans, and even most of human thinking is related to solving these problems. So that the results of learning problem solving are one of the very important skills possessed by adults [7]. [8] put forward the following steps in problem solving: 1) understanding the problem, 2) preparing a plan to solve the problem, 3) carrying out activities according to the plan that has been made, and 4) re-evaluating the problem-solving and its solutions. [9] added the problem-solving stage, namely brainstorming all possible solutions (putting forward all possible solutions).

Procedural knowledge consists of three; the first is knowledge about skills in a particular field, such as algorithms that prioritize procedures or step-by-step procedures rather than using their abilities. Second is knowledge about techniques and methods in a particular field, namely, knowledge that can show variable results. Such as knowledge of techniques or methodologies used by researchers in finding solutions to problems. Third, knowledge about the criteria that help determine when to use the right procedure. Learners are required to know how to use procedures that have been carried out; in addition, they can also show the relationship between methods and techniques that they have used or that have been used by others [10]. [11] positions procedural type knowledge in third place, while [12] places it in fourth place. Procedural knowledge is knowledge that explains how to do or make something [12]. This knowledge can also be defined as a cognitive ability that explains the steps in carrying out actions within a procedural framework clearly [13] explains that Procedural knowledge is an effort to carry out the work sequence of arranging objects and the step-by-step arrangement in achieving a solution.

This study uses a full seamless learning strategy, involving all learning spaces (social and individual, informal and formal, digital and physical), utilizing technological devices. This research will be applied to religious education courses, considering that, while students are studying religious education, learning in formal settings also occurs in non-formal settings and is carried out continuously. Therefore, the seamless learning strategy can be applied in religious education learning.Teachers and students can use tools in the form of mobile phones to be able to make observations. Applications that can be used by teachers and students to use *VR technology* include *Google Cardboard*, *Oculus Rift*, and *HTC Vive.*

The purpose of writing this article is to determine the feasibility of the development of *Virtual Reality* (VR)-based learning media based on validation by media experts and material experts, as well as student responses from previously conducted research.

1.1 The problem of the study

This research is deemed necessary to follow up and complement the results of previous research, particularly regarding the effect of seamless learning on problem-solving and procedural learning outcomes. To achieve this goal, this study will test two groups: one group implementing seamless learning with the assistance of an LMS and the other group implementing seamless learning with the assistance of Zoom. Therefore, this study can answer the following two questions.

1. Is there a difference in problem-solving learning outcomes between students taught with LMS-assisted seamless learning and students taught with Zoom-assisted seamless learning?
2. Is there a difference in procedural learning outcomes between students taught with LMS-assisted seamless learning and students taught with Zoom-assisted seamless learning?

1.2 Research Focus

This study aims to determine the effect of Seamless Learning on problem-solving and procedural learning outcomes.

2. Methods

2.1 General Background of Research

This study uses a quasi-experimental research design (quasi-experimental non-equivalent control group). The research method uses a quasi-experimental method because the subjects involved in the study were not selected randomly. This is because the class that will be the subject of the study is already structured, and administratively it is impossible for researchers to randomize the class and so on [14]. The quasi-experimental research design uses a 2x2 factorial. A factorial design is used when researchers consider other variables, one of which is the independent variable [14]. In this study, there is an experimental class, namely a class that is given a seamless learning strategy assisted by a Learning Management System (LMS), and a control class, namely a class with a seamless learning strategy assisted by Zoom.

2.2 Sample of Research

This study involved students enrolled in religious education courses in the first semester of 2022/2023 at several Catholic universities. The participants included 39 students enrolled in classes taught using the LMS-assisted seamless learning strategy and 36 students enrolled in classes taught using the Zoom-assisted seamless learning strategy.

2.3 Instrument

Data were collected through problem-solving learning outcome tests and procedural learning outcome tests. The instrument used to measure students' problem-solving abilities. The test items were created under indicators [15], namely; 1) understanding the problem (understand the problem), 2) putting forward all possible solutions (b rainstorm all possible), 3) carrying out the plan as a solution (Carry out the plan), 4) looking or checking again (looking back). The test instrument used to measure procedural learning outcomes was in the form of multiple-choice questions, where the questions were related to the level of thinking in Bloom's cognitive domain.

2.4 Procedure

This research consists of two stages: the experimental preparation stage and the experimental stage. The experimental preparation stage includes preliminary study activities on religious education courses, preparation of System Application and Processing (SAP), and testing the validity and reliability of the instrument. The second stage is the experiment, which consists of four activities. The first activity is the informal stage 1, students access and study course materials via offline and online. In this stage, students learn in an informal environment and are expected to be involved in learning activities. The learning process is carried out using a Learning Management System (LMS) called E-Macca. The LMS used not only monitors student activities but also functions to help students access materials and other teaching materials. In this learning stage, students download learning materials in the form of several electronic books on religious courses, download teaching materials to be discussed, and download issues to be discussed in formal learning activities. Next, students watch learning video links. All learning materials are accessed by students through their respective e-Macca accounts. After studying the material and watching the learning material videos, students can ask questions through the discussion forum. At this stage, students are expected to understand the material that will be discussed in formal classes later. Next, the formal stage 1 discusses issues through discussions and creates work steps for assignments. In this stage, students learn in a formal environment, namely in the classroom. In formal stage 1, students are divided into several discussion groups. Then, they are given several questions related to the material to be discussed. Each group of students identifies problems in religious learning. Next, students discuss finding solutions to these problems. The next activity is creating work steps for the assignment by compiling steps to solve the problem. Students discuss the solutions in their small groups, and the results of the discussions are uploaded to the LMS.

Informal stage 2, students work on assignments in an informal environment (web browser browsing and in-person or online discussions). In this stage, students work together to analyze learning problems and conduct observations in the learning environment and in the social environment. They search for literature relevant to the issues discussed to create a portfolio. Formal stage 2 is the presentation stage, where each group presents their report in the classroom. After the group presents their report, it is followed by a question-and-answer session with other students. Next, each group revises the report.

2.5 Data analysis

Data collected from problem-solving and procedural learning outcome tests were analyzed using inferential statistical analysis techniques, namely Multivariate Analysis of Variance (MANOVA). This analysis was used to reveal differences in problem-solving and procedural learning outcomes between the experimental and control groups.

3. Result

3.1 Posttest description of problem-solving and procedural learning outcomes based on learning strategies: The posttest results of problem-solving learning outcomes between the experimental and control groups are shown as follows;

Table 1: Level of learning outcomes of problem solving in the experimental class and control class for the religious education posttest

No	Criteria	Mark	Experiment Amount	Experiment %	Control Amount	Control %
1	Very good	86 – 100	10	27.03%	3	8.33%
2	Good	71 – 85	25	67.57%	30	83.34%
3	Enough	56 – 70	2	5.40%	3	8.33%
4	Not enough	41 – 55	0	0.00%	0	0.00%
5	Very less	0 – 40	0	0.00%	0	0.00%
	Total		37	100.00%	36	100.00%

Table 4.9 illustrates that the problem-solving learning outcomes of the experimental class students were superior to those of the control class. This is evident in the posttest scores of 27.03% students who achieved excellent results, 67.57% achieved good results, and only 5.40 of students were in the sufficient category. In the experimental class, there were no students in the poor or very poor categories. In contrast, in the control class, only 8.33% achieved excellent results, with scores dominating in the good category, with 83.34% of students achieving good results and 8.33% in the sufficient category.

Table 2: Level of procedural learning outcomes of the experimental class and control class for the religious education posttest

No	Criteria	Mark	Experiment Amount	Experiment %	Control Amount	Control %
1	Very good	86 – 100	8	21.62%	1	2.78%
2	Good	71 – 85	19	51.35%	16	44.44%
3	Enough	56 – 70	10	27.03%	15	41.67%
4	Not enough	41 – 55	0	0.00%	4	11.11%
5	Very less	0 – 40	0	0.00%	0	0.00%
	Total		37	100.00%	36	100.00%

Table 4.8 illustrates the procedural learning outcomes in the posttest of the experimental class. 21.62% were very good, with good scores dominating at 51.35%. However, there were still 27.03% of students with sufficient scores. There were still 11.11% of students with poor scores in the control class, while the very poor posttest scores were eliminated in all classes.

Analysis of the influence of learning strategies on problem-solving and procedural learning outcomes can be seen in Table 3 below.

Table 3: Results of the Influence Test

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Solution to the problem	3896.432	3	1298.811	10.091	0.305	
	Procedural	9440.915	3	4805.305	24.161	0.153	
Intercept	Solution to the problem	438247.804	1	438247.804	3404.905	0.000	0.980
	Procedural	516256.342	1	516256.342	4471.939	0.000	0.985
Learning strategies	Solution to the problem	1822.131	1	1822.131	11.172	0.002	0.162
	Procedural	987.714	1	987.714	9.626	0.003	0.123
Error	Solution to the problem	8881.041	69	128.711			
	Procedural	7965.602	69	115.444			
Total	Solution to the problem	450536.500	73				
	Procedural	528309.556	73				
Corrected Total	Solution to the problem	12777.473	72				
	Procedural	9406.518	72				

a. R Squared = 0.305 (Adjusted R Squared = 0.275)
b. R Squared = 0.153 (Adjusted R Squared = 0.116)

Table 3 shows the problem-solving learning outcomes of the experimental and control groups, F = 11.172, and a significance of 0.002 < 0.05. This means there is a significant difference between the problem-solving learning outcomes of the student group taught with the LMS-assisted seamless learning strategy and the student group taught with the Zoom-assisted seamless learning strategy. Table 3 also shows the procedural results of the experimental and control groups, F = 9.626, and a significance of 0.000 < 0.05. It can be concluded that there is a significant difference between the problem-solving learning outcomes of the student group taught with the LMS-assisted seamless learning strategy and the student group taught with the Zoom-assisted seamless learning strategy.

4. Discussion

The research findings show significant differences in problem-solving learning outcomes between LMS-assisted seamless learning strategies and Zoom-assisted seamless learning strategies. Students in classes using LMS-assisted seamless learning strategies have higher learning outcomes compared to classes using Zoom-assisted seamless learning strategies. This is consistent with the opinion of several studies that the use of seamless learning strategies can improve learning outcomes in problem-solving, but the effectiveness of seamless learning also depends on the right learning design and the use of appropriate technology. A study shows that LMS-assisted seamless learning strategies improve problem-solving abilities and strengthen collaborative skills [16]. The use of LMS-assisted seamless learning strategies and mobile devices can increase learning effectiveness and student satisfaction [17]. The use of blended online learning and Zoom-assisted seamless learning strategies can increase student engagement and facilitate distance learning [18]. Efforts are being made to improve student engagement, learning quality, and collaborative skills during the COVID-19 pandemic in higher education by using LMS-assisted seamless learning strategies and Zoom [19]. In addition, the use of seamless learning strategies shows that the learning outcomes of religious education and learning motivation are better than the learning outcomes and learning motivation of religious education taught with conventional learning strategies. [23] The problem-solving ability in learning religious education taught with seamless learning strategies is better than the problem-solving ability of education taught with conventional learning strategies [24]. In research conducted on grade X high school students in China, it was shown that there were differences in English learning outcomes and interest in learning English taught with seamless learning strategies and conventional learning strategies. [25]

Furthermore, the findings showed significant differences in procedural learning outcomes between LMS-assisted seamless learning strategies and Zoom-assisted seamless learning strategies. Students in classes using LMS-assisted seamless learning strategies had higher learning outcomes compared to classes using Zoom-assisted seamless learning strategies. The results of this study are supported by a number of previous studies in various fields. Research [20] examined the differences in procedural learning outcomes using LMS-assisted seamless learning strategies and Zoom-assisted seamless learning strategies in higher education. The results showed that both types of seamless learning strategies had a positive impact on student learning achievement and motivation. The seamless learning strategy also had a positive impact on student satisfaction and interest in learning, although there was no significant difference in learning achievement [21]. The use of a blended learning strategy, namely a combination of LMS and Zoom, can improve student learning achievement in seamless learning [22]. Research in Taiwan with research objects on grade XI high school students showed that there were differences in procedural learning outcomes taught with LMS-assisted seamless learning strategies and Zoom-assisted seamless learning strategies. [26] Learning outcomes with seamless learning strategies were better than learning outcomes taught with conventional learning strategies. [27]

5. Conclusion

Based on the research results, it can be concluded that the seamless learning strategy in religious education learning assisted by LMS can improve problem-solving learning

outcomes and procedural learning outcomes contextually. The results of this study prove that the seamless learning strategy is an innovative learning strategy in the digital technology era that can be applied to improve religious education learning outcomes in completing learning, including problem-solving and procedural skills in solving questions. The limitations of this study are in detecting learning carried out by students informally, as it takes some time to see student activities. The internet network is not yet capable in practice, and in accessing learning, needs to be provided and facilitated in the ongoing learning process.

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