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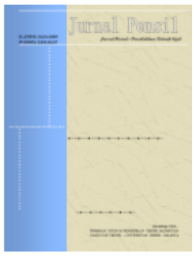

DEVELOPMENT OF ENRICHED VIRTUAL CLASSROOM WITH PEDATI IN CONSTRUCTION COST ESTIMATE COURSE

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P-ISSN: 2301-8437
E-ISSN: 2623-1085

ARTICLE HISTORY
Accepted:
10 April 2023
Revision:
26 Mei 2023
Published:
30 Mei 2023

ARTICLE DOI:
10.21009/jpensil.v12i2.34941

Abstract

This study aims to develop designs and learning products for the Enriched Virtual Classroom using PEDATI in building construction planning. Enriched Virtual Classroom belongs to blended learning. This learning model is one of the models where the learning process is played with technology and face-to-face learning is only an additional supplement if needed. The development procedure uses the ADDIE model which is integrated with the PEDATI model at the learning design preparation stage. The components and indicators for the expert review of the instrument were prepared based on the standard components and indicators of the "Network-Based Learning Evaluation Instrument" developed by Hadiansyah, et al. in 2018. Instruments will be given to learning design experts in terms of five aspects, namely subject identity, clarity of learning objectives, the relevance of learning strategies to learning objectives, the relevance of evaluation to learning objectives as well as language and communication. The results of the evaluation use the scoring from the expert review by using proportions. The percentages obtained were 94.78% from instructional design experts, 95.71% from media experts, and 90.83% from instructional design experts.

Keywords: ADDIE, PEDATI, Enriched Virtual Classroom

Introduction

Advances in technology and information are now increasingly familiar in life and are proven to make work easier (Arciosa, 2022). Various types of people, especially people who live in urban areas, are beginning to be trained in using technology in almost all activities in their lives, such as working online from home (work from home), studying from home, and shopping from home (Ismail & Nugroho, 2022).

Education in Indonesia is now entering the era of society 5.0. Students and teachers are very dependent on technology as a means of conveying information and communicating and even almost all learning activities use technology to achieve learning goals. The use of learning methods with technology is designed to make it easier and more efficient so that learning activities (Wulandari, 2022) can be carried out according to the current curriculum, namely "Kurikulum Medeka"

This statement is in line with the update on the definition of Educational Technology carried out by the Association for Education and Communication Technology (AECT) (Asino et al., 2022) in 2018 which means that Educational Technology is present as a learning medium (Sudarsana et al., 2019) to improve the quality of education (Widiyono & Millati, 2021) and student performance through the strategic design of educational processes and resources.

Learning in the era of society 5.0 can take place remotely (Dewi Harahap et al., 2022) or *online* (Avsec et al., 2022). The online learning model is a system where students can study learning topics, discuss problems together, clarify doubts with teachers and share materials, and check academic progress with the help of internet-oriented technologies (Kulal & Nayak, 2020). Not long after, blended learning appeared and became a popular learning model today. Blended learning is a learning method that combines face-to-face learning and distance learning (Cronje, 2020; Setiawan et al., 2022). According to research developed by the Clayton Kristen Institute, there are 4 classifications in blended learning, namely the rotation model, the flex model, the self-blend model, and the enriched virtual model (Lutfiana et al., 2022; Pivneva et al., 2020).

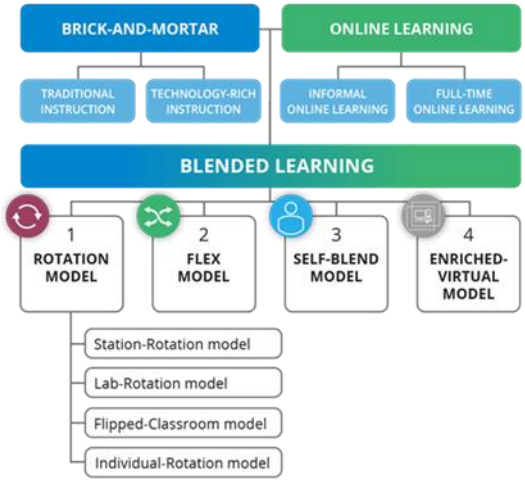

Figure 1. Learning model (Dakhi et al., 2020)

Enriched Virtual Classroom is one of the classifications in blended learning. This learning model is an alternative learning model that is carried out remotely where the learning process is dominated by technology replacing all types of mandatory activities and face-to-face learning is only an additional supplement if needed (Krismadinata et al., 2020; Mahmud, 2020). This learning model consists of reading, cross-learning, communication, and debate through electronic channels. Additional sessions for face-to-face learning can be provided in schools but only as a supplement (Alam & Agarwal, 2020).

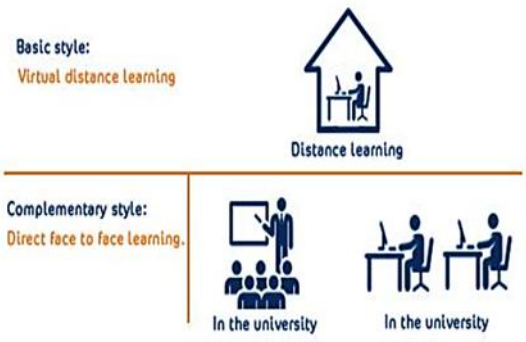

Figure 2. Illustration of EVC (Alam & Agarwal, 2020)

The Enriched Virtual Classroom learning model can be applied to formal education. The National Education System in Indonesia has been fully regulated by Law Number 20 of 2003. Education in Indonesia is divided into three, namely formal, non-formal, and informal education. Education in Indonesia is divided into four levels of education, namely early childhood education, basic, secondary, and higher education (university). While the types of education include general, academic, professional, religious, vocational, and special education (Undang-Undang Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional, 2013).

Vocational High School (SMK) is a formal educational institution in Indonesia that is at the secondary education level (Fatahillah & Triyono, 2019) and implements specialized training systems to prepare a skill (Sudarsono et al., 2022) to become a workforce of Vocational High School graduates who are of course ready to work (Sunggoro et al., 2022) professional in their field (Romadloni & Cahyaka, 2021). Vocational High School is a level of education that focuses on skills for work (Nofrita & Idrus, 2022). The better the implementation of skills for work, the higher the industrial growth in the country. The more Vocational High Schools are established in the regions, the level of welfare of the local community may be better (Suharno et al., 2020).

SMKN 3 Cikarang Barat is a vocational school that has several expertise programs. One of the expertise programs is the Construction and Property Business expertise program. The Construction and Property Business expertise program is a competency program that prepares students to master business in construction and property. The Construction and Property Business expertise program consist of several subjects that must be taken by students, namely compulsory subjects (national and regional content) and vocational specialization content subjects. Vocational specialization content subjects are divided into three sub-groups namely Basic Areas of Expertise, Basic Expertise Programs, and Skills Competency (productive). One of the subjects contained in the skill competency subject group (productive) in the Construction and Property Business is Construction Cost Estimate (Rofiah & HS, 2021). Construction Cost Estimate course is taught in class XI in semesters three and four and Class XII in semesters five and six. In class XI, this subject has 18 basic competencies and 37 competency indicators which are divided into 2 semesters, 9 subject matters, and a total of 185 hours of lessons. This study was conducted in odd semesters with 3 subject matters.

Many online platforms support the Enriched Virtual Classroom to coordinate and distribute in-building cost-budget plan learning assignments using Edmodo, Zoom, wordwall, and learning video platforms connected to YouTube. By using Edmodo is a social learning network (Az-Zahra et al., 2022) that can be used as a learning platform to connect teachers and students in sharing learning materials, and assignments, and providing good feedback to their students (Farman et al., 2022). In addition, some facilities allow small groups of students to study on Edmodo (Ratnaningsih et al., 2020).

The purpose of the Enriched Virtual Classroom model is to enhance students' active learning experiences because when viewed from the cone of Edgar Dale's learning experience (Johansen, 2023), the possibility of student understanding obtained is 71% to 90% by involving students directly (Teoh et al ., 2022) directly to analyze the budget needed to make simple buildings.

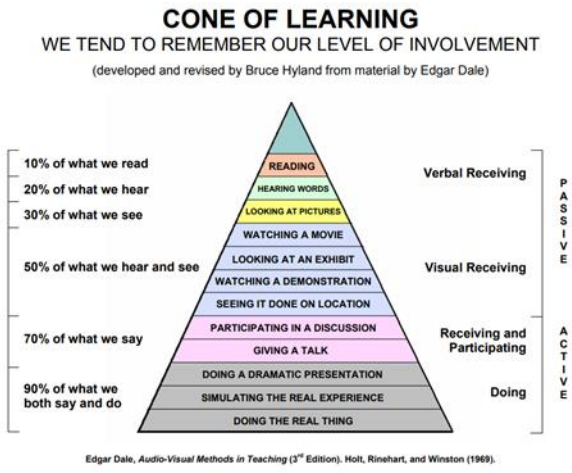

Figure 3. Edgar Dale's cone of learning experience (Penjor et al., 2022)

Before analyzing the budget for a building, students receive verbal learning such as reading learning material that has been provided on Edmodo, and receive learning visually such as viewing tutorials sourced from YouTube. The next stage is that students can discuss between students or groups using zoom to analyze the budget needed for a building. The final stage is that students will be evaluated for learning outcomes by presenting the results of their group analysis and holding independent quizzes using wordwall.

This is reinforced by research conducted by Sherif Yehia and Cindy Gunn (Yehia & Gunn, 2018) concludes that Enriching the Learning Experience for Civil Engineering Students through Learner-Centered Teaching makes students more active with variations in learning. There are many supporting platforms for the Enriched Virtual Classroom such as Edmodo, Zoom, YouTube, and wordwall. Other research was conducted by Oktovianus Nau Lalian, Eveline Siregar, Murni Winarsih (Lalian et al., 2021) which states that the development of blended learning with the PEDATI design can be used by teachers as a learning strategy in overcoming the problem of lack of face-to-face time, improving student learning outcomes, and as a learning resource for independent learning and collaborative learning. The advantages of blended learning development products are carried out systematically by formulating learning objectives, mapping and organizing learning materials, selecting and determining synchronous and asynchronous learning activities, designing asynchronous learning activities, and designing synchronous learning activities.

Based on the description above, it would be interesting if research and development of the Enriched Virtual Classroom learning model were carried out with the PEDATI Building cost-budget plan learning approach in the hope of being able to improve the student experience in learning and being able to fulfill the learning objectives, namely being able to develop a building cost-budget plan. Another goal of this development is to train students to become professional estimators of course with the application of innovative learning models.

Research Methodology

This research is research and development (Research & Development). Research and development (R&D) is a type of research used by researchers in research to produce new product designs (Maydiantoro, 2021), test the effectiveness of existing products, and develop and improve existing products (Sugiyono, 2015a).

Research and development in the form of an enriched virtual classroom on the Construction Cost Estimate course for students of SMKN 3 Cikarang will be designed, developed, validated, and evaluated systematically to produce certain learning products. This research and development refer to the ADDIE development model by adding the PEDATI learning model. The ADDIE development model is used as a reference for procedurally developing products (Prasetyo et al., 2020) while PEDATI is used to detail enriched virtual classroom learning activities (Chaeruman et al., 2020).

This research was conducted at the Construction and Property Business expertise program, SMKN 3 West Cikarang which is located at Perum Metland Cibitung

RT007/020, Telaga Murni, Kec. West Cikarang, Bekasi district, Province West Java. The Feasibility Test was carried out by material experts and media experts who are lecturers in the Building Engineering Education study program (materials) and lecturers in the Educational Technology study program (media). Field trials were carried out one to one with three students of class XI in the Construction and Property Business with different levels of ability, namely low (A), medium (B), and high (C) who were taking the Construction Cost Estimate course to determine students' perceptions of this development. Collecting data using a questionnaire instrument with a Likert scale of 1 to 5 with the data collection technique used is a combined technique (observation, interview, documentation).

Furthermore, data analysis techniques in this learning model development research obtained qualitative and quantitative data through validation from experts. Qualitative data is in the form of assessments of suggestions and criticisms from learning design experts (reviewers), media experts, and material experts as well as students while quantitative data is assessment scores from questionnaires or questionnaires that have been filled in by reviewers and students. The scoring result is then are then calculated using the percentage (%) $= \frac{\sum x}{SMI} \; X \; 100 \; \%$, $\sum x$ is the total score and SMI is the ideal maximum score (Lasamahu, 2021; Sugiyono, 2017; Tegeh et al., 2014).

Research Results and Discussion

Research on the development of an enriched virtual classroom with the PEDATI learning model the Construction Cost Estimate course produces a learning design and learning product that can be accessed on Edmodo SMKN 3 Cikarang Barat. The development of an enriched virtual classroom using the PEDATI model helps students and teachers in the learning process by maximizing face-to-face time in class for calculation materials and as a source of self-directed learning for theoretical learning materials.

This development procedure uses the ADDIE model and is integrated with the PEDATI model in designing learning. The following are the results of a research according to the stages of development ADDIE (Spatioti et al., 2022):

Analyze

Based on the results of the analysis (Analyze), the problem in Construction Cost Estimate course activities is the unavailability of independent learning resources for class XI BKP students, so students receive more learning material from the teacher through face-to-face learning in class. Therefore, teachers in the Construction Cost Estimate course subject become one of the students' main learning resources. In addition to the unavailability of independent learning resources for class XI BKP students, the main problem that occurs in the Construction Cost Estimate course is the lack of face-to-face time because the school only has six classrooms for four study programs.

Design

The blended learning design process is carried out with subject teachers in formulating learning outcomes and objectives as well as mapping and organizing materials presented online (asynchronous) and face-to-face in class (synchronous). At this stage, it is integrated with the learning design stage in the PEDATI model. The feasibility of the results of this development is reviewed by experts in the field of materials, learning design, and media. The results of the expert review of learning design, media, and materials stated that the development results were in the very good category to use.

Development

In the development stage, blended learning in the Construction Cost Estimate course is carried out in accordance with the results of the learning design that has been designed with the supporting teacher and is guided by the subject syllabus and the Media

Content Outline to determine the type of media used.

Implementation

The implementation phase is carried out by testing the prototype to obtain the results of the student's initial perceptions. The one-to-one trial was conducted on three students of class XI BKP with different levels of ability, namely low (A), medium (B), and high (C). The following are the results of the one-to-one trial:

Table 1. One to one trial results

Aspect	Cumulative Score		
	A	B	C
Learning	23	23	23
Appearance	14	15	15
Program/ Compatibility	22	24	23
Language and Communication	10	9	10
Total Score	69	71	71
Achievement Rate Percentage (%)	92	94.7	94.7

Based on the results of the one-to-one trial, the development of an enriched virtual classroom with the PEDATI model from learning aspects, display aspects, program/compatibility aspects as well as language and communication aspects is in the very good category used in Construction Cost Estimate course in Vocational High School, especially Construction and Property Business expertise program.

Evaluation

At this evaluation stage, a feasibility analysis was carried out by 3 expert reviews, namely in the areas of learning design, learning media, and learning materials. Following are the results of the expert review that has been carried out:

Table 2. Results of expert reviewers

Expert Reviews	Percentage (%)	Qualification
Instructional Design	94.78 %.	Very good
Learning Media	95.71 %.	Very good
Learning materials	90.83 %.	Very good

However, even though the results obtained were very good qualifications with information that did not need revision, this development still received recommendations and suggestions for improvement, such as making a learning plan for each meeting so that student learning activities were clearly visible and the cover design was made more attractive and added real pictures from expert reviews of learning designs. Furthermore, from the expert review of learning media, recommendations and suggestions for improvement are obtained, namely (1) to make headers for each learning activity carried out on Edmodo to make it look more attractive. (2) Make an interesting learning guide to attract students' attention to learning to use Edmodo and add an Edmodo information system flowchart to the learning design.

Finally, recommendations and suggestions for improvement from the expert review of learning materials, namely (1) in learning material 2 are given suggestions for making large activities then broken down into more detailed activities and (2) in learning material 3 it is recommended to change the title so that it is more concise and tidy return the material to be presented because it has not reached its goal.

Conclusion

Research on the development of an enriched virtual classroom with the PEDATI learning model in the Construction Cost Estimate course produces a learning design and learning product that can be accessed on the school's Edmodo. The development of an enriched virtual classroom using the PEDATI model helps students and teachers in the learning process by maximizing face-to-face time in class for calculation materials

and as a source of self-directed learning for theoretical learning materials.

This development procedure uses the ADDIE model and is integrated with the PEDATI model in designing learning. The product resulting from the development can be used as a reference for teachers of other vocational schools majoring in a building by utilizing available technological resources in the learning environment because based on the overall results of the expert review stating that this product has very good qualifications.

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