



Development of Self-blend Learning Model for Computer and Network Engineering Expertise Package Based on Website in Vocational High Schools

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Abstract. This study aims to develop a self-blend learning model in Computer and Basic Network subjects for class X SMK Computer Engineering and Website-Based Network Expertise Package that is valid, practical and effective. This type of research is research and development Research and Development by adopting the ADDIE model through stages; 1) Analysis, 2) Design, 3) Development, 4) Implementation, 5) Evaluation. The analysis technique uses the Aiken'V test to determine the validation of the model using expert tests and focuses on group discussions. The effectiveness test was conducted through a quasi-experimental. This research produces a self-blend learning model with five syntaxes: 1). Preparation Learning Orientation, 2). Access Content and Activities, 3). Access Content and Activities, 4). Assignment, Discuss, and Implementation Face to Face & Online, 5). Evaluation of The Learning Outcomes. This research is also equipped with product results in the form of self-blend learning model books, textbooks, teacher manuals, student manuals and guidebooks for using valid, practical and effective systems. Based on the findings, this self-blend learning model has proven validity, practicality and effectiveness, so it is suitable for use in Basic Computer and Network subjects. The implications of this research can be an alternative recommendation to optimize face-to-face and online learning.

Keywords: Self-Blend Learning · Computer and Network Basic · Online · Face to Face · SMK

1 Introduction

The demands of learning in the 21st century are learning that focuses on significant material but on developing critical learning skills. Given that today's students must have high creativity that is not constrained by space and time, information technology needs are increasing rapidly Dakhi et al., 2022; Dakhi et al., 2020). Students must learn to trace,

analyze, synthesize, transform, deconstruct, create, appreciate, interact with themselves and the environment, and share knowledge with others or peers. The teacher's attention provides opportunities for students to connect what they have learned to the real world. One of the essential effects of technology on learning in the 21st century is the ease of access or accessibility of digital educational resources to meet the needs of diverse learners (Irawan, Sutadji & Widiyanti, 2017; Latchem, 2017).

The components of 21st-century learning that enhance interaction with each other include: 1) how teacher activities, 2) online learning design, 3) data as learning resources, 4) online learning strategies, and 5) student achievement. These demands must improve learning patterns because it is inevitable that learning will still use online mode in the pandemic era. Learning patterns may not have clarity, so a learning orientation is needed for students with high creative power. Meanwhile, in learning technical competencies, many students experience obstacles, especially students who do not have experience, environmental understanding, and introduction to technology and habituation in learning still rely a lot on face-to-face, even though the obstacles that accompany this; students are required to be able to produce creativity. High-order thinking skills are a pattern that must construct in learning, and students as subjects must practice higher-order thinking and develop the habit of creating.

There is a system of mentoring or introduction of competencies and skills based on what they see, understand, are guided, directed, how to communicate, transfer knowledge in the pre-pandemic era, able to shape students to have high skills in the world of technical competence. However, because learning uses online mode, learning is needed to accommodate this interest, one of which is TPACK. TPACK (Technological Pedagogic Content Knowledge) is learning that uses a combined education system that emphasizes technology and specific applications (content) in learning (Deechai, Sovajassatakul & Petsangsri, 2019; Jalinus, 2021). This learning involves seven domains of knowledge that interrelate with each other. TPACK consists of; 1) Content Knowledge, namely mastery of the field of study or learning material, in this case the competence of expertise, especially in Basic Computers and Networks, 2) Pedagogical Knowledge, which is knowledge about the most optimal learning processes and strategies so that student creativity increases and learning objectives can be achieved, 3) Technological Knowledge, which is knowledge about how to use digital technology, 4) Pedagogical and material knowledge (pedagogical content knowledge) combines knowledge of the field of study or learning material with learning processes and strategies, 5) Technological and material knowledge (technological content knowledge), namely knowledge of digital technology and knowledge of the field of study or learning material, 6) Technological and pedagogical knowledge (technological pedagogical knowledge), namely knowledge of digital technology and learning processes and strategies, 7) Technological, pedagogical, and content knowledge, namely digital technology knowledge, learning processes and strategies, subject knowledge, or learning materials.

The results of interviews conducted with teachers of Basic Computer and Network subjects in class X TKJ Senior High School 1 Amandraya obtained information that; 1) the lack of teaching materials relevant to the characteristics of students. Teaching materials are only used in printed books, pdfs, and material delivery, sometimes using powerpoint presentation. Although students need the right learning resources, the internet

is one of the student learning resources. However, not all students want to look for material to study independently, which causes them to have a poor understanding of Basic Computer and Network subjects, 2) lack of learning hours, limited to only 2 h per week, while indicators or temporary material on the agenda can achieve, very dense in theoretical and practical activities. The limited number of hours of class activities often causes teaching and learning activities to be completed with in-class activities, so they replace them with homework. Thus, teaching resources greatly influence the teaching and learning process. However, the lack of teaching materials can give the impression that this is the only source of learning for the teacher. When students practice procedures and have problems, they seek help from the teacher. Students do not have the initiative to find solutions to their problems.

The results of filling out the questionnaire of students in class X TKJ about learning in the learning process obtained information: the teacher uses a learning model that is less interesting and varied; The learning media used by the teacher is less attractive; Less interesting learning in presenting material in photos, videos, and discussion forums. The results of interviews and questionnaires of Basic Computer and Networking subject teachers at Senior High School 1 Amandraya and students of class X TKJ analyzed students' characteristics and learning abilities. With the help of questionnaires distributed to students in class, TKJ X can analyze student characteristics from part 1) student understanding of Basic Computer and Network subjects in 35 respondents is 34%. In addition to analyzing students' knowledge of Basic Computer and Network subjects in detail, 2) student learning interest by 35 respondents, 74% of students stated that they were interested in the media used in learning Basic Computer and Network videos, 3) student learning motivation 93% of student respondents agreed that website-based e-learning/siakad media should motivate students to participate in the learning process, and 4) 88% of students stated that they only used Powerpoint when the teacher explained the material when learning media.

The blended learning model in basic computer and network subjects designed to enable online and face-to-face learning, anytime, anywhere. Blended learning is a formal instructional program that delivers content and instruction through digital and online environments with elements of learner control over time, place, and pace (Catt, Falk, & Wallace, 2011). Many schools are implementing blended learning because it improves learning effectiveness and successfully integrates online and face-to-face instruction for adult learners. (Mesh, 2016).

With blended learning, the learning time is longer and students can be involved (Hamilton and Tee 2013). In this way, students have more flexibility in choosing when and where to study, such as in the park, at the library, at home, on the road, at a meeting place such as a café and more. Moreover, with more materials, the knowledge gained is broader and teachers and students can be involved in the learning.

2 Method

This type of research is research and development Research and Development by adopting the ADDIE model through stages; 1) Analysis, 2) Design, 3) Development, 4) Implementation, 5) Evaluation. The analysis technique uses the Aiken'V test to determine

the validation of the model using expert tests and focuses on group discussions. The effectiveness test was conducted through a quasi-experimental. This research produces a self-blend learning model with five syntaxes: 1). Preparation Learning Orientation, 2). Access Content and Activities, 3). Access Content and Activities, 4). Assignment, Discuss, and Implementation Face to Face & Online, 5). Evaluation of The Learning Outcomes. This research is also equipped with product results in the form of self-blend learning model books, textbooks, teacher manuals, student manuals and guidebooks for using valid, practical and effective systems.

3 Result and Discussion

Based on the results of research on the development of a model based on self-learning in computing and networking subjects, which follows the steps of the ADDIE development model through the stages of analysis, design, development, implementation and evaluation (Branch 2009). An explanation of the steps is provided below:

1. Analysis

Needs analysis is an initial investigation of the need for a self-blended learning model in basic computer and network subjects to collect information in the form of observations (observations) and distribute questionnaires to identify problems in the field, analyze the objectives and content of basic computer and network subjects, analyze characteristics, analyze model needs that contain perceptions, experiences, and needs in model development, and analyze the needs of e-learning components.

At this stage, a literature review also conducts as the beginning of the development of the self-blended learning model, literature review uses to analyze theories and concepts related to the development of the self-blended learning model and activities through this literature review to collect information relevant to the theme under study. The source is undoubtedly based on relevant references such as books, national and international scientific journals, and other sources in writing, both print and electronic. The literature review results are used to examine in depth and draw conclusions from the development of the self-blended learning model.

Learning development is carried out to achieve relevance between the skill needs of graduates and the world of work, which includes the skills of the 21st century and the era of Industrial Revolution 4.0, thus in this case, the development of a blended learning model in the core subjects of computing and networks. The results of previous research are based on the analysis conducted to meet the needs of developing blended learning models in the core subjects of computer science and networks in the form of student analysis results and based on learning needs in the 21st century to assess the 4C and the era of Industrial Revolution 4.0. In addition, an autonomous blended learning model should be developed based on the analysis of the needs of the world of work that requires this skill and the needs of student characteristics.

The existing learning process tends to be dominated by teachers, and students often wait for teacher instructions, there are time constraints when students must be able to do assembly, and so on, students are less active and have not thought critically to reach

HOTS. Students learning basic computers and networks tend to work independently, and 4C soft skills have yet to be applied. Learning independently does not work in teams, so students solve problems or tasks; if there are obstacles, students only ask the teacher and limited discussions with other students.

Based on the data from the needs analysis and preliminary research results, it becomes a reference in developing the self-blended learning model and its supporting products, such as model books, textbooks, teacher's manuals, and student manuals. In addition, the aspects of philosophy, psychology, culture, and the development of science and technology are also studied to make a rational development of the self-blended learning model.

2. Design Stage

Theoretically, building a model consists of five elements, namely; a) Syntax/operational steps of learning, b) Social System; the atmosphere and norms that apply in learning, c) Principles of reaction; describes how lecturers should view and treat students, d) Support system; all facilities, materials, tools, or learning environments that support learning, and e) Instructional and nurturant effect; learning outcomes obtained directly based on the objectives set and beyond those set.

The model development has produced products in the form of blended learning models in basic computer and network subjects. In contrast, the products produced include a) model books, b) textbooks, c) teacher guidebooks, d) student guidebooks, and e) e-learning guidebooks. The developed model consists of a model rationale, which contains supporting theories, and relevant research to be used as a foundation in the preparation and development of self-blended learning models that have rationality of thought that refers to the needs of learning competencies in the era of the industrial revolution 4.0 and 21st-century learning, has reasons and arguments to overcome problems with previous learning models. In addition, there is a rationalization for the development of learning models based on the characteristics and conditions of students; besides that, the development also refers to the learning outcomes of basic computer and network subjects, learning theory, impact, and social learning systems.

This research has produced a self-blend learning model containing syntax that has validity from assessing the elements of a good learning model (Fig. 1).

3. Development Stage

The model products developed were validated, which included: a) model book, b) textbook, c) teacher's guide, d) student's guide, and e) e-learning guide. The validity test used product evaluation techniques proposed by Tessmer (2013) in Plomp (2013), namely expert review and focus group discussion. The expert review validation results have a good resistance level compared to other validation techniques. The validation results carried out by the validator on the feasibility of the content of the model product validity instrument are categorized as meeting scientific criteria in product development.

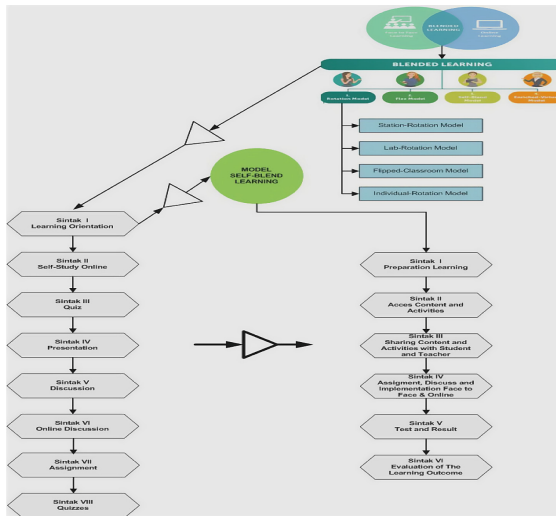


Fig. 1. Self-blend Learning Development Model

According to Azwar (2013: 123), the assessment with the validity level of V Aiken obtained 0.87 is interpreted as relatively high (valid). The validation results of all indicators assessed by the validator from the aspects of content feasibility, instrument language, and feasibility of the visual aspect are valid and suitable for testing. The results of the validity test of the model book on the validation instrument from the validator are: a) model rationalization, b) theoretical basis, c) model characteristics, d) Syntax, e) Social system, f) reaction principles, g) Support system, h) instructional impact and accompanying impact, the total of all indicators has an average score of 0.8708 with a valid category. It is concluded that the model book that has been developed is declared valid from all aspects of the assessment.

The validity tests of the validated textbooks were: a) textbook content feasibility, b) linguistic feasibility, c) graphic feasibility, and d) ease of representation by valid categories. The developed textbooks were declared valid in all aspects of the evaluation, with an average of 0.890 in the very valid category. As a result, the textbooks developed were declared valid in all aspects of the assessment.

With regard to the validation tests of the validated teacher's manual, namely (a) writing, (b) language use, (c) introduction, (d) content aspects, and (e) evaluation system, all indicators were classified in the valid category with an average total score of 0.880. In conclusion, it is declared that the developed teacher's guide is valid in all aspects of the assessment.

The validation test of the student guide by the validator included a) text format, b) language use, c) introduction, d) content aspects, and e) evaluation system, and the sum of all indicators was in the valid category with an average score of 0.8838. As a result, the developed study guide was declared valid for all aspects of the assessment.

4. Implementation Stage

The practice test measures the use of the self-constructed learning model in the basic subjects of computer science and networking. The test is administered to teachers and students. The teacher practicability assessment includes practicability of the learning model book, practicability of the textbook and teacher's manual, with an average value of 0.843 in the Practicability category. While the evaluation of student usability, which includes the usability of the learning model book, the usability of the textbook and the usability of the student handbook, has a mean value of 0.848 in the Practical category. It was concluded that the usability evaluation of teachers' and students' responses indicates that the overall product has practical value.

5. Evaluation Stage

Description of the results of effectiveness testing from cognitive aspects, affective aspects, and psychomotor aspects, followed by posttest in experimental and control classes. Assessment of cognitive aspects to determine the success rate of the extent to which students master the theoretical studies in basic computer and network subjects that contain HOTS cognitive levels, including analysis, evaluation, and creation of C3, C4, C5, and C6 abilities. Based on the results of the average score on cognitive aspects when the experimental class amounted to 71.02, while the control class amounted to 64.13. In addition, there is a difference in the average learning outcomes obtained by the experimental and control classes.

In the affective assessment to determine the attitude and behavior of students in learning in the self-blended learning model in the experimental class, the affective average was 79.8. In the control class, it was 79.8. It concludes that the experimental class is better than the control class based on the average score of learning outcomes in the affective aspect. Results For psychomotor results from the results of student group project assignments. Of the four groups, it concludes that the group had a high average psychomotor assessment of each assessment aspect.

4 Conclusions

The research results of the development of the self-blend learning model resulted in a learning model that combines online and face-to-face support systems in the form of a valid, practical, and effective self-blend learning model book, textbook, teacher's manual, and student's manual. This self-blend learning model allows students to learn flexibly, anywhere and anytime, under interaction and feedback. The developed model is also effectively packaged and can be an indicator to foster the ease of flexibility of learning anywhere and anytime without being limited by distance, space, and time; with online learning and laboratory learning approaches, it can also foster student learning activities and motivation in learning. This self-blend learning model can strengthen cognitive, affective, and psychomotor aspects. This model is relevant for implementing 21st-century learning that includes critical thinking, creativity, communication, and collaboration skills.

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