Developing a Blended Learning Model in Islamic Religious Education to Improve Learning Outcomes

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***Abstract*—The blended learning (BL) model was becoming popular during the COVID-19 pandemic. Even though much research has been conducted on BL, simple steps in model BL are still scarce. BL has complex steps and requires long-term stability support. The fundamental problem is to find the right model of blended learning. This study aims to find a model to teach Islamic Religion (IR) using ASSURE and the three-stage Plomp design models. This research is type of research and development. This article finds a model of syntax BL development at IR. The students were from three Islamic universities in Yogyakarta, Indonesia. This research limitation was more difficult when the COVID-19 limited classroom meetings. The innovation of this BL model is simple steps into building BL and has the originality to the contextually subject matter.**

***Index Terms*—ASSURE and Plomp, blended learning model, Islamic religion.**

I. Introduction

The COVID-19 pandemic has created challenges for global higher education, in particular, the instructional developments [1]-[5]. Instructional developments in higher education discuss how instructional influences are influenced and how to respond to the instructional future. The COVID-19 pandemic has changed the instructional. Many researchers have recognized computer to instructional innovations [6]-[9]. Blended learning (BL) is believed to be instructional innovations [6], [10]. BL combines between the best teaching in classroom (onsite) and e-learning (online) [11]. The BL model provides broad opportunities for students to learn [4], [12]. The BL is full of steps and requires long-term stability support [13]–[17]. Besides that, it focuses on a reconstruction problem in which BL can respond to problem learning needs even outside the classroom and can be an important element of pedagogy [5], [18], [19]. Moreover, Web Pedagogical is an important competence for pre-service teachers [20]–[22]. Even though many studies have been conducted on BL, but building BL systematically, simply, and contextually still scarce.

This study is made for students of pre-service teachers at Islamic religious education universities. In course for students of pre-service teachers at Islamic religious (IR) education universities, students learn how to plan and analyze as well as teach IR. Students are provided with various online and onsite learning resources so that it is easy to explore real-world problems. The facilitated learning experience is gained in both online and onsite learning environments. BL provides a flexible approach to the collaborative learning process by students, teachers, and experts. BL has also proven conceptually effective and can be applied in various forms of learning across disciplines. Unfortunately, blended learning is a complex step and requires stability support [13]–[17].

Manuscript received June, 2021; revised September 1, 2021.

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II. Literature Review

A. Blended Learning Model

BL combines the best teaching in the classroom (onsite) and e-learning (online) [11]. BL is learning with a combination of face-to-face and online learning to produce effective, efficient, and flexible learning [23]. BL in higher education is increasingly popular because it has more advantages. Characteristics of students as adults have been able to do independent learning. Students are able to find materials, follow instructions from lecturers, and take responsibilities. The proportion of learning categorized as BL, according to Allen *et al*., that is done online is as much as 30%–79% [24]. BL increases student participation from eight indicators: visual, oral, writing, writing, drawing, metrics, mental, and emotional skills [7]. Armando *et al*. [25] designed an innovative location-based service for BL environments with 5G technology. Engelbertink *et al*. [26] found that the participatory design approach to leading BL course is the use of technology that focuses on content, target group, context, and ethical aspects in the course. Kang *et al*. [27] verify a flipped classroom on knowledge, problem-solving, and satisfaction student in designing BL. Ayob *et al*. [28] identify the effectiveness of using the strategy of BL toward higher students in the United Arab Emirates. Shantini *et al*. [29] found several factors that influence the implementation. The possibility of developing a BL model that has been designed can be implemented in non-formal education institutions. Jalinus *et al*. [8] developed a BL model in vocational education. Marsel Nande *et al*. [30] improved students' learning outcomes in senior high school using this model.

There are 15 articles related to the research that are about some factors in BL. Amelia *et al*. [31] examined the effect of e-scaffolding in BL on pre-service teachers. Archibald [32] described the blended teaching readiness model are reliable for use with pre-service through a blended teaching course. Lu'luilmaknun *et al*. [33] determine the skills of pre-service

mathematics teachers after implementing BL. Hadipriyatno *et al*. [34] made a test to find out the effectiveness of the BL to improve the scientific literacy skill of pre-service of the teacher and students at Universitas Mataram Indonesia. Yusro *et al*. [35] identified the influence of active involvement on BL on pre-service teachers. Bordoloi *et al*. [13] reported perceptions of teachers and students about the use of BL models in instructional transactions. Hajan and Padagas [36] offered a pedagogical method of teaching writing in BL that can improve the skill. Jost *et al*. [37] reviewed the role of learners' personalities and behaviors in their academic success in a BL setting. Ustun *et al*. [38] reported a study to assist and teach a BL course in higher education. Bokolo Anthony [6] reported faculty institutional initiatives that affect the implementation of BL. Müller *et al*. [39] reviewed the impact of replacing classroom time with BL on higher education institutions. E-learning requires educator creativity and digital literacy [19]. Zheng *et al*. [40] found how a teacher can trigger students' connection of needs, motivation, and potency in BL. Luan *et al*. [41] reviewed machine learning issues and future regarding machine-learning-based precision education.

There are 10 articles related to the research discussed, which are about the instructional component in BL. Fleischmann, in his article, explored how educators can make a studio design of pedagogy into BL with a flipped classroom model where video lectures, software tutorials, and readings are delivered online through a Learning Management System [42]. In line with it, digital teaching is necessary to develop a BL model [1]. Makhachashvili discovered needs for individual quality and efficiency digital formats, interdisciplinary skills, and cross-sectoral of individual experience in BL [43]. Hadisaputra develops a model of BL that is applied effectively in promoting critical thinking skills [44]. Şentürk examined the effects of BL in academic achievement and the teaching principles and methods course with a semi-experimental research design [45]. Lockee explored digital teaching and learning during the COVID-19 pandemic with educator preparation for successful professional practice in BL [46]. Berga *et al*. [47] investigated the implementation of BL course-related self-efficacy, perceptions, and knowledge. ElSayary [48] explored teachers' practices using a reflective practice model BL environment. Bahri *et al*. [49] reported learning tools in BL that are integrated with Moodle-based learning strategies. In conclusion, Web Pedagogical is an important competence for teachers [21]. There are five articles that explain an "evaluate" component. Mohammed provided a framework outlining the multi-stage process model of BL and how researchers can develop and evaluate it [50]. Darlis *et al*. evaluated students' characteristics and digital literacy and the impact of their performance on their performance in BL [51]. Berga *et al*. gave a report about BL that has the potential elements for innovative, flexible, and continuous evaluation of BL as a pedagogical approach [47]. Mahajan *et al*. explored an online assessment with classroom assessment and structured a blended assessment in medical education [52]. Iyer *et al*. provided a framework blended programmatic assessment on medical schools [53].

B. Plomp and Assure Models

This model combines the design of the three-stage ASSURE and Plomp learning systems. ASSURE and Plomp has simplicity, practicality, and student engagement. Calhoun explained that the learning model is capacity development so that it is optimal for learning [54]. The model can also be interpreted as a simplification of something complex so that it is easy to implement. The learning model does not look at the learning design study. Learning Design in the development organizing system includes analysis, development, application, and management of learning programs [35]. The following are the steps for implementing the combination of the ASSURE and Plomp models:

1) Preliminary research

The characteristics of the students in this study were aged 20–25 years. This age range is included in the formal operational stage and has matured. At this stage, students are able to think formally; this is marked by reflective thinking. The ability to think reflectively enables them to argue and see the point of view of other people in their opinions. Adults have been able to learn independently, learn internal processes, and involve andragogy. Students have responsibility for their duties. In general, students already have computer skills and have a previous learning experience.

State objectives at IRES are the principles of learning design, syllabus preparation, and development of assessment instruments. In addition, there are developed assessment questions and rubrics with attention to learning skills.

2) Prototyping stage

Selecting instructional with an open strategy about goals and discusses learning, concept introduction and interpretation (online), exploration, presentation, reflection, and feedback and evaluation (online). This technology uses a BL application using a Learning Management System (LMS). This technology uses a BL application using a Learning Management System (LMS). The BL application was then named Blended learning Pendidikan Agama Islam (B-PAS). B-PAS uses Moodle-based media. B-PAS material is packaged in materials, quizzes, and portfolio techniques. B-PAS uses a mixed strategy of online and onsite. B-PAS relies on computer technology that focuses on utilization. The use of LMS and supporting materials stimulates approval and support of meaning, a supportive environment, preparation of experiences, and students' basic abilities.

3) Assessment stage

Participation of students requires participation of students through being involved in the formulation of learning objectives and activities to be carried out, participation, and presentations with the guidance of lecturers, teachers, and opportunities for reflection in learning activities. Student participation requires participation through involvement in the formulation of learning objectives and activities to be carried out, and presentations with lecturer guidance, and opportunities for reflection. Reflection is done through the evaluation of portfolio learning outcomes. Reflection is done with the help of an observation guide.

III. Methodology

The study is a part of research and development (R&D) and uses ASSURE and the three-stage Plomp design models. Quality assessment of this study model following the Nieveen standard meets the criteria of being valid, practical, and effective. Data collection involved instrument and evaluation experts, material experts, e-learning experts, learning multimedia experts, information technology experts, students, and lecturers.

The realization of this research instrument includes validity and reliability. Validation is done through the validation of experts and educational practitioners. Validation activities are carried out with expert judgment on the validator. The validator assesses and provides corrections on the validation sheet. The level of validity of the model was determined based on qualitative data, namely the final conclusion of the validator. Based on the conclusion of the validator, the product was feasible to use. Researchers make revisions in accordance with the input and suggestions given by the validator. The assessment instrument that has been valid is then estimated for its level of reliability by looking for Cronbach's Alpha value. The quality of the instrument in the form of a test developed to measure effectiveness is in the form of a pretest and a post-test. These test components are validated by experts prior to use. This instrument was developed and then validated by experts.

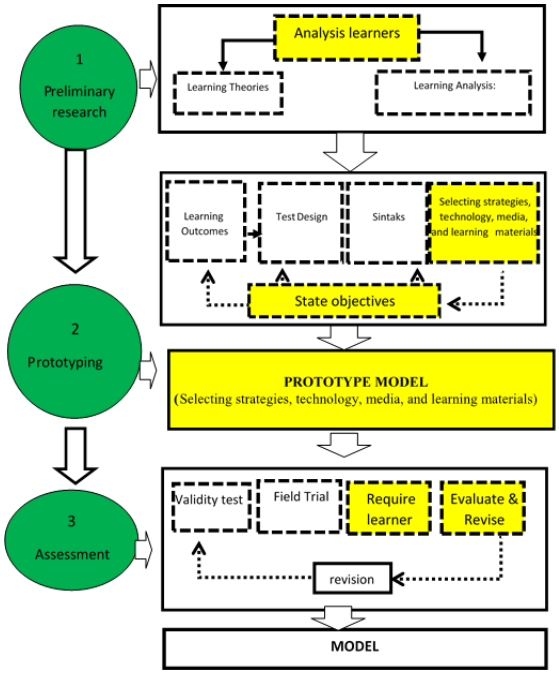

Fig. 1. The ASSURE and Plomp models.

The purpose of this study is to describe the development of a BL model through Islamic religious (IR) education lectures. In these lectures, the application is used to help students improve their abilities in lesson planning through the portal https://pjj.b-pas.net/moodle30/. This portal provides learning videos and materials; links to learning resources are available on the website. The portal trains one to understand and practice Islamic education planning and other supporting materials. The study used three Islamic universities in Yogyakarta. This report summarizes the results of the evaluation and how the system works. These results helped me to revise and develop an IR learning model that uses a combination of onsite and online so that it is more useful for students. The first meeting is an introduction to the pretest; each class meeting is an online activity according to the learning design. Students in this lesson are students at three universities with a concentration in Islamic religious education in Yogyakarta, Indonesia.

Lessons are based on a combination of the three-stage Plomp model and the ASSURE model (see Fig. 1):

1) Preliminary research stage, which includes
   A = Analysis learners
   and
   S = State objectives
2) Prototyping stage, which includes
   S = Selecting instructional (strategies, technology, media, and learning materials)
3) Assessment stage, which includes
   U = Utilize instructional (strategies, technology, media, learning materials, and activation of students),
   R = Require learner participation, and
   E = Evaluate and revise.

IV. Data Analysis

Descriptive statistics are displayed from student learning outcomes. In this study, the gender did not differentiate because these factors have the same characteristics. The sample is small because of the limitations of the COVID-19 pandemic. Researchers use percentages in analyzing learning outcomes. The percentage shows the level of student achievement. In this lesson, the learning planning is analyzed into the dependent variable. The importance of combining the Plomp and ASSURE models is to simplify with a systematic development step for solving IR learning problems and has the originality of contextual subject matter. The simplicity of the systematic steps of developing B-PAS is seen with the Preliminary research stage, Prototyping stage, and Assessment stage. The originality of contextual subject matter is seen with Analysis learners, State objectives, Selecting instructional (strategies, technology, media, and learning materials), Utilize instructional (strategies, technology, media, learning materials, and activation of students), Require learner participation, and Evaluate and revise.

V. Result and Discussion

From this explanation, it can be concluded that BL has a complete ideal instructional component. Components of direct learning onsite and online, interaction and interaction, materials, or materials that are measured independently, and decisions are made flexibly. The innovation aspect in B-PAS model are combining the Plomp of the three stages and the ASSURE model is the existence of complementary relationships. ASSURE has the originality to the contextual subject matter, and Plomp has the power of a simple systems approach. ASSURE and Plomp have capacity building, so that it is optimal for learning and simplification of something complex, so that it is easy to implement

In the context of the pandemic, COVID-19 and societies

are engaging with instructional. It outlines four key dimensions of Design and Develop, Factors, Instructional and Management, and Evaluate in which digital literacy gives support to an internal process. Designing a BL model becomes an instructional innovation during the pandemic. Instructional innovations must be able to increase result learning [6], [10] with mixed classroom (onsite) and e-learning (online) [11]. The BL model provides broad opportunities for students to learn [4], [12]. Web Pedagogical is an important competence for teachers [20]–[22]. B-PAS is a learning model for IR with five elements, including learning structures (syntax), social systems, principle of reaction, support systems, and instructional impact. Table I is learning stuctures (syntax) of the B-PAS model.

TABLE I: LEARNING STRUCTURES (SYNTAX)

Learning Stages	Type	Lecturer Activities	Student Activities
Planning and preparation	Onsite	Motivating students with questions: What will it do to me?	Listening and reflecting on the benefits of the material
		Inviting targhib (motivation) and tarhib (challenge) in IRES learning	Discussion and reflection on the influence of targhib and tarhib on the importance of the subject
		Formulation of specific objectives in a collaborative constructive manner	Formulate specific goals
		Exploration of experiences that students have related to Blended Learning preparation	Describe the experiences that students have related to Blended Learning preparation
		Preparing the Pretest	Pretest
		Lecturer and student agreement regarding details of learning activities	Lecturer and student agreement regarding details of learning activities
	Online	Access the portal, and login into the e-learning program	Access the website, and login into the e-learning program
		Shows learning topics	Choosing a learning topic and listening to the learning objectives
Introduction and meaning of concepts	Onsite	Show learning preview presentation	Observe the learning preview presentation
		Show a presentation of learning tools	Observe the presentation of learning tools
		Show technical e-learning presentations	Observe the technical presentation of online learning
		The lecturer asks students to tell their meaning about the preview of IRES learning through the formulation of intermediate goals and final objectives	the student explain the understanding of the preview of IRES learning through problem formulation
	Online	Uploading course materials (documents, videos, and presentations)	Study material through files (documents, videos, and presentations)
		Guiding students in online discussions (forums, chatting, and streaming)	Deepen the material through online discussions (forums, chats, and streaming)
Exploration and Clinical Learning Supervision	Onsite	Guiding students to study the material	Study the material
		Guiding students in group discussions	Deepen the material through group discussions
		Guiding students based on worksheets	Conduct an experiment based on a worksheet
	Online	Checking student assignments	Upload tasks according to worksheets
		Guiding students to conduct online discussions	Deepen the material through online discussions (forums, chats, and streaming)
Reflection, Feedback, and Evaluation	Onsite	Guiding students to link the IRES learning variables with the IRES learning research theme	Linking the IRES learning variables with the IRES learning research theme
		Facilitator analysis variables—IRES learning variables	Analyze IRES learning variables
		Guiding students to present the results of the analysis of learning variables	Presenting the learning analysis result variables
		Follow-up in the form of presenting assignments, through e-learning	Listening to the form of offering assignments
		Inform the plan of learning activities for the next meeting	Listening to the lesson plan for the next meeting
	Online	recheck Post-test	Do a Post-test
		Log out of the program	Log out of the program

A. *Learning Stuctures (Syntax)*

1) *Planning and preparation*

Learning is a meaningful knowledge-building process. The learning objectives involve the activeness of students and lecturers. This process opens opportunities for students to choose what they want to learn and deepen the material. Students know the risks and benefits of knowing and designing goals in learning orientation. This is in line with the finding that BL stimulates students to play an active role and develop skills through challenging problems, so that students who use this model are able to produce many alternative solutions [35]. Learning becomes more meaningful for students if the context of learning is related to real life. Students feel that learning is very useful in the learning process. Students are invited to have and identify challenges and problems in their learning life. In this phase, it was found that the problems faced were in the writing of the Final Project and its supporters, for example, in the use of information retrieval in the writing of a final project. Experiences that students have and challenges of writing a final assignment are interesting topics in managing or constructing and stimulating student learning of this course.

Students are provided with information on various learning resources (behavioristic) and interconnecting their relationship with individual interests and abilities in completing studies to become prospective scholars of IR education (cognitivist). The learning process is indicated by an equilibration or balancing of individual cognitive

structures (constructivism). Student experience in the process of assimilation and accommodation in this learning is related to recognition or knowledge (assimilation) and modification of cognitive structures (accommodation). Learning preview is carried out as an effort to focus students' attention and learning motivation. The preview stimulates motivation and initial knowledge to be free and active in finding, managing, and storing various forms of information contained in learning. The brain will be active in constructing a picture of what is happening in the individual and take the opportunity to minimize errors. Individual students are encouraged to stop actively making cognitive decisions so that the process of acceptance and rejection of the information needed is optimal.

2) Introduction and meaning of concepts

Students are introduced to concepts and interpretations independently through online learning. In online learning, students seek knowledge and information, complete assignments so that cognitive constructs are structured and creative. Students download material on an available link. Students are also looking for other supportive references. Through e-learning, students are inspired to find more information in a more comfortable way. Learning is said to be effective if students are active in finding the experience of seeking the knowledge needed [20].

3) Exploration and clinical learning supervision

Different and interdisciplinary student learning requires a set of teaching strategies and ways of engaging students. The problem-solving stage of this problem allows students to do cognitive constructs through social. In accordance with Vygotsky's opinion, learning requires a lot of internal development processes. The internal development process will function if the individual can adapt to his environment. The interaction is through cooperation with friends or lecturers. The collaborative critical discussion stage aims to make IR learning stimulate interaction, evaluation, and discussion in groups. This stage facilitates the process of assimilation and accommodation of information as a stage in the constructivist process. Discussions make students see and hear different points of view from their friends or lecturers. The different processes of assessing, giving, and being effective in building knowledge make learning activities through discussion come alive. Discussion activities of students will generate perceptions and understandings and an evaluation of various kinds of information. This phase is through online learning via teleconference. The online discussions are carried out periodically via video conferencing. Students are free to argue about brainstorming their understanding of the reading or interpretation of IR.

4) Reflection, feedback, and evaluation

Feedback reflection is a response to student performance. Students also respond to lecturers' performance in learning. Reflection and feedback occur in two directions, both lecturers to students and students to lecturers. Feedback from lecturers is in the form of ideas and input that are discussed. This stage becomes an important process in learning because students and lecturers will motivate each other about the competencies being discussed.

B. Social System

The BL model of IRES learning is collaborative and utilizes the web in e-learning. Students and lecturers collaboratively determine the formulation of goals, learning activities, and learning conditions that are realized through learning contracts. The learning web through the B-PAS portal allows students to experience real learning experiences and interact with one another virtually. This is in line with the research findings of Rusly *et al*., who stated that the e-learning web portal is able to function as a useful simulation that allows students to experience real learning experiences and interact with one another virtually [21]. The collaborative environment through the social system is in accordance with the principles of constructivist theory, where lecturers and students work complementarily. The lecturer sets the start of the activity through a series of learning processes and provides opportunities for students to adjust and provide suggestions so that an agreement is formed. Students are mature individuals in determining their attitudes and consequences. This mutual agreement occurs in the preview of collaborative learning that occurs through online and onsite activities. This collaborative activity is mostly done synchronously. Students and lecturers had an intense dialog.

C. Principle of Reaction

The reaction principle in the B-PAS model is targhib and tarhib in the knowledge construction process of IRES learning lectures. Technically, the lecturer provides an understanding of the opportunities or expectations when understanding IRES learning courses. Providing opportunities or hopes in Islamic religious terms is often called targhib. Lecturers also provide the risks and threats when they do not understand IRES learning courses. The giving of risks and threats in Islamic religious terms is often called tarhib. The principle of model reaction is also contained in the role of the lecturer as a facilitator, motivator, and moderator for students. This role is in line with a constructivist theory that gives students the opportunity to build their knowledge. Positive responses from students can be seen in the setting of goals in learning, activeness in learning, and the process of exploration and learning feedback.

D. The Support System

The Support System of the B-PAS model includes a collection of various learning resources, both print and video, and application links in deepening the learning material. The support system for the B-PAS model is carried out onsite and online. Online portals as learning media have been prepared in a standard way to make it easier for students to learn. The supporting system of the B-PAS model includes 1) an e-learning portal, 2) a lesson plan, 3) worksheets, and 4) a book model.

1) Portal e-learning

The e-learning portal uses Moodle version 3.8.3. The material facilitates exploration and interpretation, the environment, preparation of student experiences, and abilities in the implementation of learning (see Fig. 2).

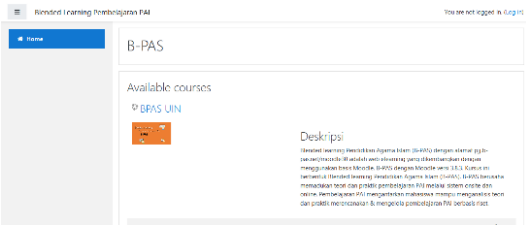

Fig. 2. Portal display.

2) *Lesson plan*

The lesson plan contains the identity of the course, study program, author, course description, learning achievement, and competency map. The lesson plan is the implementation plan for the B-PAS learning (see Fig. 3.).

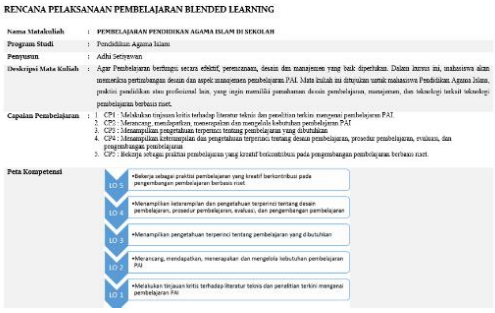

Fig. 3. Lesson plan.

3) *Worksheets*

Worksheets as a supporting tool pay attention to aspects of relevance to the constructivist theory. The worksheets are only limited to big pointers that are connected to learning research design activities for students (see Fig. 4).

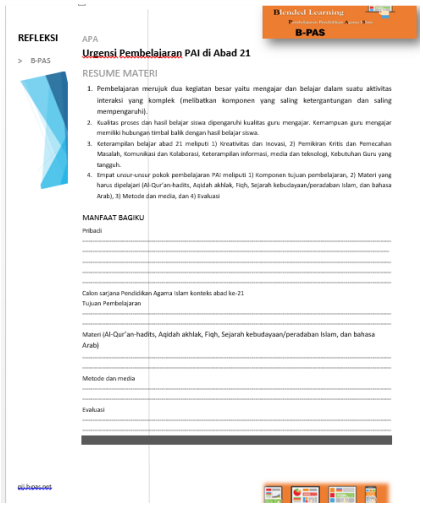

Fig. 4. Worksheet.

4) *Book model*

The model book (see Fig. 5) contains an Introduction, including Background, Problem Identification, Product Specifications Developed, and Product Benefits, and IRES mixed learning (B-PAS), including the Development of IR Education Learning Models (IRES) Learning Theories and Implementation of the BL IR Learning Model (Model Implementation Learning Design, Syntax of the B-PAS model, social systems, Reaction Principles, Support Systems, Instructional Impacts and Accompanying Impacts, and Instructions for the Use of e-learning.

Fig. 5. The model book.

E. *The Instructional Impact*

The instructional impact of B-PAS demonstrates the merging of integrated onsite and online learning. The combination of the advantages of onsite learning and online learning makes for excellence in IR learning. The ability of students to learn independently provides a variety of learning resources and the opportunity to construct flexible knowledge. Flexibility makes students feel independent in their field of time in learning. The impact of accompanying B-PAS shows a supportive or positive attitude in learning activities. Students seek, help, select, and even make their own choice of themes according to their interests. The instructional impact that emerged from the development of the B-PAS model was the enthusiasm of the students in building their knowledge.

Based on the results of the student learning competency test on the tryout (see Fig. 6), the score ranges from 60 to 95. Based on the results of the analysis of student learning outcomes, the mean score was 79.3. These results indicate that the number of students who obtained a competency score of less than 70 was 2 (14%), and 12 students (86%) had a score $\geq$ 70. Based on the presentation of the results of the student learning competency test in learning using the B-PAS model, the competency score reached 86%. Thus, the B-PAS model fulfills the effectiveness criteria, according to the results of the learning outcomes competency test.

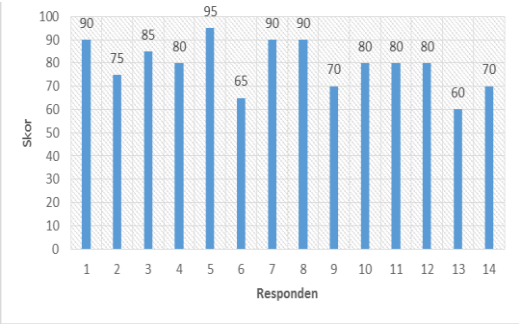

Fig. 6. Learning test results.

BL gets growing in popularity during the COVID-19 pandemic. BL has a number of steps and requires long-term stability support, needs Web Pedagogical for competence pre-service teachers. This article aims to find out the components of the BL environment for BL development, about 55 BL articles in 2020 to 2021. The findings show that BL research consists of four components: Design and Develop, Factors, Instructional and Management, and

Evaluate.

Assessment of the effectiveness, efficiency, and practicality of the experts obtained an average score of 87, in the very good category; the assessment of the B-PAS program for the experts obtained an average score of 69.25, in the very good category; the assessment of the B-PAS model obtained an average value of 68.1, in the very good category; the assessment of learning devices from the lecturer obtained an average value of 109.7, in the very good category; and the assessment of having, efficiency, and practicality from the lecturers obtained an average value of 72.33, which was categorized as very good. The B-PAS model met the effectiveness criteria including the B-PAS learning response model from the respondents; that is, 36% gave good responses, 64% was very good, and the fulfillment of student learning competency test results using the B-PAS model was 86%.

VI. Conclusion

Based on data analysis and discussion of research on the development of the B-PAS model, it can be concluded that the IR blended learning model is a blended learning model developed through the three stages of the ASSURE and Plomp models. The B-PAS model contains five model elements, namely the learning structure (syntax), social system, reaction principle, support system, and instructional impact. Implementation B-PAS through the procedure of stages 1) preliminary study, which includes analysis of student characteristics and setting learning objectives; 2) prototype development, which includes the stages of selecting strategies, technology, media, and learning materials; 3) product testing, which includes the use of strategies, technology, media, learning materials, activating student involvement, and evaluating revisions.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Adhi Setiyawan conceived the research and development; Analyzed and interpreted the data; materials, analysis data; Wrote the paper. Achmad Dardiri and Herminarto Sofyan conceived the research and development; analysis tools or data; Wrote the paper.

Acknowledgments

Appreciation is given to Yogyakarta State University and Universitas Islam Negeri Sunan Kalijaga Yogyakarta for providing research facilities. Gratitude is also given to Mohammad Adam Jerusalem, Ph.D. for giving advice to this article and to resource persons who helped in the research development process.

References

[1] J. Crawford *et al.*, "COVID-19: 20 countries' higher education intra-period digital pedagogy responses," *J. Appl. Learn. Teach.*, vol. 3, no. 1, Art. no. 1, 2020, doi: 10.37074/jalt.2020.3.1.7.

[2] R. Hilburg, N. Patel, S. Ambruso, M. A. Biewald, and S. S. Farouk, "Medical education during the coronavirus disease-2019 pandemic: Learning from a distance," *Adv. Chronic Kidney Dis.*, vol. 27, no. 5, pp. 412–417, Sep. 2020, doi: 10.1053/j.ackd.2020.05.017.

[3] P. K. Jena, "Impact of pandemic COVID-19 on education in India," *Social Science Research Network, Rochester*, NY, SSRN Scholarly Paper ID 3691506, Jul. 2020. Accessed: Jun. 11, 2021.

[4] L. D. S. Lapitan, C. E. Tiangco, D. A. G. Sumalinog, N. S. Sabarillo, and J. M. Diaz, "An effective blended online teaching and learning strategy during the COVID-19 pandemic," *Educ. Chem. Eng.*, vol. 35, pp. 116–131, Apr. 2021, doi: 10.1016/j.ece.2021.01.012.

[5] C. M. Toquero, "Challenges and opportunities for higher education amid the COVID-19 pandemic: The Philippine context," *Pedagog. Res.*, vol. 5, no. 4, pp. 1–5, 2020.

[6] B. Anthony, "Institutional factors for faculty members' implementation of blended learning in higher education," *Educ. Train.*, vol. 63, no. 5, pp. 701–719, Jan. 2021, doi: 10.1108/ET-06-2020-0179.

[7] E. Farida and H. D. Surjono, *Implementation of Blended Learning to Improve Fifth Graders' Learning Participation*, Atlantis Press, 2019, pp. 192–205.

[8] N. Jalinus and E. Al, "Developing blended learning model in vocational education based on 21st century integrated learning and industrial revolution 4.0," *Turk. J. Comput. Math. Educ. TURCOMAT*, vol. 12, no. 8, Art. no. 8, Apr. 2021, doi: 10.17762/turcomat.v12i8.3035.

[9] A. S. Peng, R. Nelson, C. Liu, A. Turkmen, W. Shi, and J.-L. Lin, "Design and development of a hybrid instructional model for a computer engineering course," presented at the 2013 North Midwest Section Meeting, Mar. 2021.

[10] C. McGrath, P. J. Palmgren, and M. Liljedahl, "Beyond brick and mortar: Staying connected in post-pandemic blended learning environments," *Med. Educ.*, vol. n/a, no. n/a, doi: 10.1111/medu.14546.

[11] D. L. Elliot, "Essentials for blended learning by Jared Stein and Charles R. Graham," *Psychol. Teach. Rev.*, vol. 27, no. 1, pp. 81–82, 2021.

[12] S. Dwijonagoro and S. Suparno, "Pranatacara learning: Modeling, mind mapping, e-learning, or hybrid learning?" *J. Cakrawala Pendidik.*, vol. 38, no. 1, Art. no. 1, Feb. 2019, doi: 10.21831/cp.v38i1.23034.

[13] R. Bordoloi, P. Das, and K. Das, "Perception towards online/blended learning at the time of Covid-19 pandemic: An academic analytics in the Indian context," *Asian Assoc. Open Univ. J.*, vol. 16, no. 1, pp. 41–60, Jan. 2021, doi: 10.1108/AAOUJ-09-2020-0079.

[14] M. Flavin, "A disruptive innovation perspective on students' opinions of online assessment," *Res. Learn. Technol.*, vol. 29, May 2021, doi: 10.25304/rlt.v29.2611.

[15] S. A. Hasnain, "To blend or not to blend from an instructor's perspective: Introducing blended learning in medical education in a gulf cooperation council country," University of Liverpool, 2021.

[16] G. Secundo, G. Mele, P. D. Vecchio, G. Elia, A. Margherita, and V. Ndou, "Threat or opportunity? A case study of digital-enabled redesign of entrepreneurship education in the COVID-19 emergency," *Technol. Forecast. Soc. Change*, vol. 166, p. 120565, May 2021, doi: 10.1016/j.techfore.2020.120565.

[17] L. Wang, Y. Huang, and M. Omar, "Analysis of blended learning model application using text mining method," *Int. J. Emerg. Technol. Learn. IJET*, vol. 16, no. 1, pp. 172–187, Jan. 2021.

[18] B. Philipsen, J. Tondeur, N. Pareja Roblin, S. Vanslambrouck, and C. Zhu, "Improving teacher professional development for online and blended learning: A systematic meta-aggregative review," *Educ. Technol. Res. Dev.*, vol. 67, no. 5, pp. 1145–1174, Oct. 2019, doi: 10.1007/s11423-019-09645-8.

[19] R. Sefriani, R. Sepriana, I. Wijaya, P. Radyuli, and M. Menrisal, "Blended learning with Edmodo: The effectiveness of statistical learning during the COVID-19 pandemic," *Int. J. Eval. Res. Educ. IJERE*, vol. 10, no. 1, p. 293, Mar. 2021, doi: 10.11591/ijere.v10i1.20826.

[20] D. Chatham, *Advancing Online Course Design and Pedagogy for the 21st Century Learning Environment. Advances in Educational Technologies and Instructional Design (AETID) Book Series*, IGI Global, 2021, doi: 10.4018/978-1-7998-5598-9.

[21] N. H. M. Rusly, A. Abd Aziz, and S. Ngadiron, "A case study on the application of web-based blended learning," *Management*, vol. 5, no. 17, pp. 20–27.

[22] M. A. Thohir, M. I. Sukarelawan, J. Jumadi, W. Warsono, and A. Citrasukmawati, "The effects of instructional design based web course on preservice teachers' competencies," *Int. J. Eval. Res. Educ.*, vol. 10, no. 1, pp. 230–236, Mar. 2021.

[23] J. Stein and C. R. Graham, *Essentials for Blended Learning: A Standards-Based Guide*, Routledge, 2020.

[24] R. Boelens, S. Laer, B. Wever, and J. Elen, "Blended learning in adult education: Towards a definition of blended learning," 2015.

[25] N. Armando, R. Almeida, J. M. Fernandes, J. S. Silva, and F. Boavida, "End-to-end experimentation of a 5G vertical within the scope of blended learning," *Discov. Internet Things*, vol. 1, no. 1, p. 9, Dec. 2021, doi: 10.1007/s43926-021-00008-5.

[26] M. M. Engelbertink, S. M. Kelders, K. M. Woudt-Mittendorff, and G. J. Westerhof, "Participatory design of persuasive technology in a blended learning course: A qualitative study," *Educ. Inf. Technol.*, pp. 1–24, 2020.

[27] H. Y. Kang and H. R. Kim, "Impact of blended learning on learning outcomes in the public healthcare education course: A review of flipped classroom with team-based learning," *BMC Med. Educ.*, vol. 21, no. 1, p. 78, Jan. 2021, doi: 10.1186/s12909-021-02508-y.

[28] H. H. Ayob, G. Daleure, N. Solovieva, W. Minhas, and T. White, "The effectiveness of using blended learning teaching and learning strategy to develop students' performance at higher education," *J. Appl. Res. High. Educ.*, vol. ahead-of-print, no. ahead-of-print, Jan. 2021, doi: 10.1108/JARHE-09-2020-0288.

[29] Y. Shantini, D. Hidayat, L. Oktiwanti, and T. Mitsuru, "Multilevel design in the implementation of blended learning in nonformal education unit," *J. Nonform. Educ.*, vol. 7, no. 1, Art. no. 1, Feb. 2021, doi: 10.15294/jne.v7i1.27544.

[30] M. Nande and W. A. Irman, "Penerapan model pembelajaran blended learning dalam meningkatkan hasil belajar siswa sekolah menengah kejuruan," *EDUKATIF J. ILMU Pendidik.*, vol. 3, no. 1, Art. no. 1, Mar. 2021, doi: 10.31004/edukatif.v3i1.240.

[31] R. Amelia, I. Rofiki, H. S. Tortop, and J. A. Abah, "Pre-service Teachers' Scientific Explanation with E-Scaffolding in Blended Learning," *J. Ilm. Pendidik. Fis. Al-Biruni*, vol. 9, no. 1, Art. no. 1, Apr. 2020, doi: 10.24042/jipfalbiruni.v9i1.5091.

[32] D. E. Archibald, C. R. Graham, and R. Larsen, "Validating a blended teaching readiness instrument for primary/secondary preservice teachers," *Br. J. Educ. Technol.*, vol. 52, no. 2, pp. 536–551, 2021, doi: 10.1111/bjet.13060.

[33] U. Lu'luilmaknun, K. S. A. Kautsar, R. A. Apsari, T. W. Triutami, and N. P. Wulandari, "Collaborative skills of pre-service mathematics teachers in blended learning," *JTAM J. Teori Dan Apl. Mat.*, vol. 5, no. 1, Art. no. 1, Apr. 2021, doi: 10.31764/jtam.v5i1.3309.

[34] G. Hadiprayitno, K. Kusmiyati, A. Lestari, M. Lukitasari, and A. Sukri, "Blended learning station-rotation model: Does it impact on preservice teachers' scientific literacy?" *J. Penelit. Pendidik. IPA*, vol. 7, no. 3, pp. 317–324, May 2021, doi: 10.29303/jppipa.v7i3.676.

[35] A. C. Yusro, M. Sasono, and G. Primayoga, "The influence of active involvement on learning outcomes of physics pre-service teachers: A case study of blended learning on statistics course," *Momentum Phys. Educ. J.*, pp. 30–37, May 2020, doi: 10.21067/mpej.v4i1.4194.

[36] B. H. Hajan and R. C. Padagas, "Blended learning in a research writing class: Perceptions and experiences from esl secondary learners," *TESOL Int. J.*, p. 103.

[37] N. S. Jost, S. L. Jossen, N. Rothen, and C. S. Martarelli, "The advantage of distributed practice in a blended learning setting," *Educ. Inf. Technol.*, vol. 26, no. 3, pp. 3097–3113, May 2021, doi: 10.1007/s10639-020-10424-9.

[38] A. B. Ustun and M. W. Tracey, "An innovative way of designing blended learning through design-based research in higher education," *Turk. Online J. Distance Educ.*, vol. 22, no. 2, Art. no. 2, Apr. 2021, doi: 10.17718/tojde.906821.

[39] C. Müller and T. Mildenberger, "Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education," *Educ. Res. Rev.*, vol. 34, p. 100394, Nov. 2021, doi: 10.1016/j.edurev.2021.100394.

[40] W. Zheng, F. Yu, and Y. J. Wu, "Social media on blended learning: the effect of rapport and motivation," *Behav. Inf. Technol.*, vol. 0, no. 0, pp. 1–11, Apr. 2021, doi: 10.1080/0144929X.2021.1909140.

[41] H. Luan and C.-C. Tsai, "A review of using machine learning approaches for precision education," *Educ. Technol. Soc.*, vol. 24, no. 1, pp. 250–266, 2021, Accessed: Jun. 18, 2021.

[42] K. Fleischmann, "Hands-on versus virtual: Reshaping the design classroom with blended learning," *Arts Humanit. High. Educ.*, vol. 20, no. 1, pp. 87–112, Feb. 2021, doi: 10.1177/1474022220906393.

[43] R. Makhachashvili and I. Semenist, "Complex framework of digital learning quality assessment in Covid-19 context: Survey study for european and oriental languages programs," *COMPLEXIS*, 2021, pp. 107–116.

[44] S. Hadisaputra, M. S. Ihsan, Gunawan, and A. Ramdani, "The development of chemistry learning devices based blended learning model to promote students' critical thinking skills," *J. Phys. Conf. Ser.*, vol. 1521, p. 042083, Mar. 2020, doi: 10.1088/1742-6596/1521/4/042083.

[45] C. Şentürk, "Effects of the blended learning model on preservice teachers' academic achievements and twenty-first century skills," *Educ. Inf. Technol.*, vol. 26, no. 1, pp. 35–48, Jan. 2021, doi: 10.1007/s10639-020-10340-y.

[46] B. B. Lockee, "Shifting digital, shifting context: (Re)considering teacher professional development for online and blended learning in the COVID-19 era," *Educ. Technol. Res. Dev.*, vol. 69, no. 1, pp. 17–20, Feb. 2021, doi: 10.1007/s11423-020-09836-8.

[47] K.-A. Berga *et al.*, "Blended learning versus face-to-face learning in an undergraduate nursing health assessment course: A quasi-experimental study," *Nurse Educ. Today*, vol. 96, p. 104622, Jan. 2021, doi: 10.1016/j.nedt.2020.104622.

[48] A. ElSayary, "Using a reflective practice model to teach STEM education in a blended learning environment," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 17, no. 2, 2021.

[49] A. Bahri, I. S. Idris, H. Muis, M. Arifuddin, and M. J. N. Fikri, "Blended learning integrated with innovative learning strategy to improve self-regulated learning," *Int. J. Instr.*, vol. 14, no. 1, pp. 779–794, Jan. 2021, Accessed: Jun. 12, 2021.

[50] E. M. Abdel-Haq, "The blended learning model: does it work?" *Sohag Univ. Int. J. Educ. Res.*, vol. 3, no. 3, pp. 29–40, Jan. 2021, doi: 10.21608/suijer.2021.122458.

[51] V. Darlis and D. K. Sari, "The effectiveness of blended learning: The impact of student's characteristics and digital literacy on student performance," in *Proc. the 3rd International Conference on Educational Development and Quality Assurance (ICED-QA 2020)*, 2021, pp. 561–566.

[52] R. Mahajan, S. Saiyad, A. Virk, A. Joshi, and T. Singh, "Blended programmatic assessment for competency based curricula," *J. Postgrad. Med.*, vol. 67, no. 1, pp. 18–23, 2021, doi: 10.4103/jpgm.JPGM_1061_20.

[53] P. Iyer, "Blended programmatic assessment for competency-based curricula: Is it the way forward?" *J. Postgrad. Med.*, vol. 67, no. 1, pp. 4–5, 2021, doi: 10.4103/jpgm.JPGM_1378_20.

[54] L. Cohen and L. Cohen, *A Guide to Teaching Practice*, London; New York: Routledge, 2010.

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