
Learning Resource Development: An Online-Based Learning Resource for Indonesian Teachers

SOFYAN,¹ DAMERIA SINAGA,² AND RUBIATI³

Abstract

The purpose of this study was to develop an online-based learning resource for Indonesian language teachers. The development step started with the identification of learning objectives, learning process, analysis of learning resources and environments, formulation of specific objectives, design of assessment instruments and learning strategies, selection and development of teaching materials, design and evaluation of formative development projects, and making of good terms. The findings showed that the formative evaluations by experts showed the agreements of 89.23% from educational technology experts, 97.50% from material experts, and 90.00% from multimedia experts. The agreements informed that the online-based learning could be recommended for Indonesian language teachers. Furthermore, the average results of individual trials were 89.21%, small group trials (97.13%), and field trials (89.04%). The online-based learning resource established in this research and development study was feasible and useable. Implications of the findings are also discussed.

Keywords

Development of learning resources, design-based learning, Indonesian language teachers, online-based learning

1 Faculty of Teacher Training and Education, Universitas Jambi, Jambi, Indonesia; sofyanzaibaski68@gmail.com

2 Indonesian Christian University, Indonesia.

3 *Sekolah Menengah Pertama Negeri 10*, Kota Jambi, Jambi, Indonesia; rubiaturubiati@yahoo.co.id

Introduction

The development of Information and Communication Technology (ICT) in the 21st Century, especially online-based, has had a major impact on education (Prasojo et al., 2019). The contribution of ICT-based learning, especially online-based, is currently far beyond what has been imagined by educational experts and practitioners. The role of online-based learning has been able to change the ways of education. For teachers, the role of technology like online-based multimedia in increasing competence to design-based learning is needed. Designing learning is the main scenario and pattern of learning which is carried out systematically and procedurally between components in the learning system. Through online-based learning, teachers achieve many beneficial things and new understanding. Online-based learning has been able to create a new culture of learning and teaching skills required for 21st century education (Chai, Tan, Deng, & Koh, 2017; Göksün & Kurt, 2017; Muhaimin et al., 2019; Prasojo et al., 2017; Prasojo et al., 2018; Prasojo et al., 2020) in producing and developing the number of knowledgeable and skilled graduates. This requirement is found in the Indonesian teacher's pedagogical competency standards that teachers must integrate multimedia in learning. Technology-based learning provides high confidence for teachers (Muhaimin et al., 2019; Mukminin et al., 2019; Syaiful et al., 2019) to access various learning components.

Online-based learning projects encourage people to collaborate in collegial communities who share common vision and goals in various ways. In these groups, teachers can solve problems, revise work, and build knowledge (Ivers & Barron, 2002). Within this situation, teachers have the opportunity to learn independently and apply their skills in real practice. Teachers can learn and assess their work. The impact and importance of various knowledge from learning resources can be obtained, such as the problem of designing learning; challenge of communicating with different study participants (Hadiyanto et al., 2013). It is also important on how to provide and accept responses as a constructive criticism and evaluation. The positive impact of applying online-based learning helps users have the competence and skills on using technology and preparing it for their future career demands. Therefore, this research was conducted in the context of Indonesian education.

Increasing pedagogical and professional competences of teachers in designing learning is an umbrella for learning success. The focus of this research was on the process of developing learning resources for designing online-based learning for Indonesian junior high school language teachers. The purpose of this research was to provide specific learning resources for designing learning by utilizing online multimedia. The results of this study were hoped to contribute greatly as a model for teachers, principals, supervisors, and other education and training practitioners in designing learning. For further research, the results of this study presented qualitative data that could be used as a reference for further experiments or development. To achieve the purpose of the study, one major research question was: How is the online-based learning resource for Indonesian language teachers developed?

Literature Review

Effective learning

Effective learning planning produces effective learning (Jones & Davis, 2011). Therefore, it is important to do design-based learning. Design-based learning is a pattern, sequence, and procedure that guide learning processes. It is an activity in determining the conditions of learning and the needs of individual learning as well as determining the objectives, creating models, approaches, and learning strategies as intervention steps in the transformation of learning. Effective learning could be realized if there is an effective design. Design-based learning is a systematic method for analyzing, designing, developing, evaluating, and managing teaching process for efficient knowledge and learning experience (Dick & Carey, 2009; Ross & Kemp, 2004; Hadiyanto et al., 2013; Posner & Rudnitsky, 2001; Smith & Ragan, 2005; Chen, 2011). Learning theory should be implemented into the design in relation to the improvement of the quality of performances aiming to improve students' performance and the efficiency and effectiveness of learning (Gagne & Briggs, 1978; Rothwell & Kazanas, 2004). Thus, designing learning is an activity that includes a series of actions from various existing components, interrelated, including analyzing learning individuals, learning environment and objectives, selecting and developing assessment strategies and tools, selecting and developing learning materials, and evaluating learning outcomes. Design-based learning effort should be conducted by teachers.

Teachers in design-based learning

Design-based learning should have impacts on learning process to make learning to be more effective. Effective learning can be observed from high learning motivation and communicative interactions between teachers, students, and the environment as a source of learning as well as the completeness of the learning process (Keller, 2010; Gagne, Wager, Golas, & Keller, 2005). To measure Indonesian teachers' pedagogical competences, teacher competency test (TCT) is adopted. TCT is an evaluation program implemented by the Indonesian Ministry of Education and Culture (MoNE, 2015). The 2015 TCT results show the low pedagogical and professional competence of Indonesian teachers. The TCT value obtained was still under the minimum criteria required by MoNE, which was 55 out of 100.

The low quality of teachers' competences is inseparable from the lack of focus on strategies and models for pedagogical and professional development. In addition, the teacher development strategy does not seem to be based on an assessment of the needs. In addition, the training model does not require teachers to improve their designing learning in an attempt for innovative and creative way to the level of the implementation. As a result, the efforts that have been made, whether facilitated by the central government or the regional ministry, are not maximized. Training models and materials do not adjust to the conditions needed by teachers (MoNE, 2015). The training material still presents many aspects of

learning policies and theories, not the practice of designing learning. The discussed trends and issues do not adjust to the latest paradigms of the current development of education and learning. Limited availability of learning resources for teachers is another factor to be solved. Learning resources for designing learning should also be improved (Habibi, Yusop, & Razak, 2020).

In line with the progress of technology integration in the world of education, the use of online-based learning in an effort to increase teachers' competences in designing learning has many advantages. Submission of learning materials through online is more efficient (Allen & Seaman, 2013) and it benefits financially. Teacher does not need to go to a certain place in a certain time to access learning. In addition, online-based learning resource is a distributed collaborative hypermedia information system (Vaughan, 2006) which houses various information that can be accessed through the Internet. These benefits can increase interactivity and productivity (Arkun & Akkoyunlu, 2008; Cathorall, Xin, Blankson, Kempland, & Schaefer, 2018; Frey & Sutton, 2010). Therefore, it can generate interest, support attraction, build independence, and improve online communication skills.

The development of online-based learning resources for teachers is based on a behavioristic view (Nurdin, 2005). It can determine the development of knowledge acquisition. Meanwhile, constructivist (Regeluth, 1999) viewed that learning occurs when students actively create their own knowledge. Learning cannot be separated from the learning environment (Pritchard & Woollard, 2010) and constructivism lays on the importance of the social environment. In other words, the experiences that exist in individuals who learn from their social life can be integrated into learning. A constructivist orientation in learning with online-based learning resources is important to understand and do, considering that teachers as users of learning resources must be able to build new knowledge, based on the experiences they have. The rich environment that teachers have, such as collegial community, school environment, academic environment, and other social environments would greatly assist teachers in building new knowledge, including about design learning.

The reason for combining online multimedia with learning resource materials is to improve teachers' design learning (Jones & Davis, 2011). There is a need to plan learning better which in turn would motivate people to learn. The development of online multimedia-based learning resources is also based on the assumption (Gustafson & Branch, 2002). Designing and developing learning patterns are needed as a concept and communication framework for analyzing, designing, developing, and evaluating.

Methodology

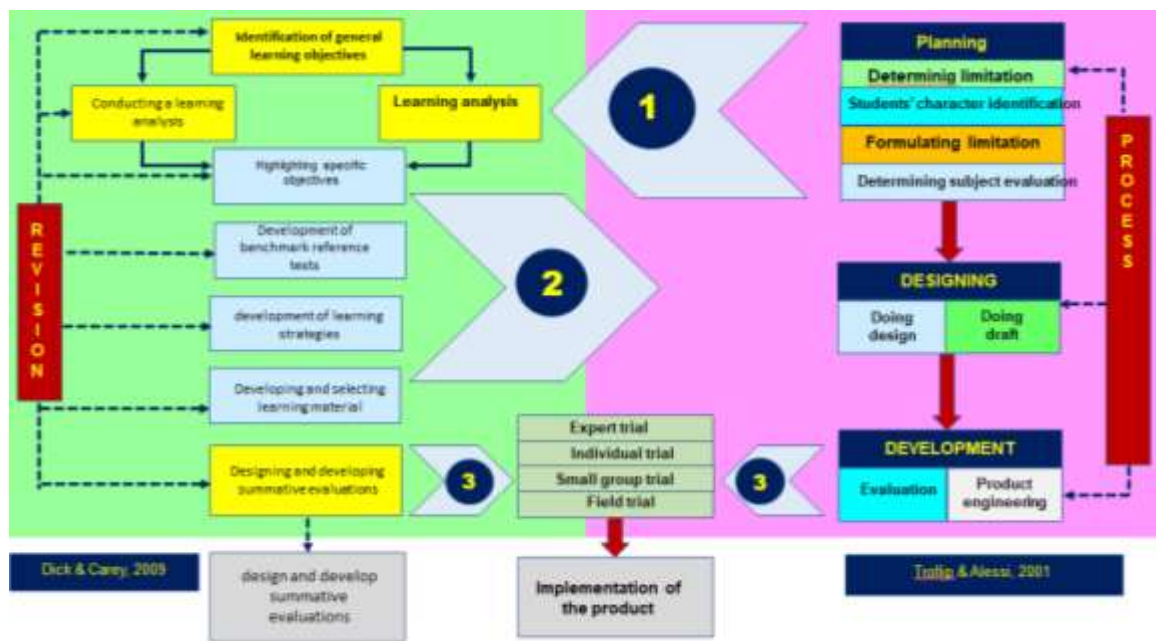
Research design, participants, and locale of the study

This research applied research and development (R&D) method. R&D is very likely to be applied in the field of education, because it has a close relationship between systematic evaluation of programs or projects and their future development. It is a facilitation of the

study of new models, tools, and procedures so that we can reliably anticipate their effectiveness and efficiency (Richey & Nelson, 2000). The steps done in the current study followed a systematic and procedural approach proposed by Dick and Carey (2009). The selection of this model was based on the characteristics and orientation of the model and the products.

The first characteristic of the development, that the product in the form of learning resource is systematically arranged and developed. Learning resources are part of the components that exist in learning that must be designed in a systematic way. Systemic development techniques that are relevant to the elements must be present in the learning resources as the results of the development. The second characteristic is that the product development is packed with online-based multimedia. Multimedia development is procedure oriented. The relevant model in multimedia development in this study is the model applied by Alessi and Trollip (2001). Product development resulting from the combination of the two models can be measured. This learning resource is ultimately more quality and effective to be used by the teachers in design-based learning. The stages of R&D of the current study are shown in Figure 1.

Figure 1. Stages of the R & D

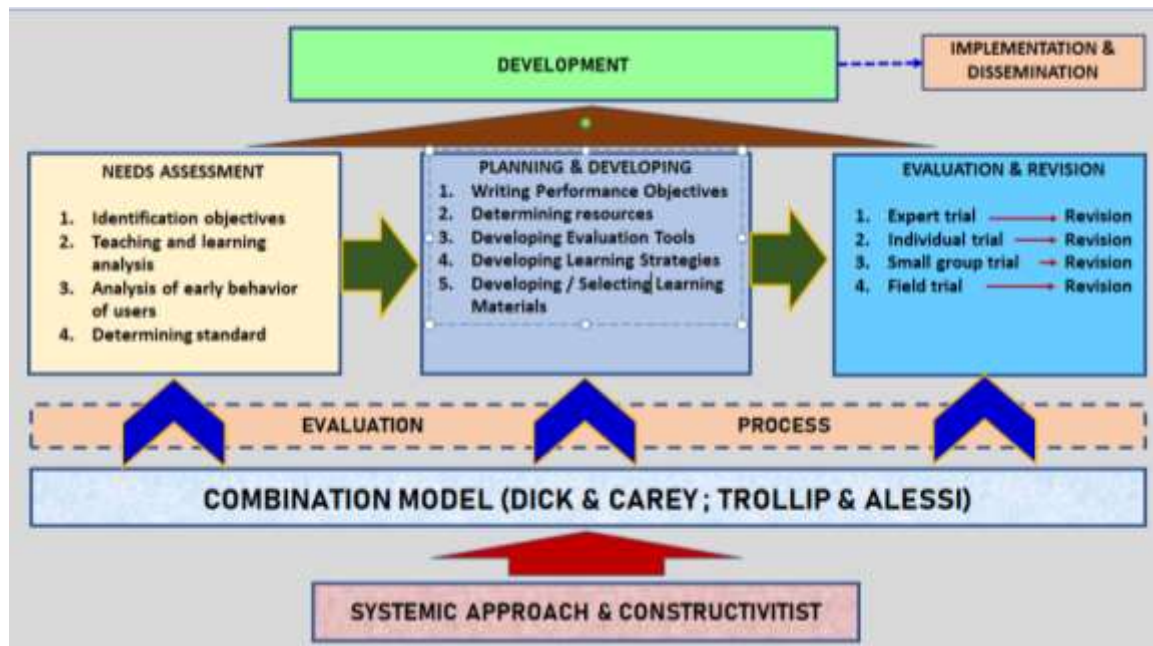


Data collection and analysis

Data collection in this research was carried out through preliminary research, design, development, and evaluation procedures (including: expert validation and field trials). Data were collected using questionnaire, observations, interviews, group discussion, and

documents. The procedures for conducting R&D were as follows. For the main data collection, this study involved eighty-eight Indonesian language teachers. It also involved three supervisors, five principals, and two educational policy makers.

Figure 2. *Procedural model*



The procedure used in this study was triangulation techniques (Denscombe, 2007; Guion, 2002). The information obtained from the same event but from different participants for verification. Triangulation techniques include data, investigation, theory, and method. The triangulation method allows data analysis to be more reliable even though it is through different methodologies. The triangulation method allows the emergence of various opinions in the same context. The reason for choosing this research design was because R&D studies can describe data collected from the initial study stage, development process, and in-depth evaluation process. Data obtained through a questionnaire were cross-checked with data from interviews, observations, documentation, and the results of trials. The R&D product validation process involved three experts in educational technology selected according to their expertise. Three experts who validated were those who had expertise in the fields of multimedia, learning, and educational technology. The three experts came from different universities. The experts were given an instrument in the form of a questionnaire to collect data consisting of two parts. The first part uses a 5-point *Likert* Scale (5 = very good, 4 = good, 3 = moderate, 2 = less, and 1 = very less). The second part aims at accepting comments from the experts.

Ethical considerations

In this study, all identities of participants and locations were masked. Additionally, all identities regarding data sources were masked. All participants were also informed that all their data would be kept confidentially by researchers.

Findings

The results of the observations on preliminary research on teacher design-based learning showed that the quality of design-based learning did not meet the required standards. Only 35% of the lesson plans had measurable learning objectives. Lesson plan that had an evaluation design that met the standards according to learning objectives was only 25%, had a strategy and learning steps that required the activities of students only 20%, Lesson plans were equipped with learning materials relevant to the learning objectives were only 35%, and only 50% of them had learning media. Meanwhile, there was no electronic learning resources informed related to design-based learning. The observational data on the lesson plan were relevant to the results of interviews with supervisors, school principals, and policy makers. The following are the some quotations of the results of the interviews with two supervisors, one principal and one policy maker,

"Most teachers have not done curriculum analysis and mapping basic competences that will be taught according to the students' learning needs. There are still many teachers who have not designed the learning. The existing design is still in the form of a duplicated one and does not reflect the results of the need analysis. Suggestions given by teachers must maximize collegial meetings for the purposes of collaborative design-based learning, group learning both independent learning and school-facilitated learning. "(Interviewee 1-Supervisor A)

"From the experience of supervising learning in the schools I supervised, most teachers have not maximally carried out the learning steps as designed in the lesson plan. As a result, the process of evaluating learning that should have been carried out was not done appropriately. Learning only emphasizes aspects of knowledge acquisition, not the process of forming critical thinking skills, forming good attitudes and kinesthetic language skills. "(Interviewee 2-Supervisor B)

"The limited learning resources both printed and electronic make teachers become uncreative in renewing and adjusting to the new paradigm of innovative design-based learning. It is recommended that teachers be able to utilize group discussions in the teacher's work community in order to conduct collaborative workshops." (Interviewee 1-Principal B)

"That the local government has not been able to optimally provide budgets for teacher training workshops in designing learning, the regional government through the education office also does not have enough financial supports to facilitate sufficient infrastructures that can facilitate the needs of teachers. Local governments still depend on funding sources from the central government through the school operational funds. What is still being done is asking the teachers to improve their competences independently by utilizing various learning resources available."
“(Interviewee 1-Stakeholder A)

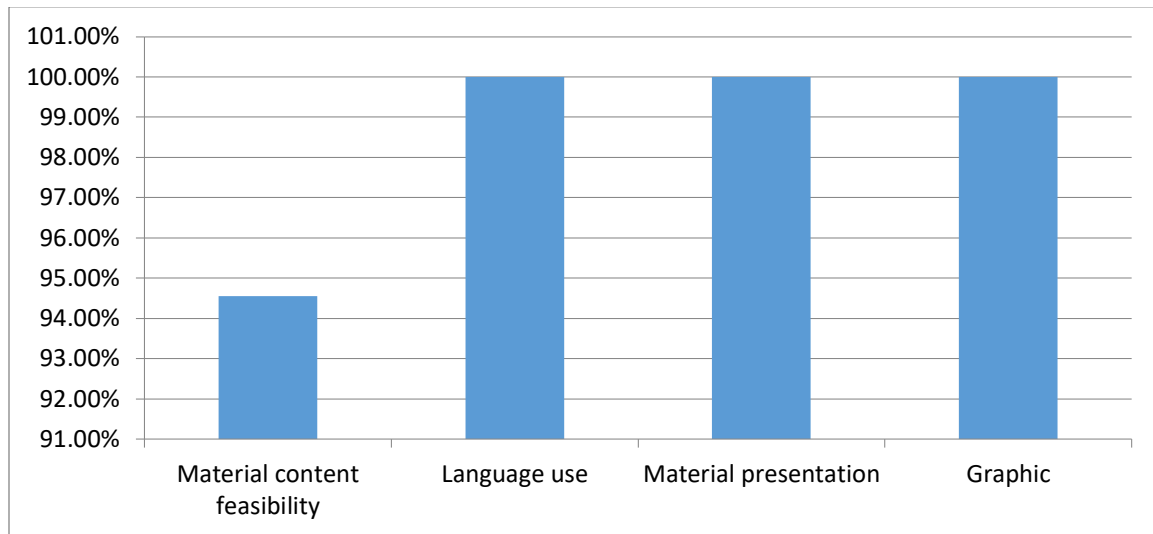
After researchers did the interviews in the preliminary need analysis research, the initial questionnaire was obtained based on the data. The questionnaire was required for designing online-based learning resources because of several factors; they had been able to use a computer with various applications available, they could use the facilities to access the Internet network at school and at home, and the school had provided support for the availability of computer and network devices.

According to teachers, the online learning resources they had accessed were still lacking regarding the contextual theory and practice; therefore, they needed to design online-based learning. Therefore, teachers wanted more flexible and up-to-date online learning resources specifically designed to online-based learning. This is based on the limited conventional learning resources (printed books) as a reference for designing learning. Even if available, the books presented an old paradigm and some parts were no longer relevant to the development of modern learning models and approaches. On the basis of needs analysis in the initial studies that had been carried out, it is important to develop an online-based learning resource for teachers.

The products developed in this project were in the form of online multimedia-based learning resources. Online multimedia was developed using a web Learning Management System (LMS) system. The use of LMS makes operational management to be easier than that of other media (Aman, Prasojo, Sofwan, Mukminin, Habibi, & Yaqin, 2020). The process of designing, operating, and editing that was easy and fast allows developers to develop learning resources properly. The results of the development were then evaluated and validated by a team of experts. The team of experts involved to validate the product includes: (1) educational technology experts; (2) expert design-based learning materials; and (3) learning multimedia experts. The results of the validation of educational technology experts are illustrated in Figure 3.

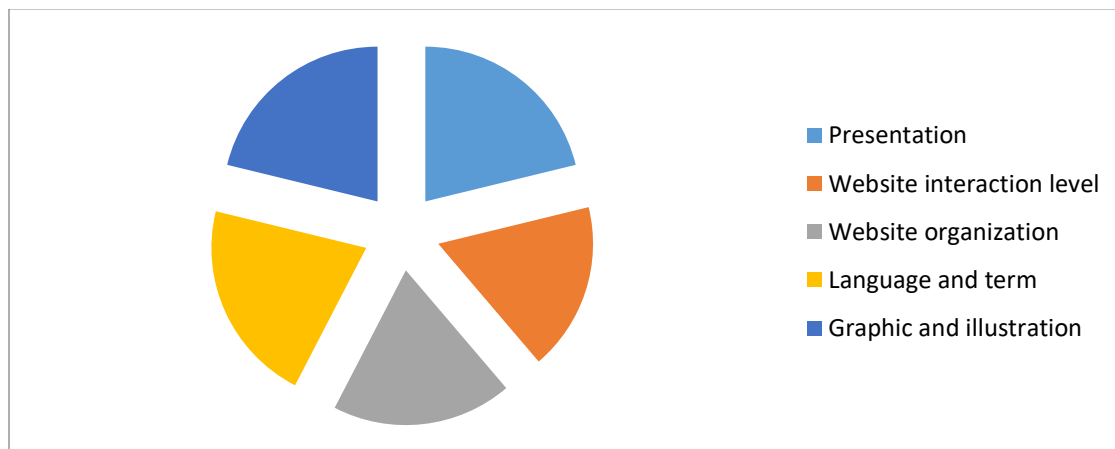
The results of the validation of the education technology expert on aspects of learning were considered to be very good. It was concluded that the indicators and principles of educational technology in the product development, online-based learning resources, were declared to have met the feasibility and could be continued in the trial process. Following are the results of expert validation of learning materials about design-based learning, as the following graph.

Figure 3. *Validation of educational technology experts*



The assessment of each indicator meets the eligibility criteria. Based on the results of the validation, the expert recommended that learning resources for designing online-based learning be appropriate and continued for the trial process (Figure 4).

Figure 4. *Validation of learning multimedia expert*



Multimedia learning experts assessed that the developed online-based learning resource had met the source of learning criteria. Each indicator met the eligibility criteria. So, it is believed that developed products could be used as a medium and a source of learning. On this basis the expert recommendation, the online-based learning resource was feasible and could be used in the trial process. The results of the validation of the three experts as illustrated in the graphs that have been presented, obtained the average eligibility as illustrated in Figure 5.

Figure 5. *Validation of expert teams to the online-based learning resource*

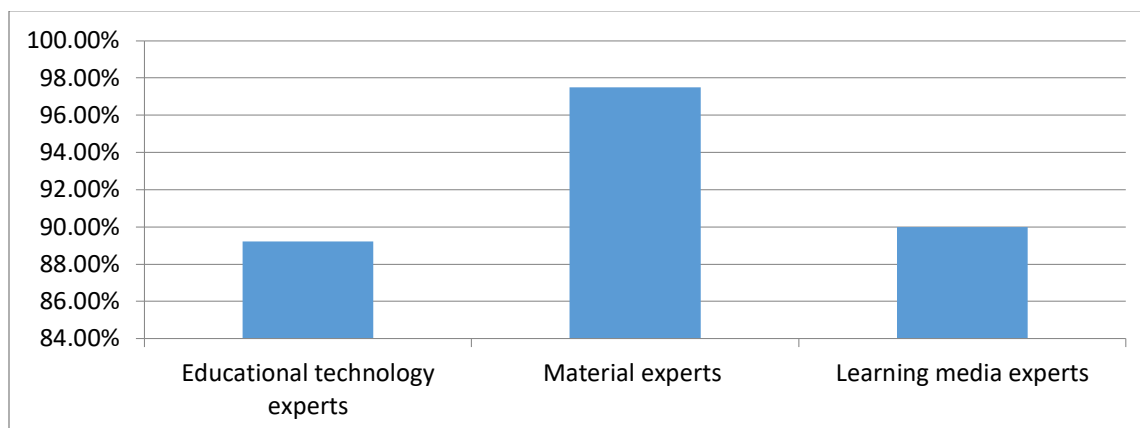


Figure 5 illustrates, that the percentage of quality assessment results of the expert team was in very feasible. The expert team assessed that the source had been developed following the correct procedures and heeded the principles of the system and the method of model development. The expert team recommended that the product development could be continued to be tested and used by teachers both individually and in groups according to the existing characteristics. The use of development products by teachers in the trial process was carried out to see the qualitative effectiveness of the use of learning resources that had been developed. Table 1 illustrates the quality of teacher responses from the trial process.

Table 1. *Trial results of the online-based learning resource*

Trial	Indicator	Response quality
Individual	Material Clarity	90,26%
	Navigation Facility	87,62%
	Material Eligibility	89,09%
	Average	89,21%
Small group	The performance of the display	96,27%
	Effectiveness of Time	91,90%
	Material Eligibility	94,10%
	Illustration Suitability	96,25%
	Appropriate Evaluation	90,00%
	Average	97,13%
Big group	Navigation Facility	88,57%
	Relevance of Graphic	89,63%
	Material Adequacy	89,57%
	Material Updates	87,11%
	Average	89,04%

Table 1, illustrates that the quality of acceptance of trial subjects is very good. The response of the test subject to the indicators asked during the trial process was positive. The online-based learning resource generally met the expectations of teachers. It was quite effective in facilitating the development of design-based learning. The latest material characteristics, easy-accessible menu, interesting display, relevant illustrations, and suitable components could be utilized by the teachers in improving the competency of designing learning.

Discussion

Theoretically and practically, writing goals in design-based learning is important. Learning objectives are indicators that mark the achievement of a process that has been done. Learning objectives are also a guide for teachers in developing assessment instruments, writing teaching materials, developing learning strategies, as well as selecting appropriate learning media. Learning objectives (Dick & Carey, 2015) are important to highlight as a basic requirement for developing test items, whether students really have a possessed subordinate skill (entry behavior), and goals also help ensure the suitability of learning provided for certain students. In addition, the goal is useful for designers (teachers) who need improvement over previous learning that has not yet reached the learning target.

Learning objectives (Sanjaya, 2009) are components that influence all forms of interaction between teachers and students. As a binder, learning objectives are guidelines that are a source of design for other components included in learning so that the other components are bound together in the process of achieving goals. As it is known, learning is a system in which every component is a complete and complementary factor. The design of learning undertaken by the teacher includes an assessment plan, learning strategies, learning materials, methods, and media ultimately contributes to the achievement of objectives (Erlina et al., 2018).

Preliminary data that had been carried out provides the fact, that in terms of designing learning, it already had initial competences, such as: (1) teachers' understanding of teaching and learning theory; (2) experience in designing learning; (3) basic ability in operating computers; (4) basic ability in integrating multimedia for learning; and (5) ability in learning independently and in groups. The competences and skills that had been mastered by the teachers had not been fully developed in designing learning. This fact was supported by the results of observations, interviews with the principals, as well as the supervision results on the completeness of teaching when the initial study was conducted. In fact, basic competences of these teachers are very potential in empowering teacher development efforts in designing learning.

The need for teachers to access online learning resources that can be used as guidelines in designing learning is greatly available. The teachers have not maximally used conventional learning resources in the form of books and printed modules to guide them in designing learning. On the other hand, learning resources for designing online-based learning are not yet available. The importance of developing online-based learning resources is also

based on the unavailability of learning resources that can specifically be used as a guide for teachers to design-based learning. The teachers want online learning resources that are specific and practically can be used independently or in groups.

After completing all stages of development, expert evaluation, and users' trials, the online-based learning resource had been declared in a feasible way. The expert validation process was carried out through several stages and studies. Valid conclusions from experts were a strong basis for developers to test products for users, in this case Indonesian language teachers. The online-based learning resource that was validated by the experts had been declared eligible for teaching use in Indonesian education. According to the experts, the online-based learning was developed based on a material focus and presentation of designing learning. In addition, the online-based learning resource developed have met the criteria and principles of learning technology aimed at facilitating and improving user performance.

Characteristics of the learning resource for effective learning were considered "good". According to the expert, that the provision of concrete examples of each material is able to foster enthusiasm and confidence for users to independently establish an online-based learning resource should follow the needs of students in their class. Independent learning (Mujiman, 2007) is an active learning activity that is driven by a motive to master a competence and build on the knowledge.

Giving reinforcement in online-based learning design can be done in accessible environment. This is important so that the users know how far they have mastered a study material. Strengthening and reversing learning outcomes are the form of motivation service (Santrock, 2007). Motivated behavior is a behavior with full of energy, endurance, discipline, learning creation resulting in effective learning outcomes. Effectiveness is sometimes considered as a motivation (Keller, 2010).

Resources for designing online-based learning require student-centered learning which leads to independent learning. Independence learning requires effective use of learning resources. Effective learning can ultimately create individuals to obtain skills, knowledge, learning enjoyment, and attitudes. Learning is an attempt to manage the environment intentionally (Miarso, 2007); creating positive and effective learning conditions by utilizing learning resources help users develop their competences to gain critical thinking, attitudes, skills, and other positive attitudes from what is learned.

The results of the field trials were also relevant to other studies. During trials, the users had high motivation in learning. Increased motivation in designing learning with the help of online learning resources has a positive impact on improving pedagogical competences and teacher professionalism. In addition, the use of online-based learning resources can be adjusted by users with existing capabilities and existing learning environments. Users' responses as a test subject are relevant to the cognitive approach to active division. Cognitive approach emphasizes active learning because it assumes people to learn not only by observing but by doing the approach. It also shows the importance of various activities in learning that utilize online multimedia. The interactions that occur not only to maintain attention, but also to help to create, to store new knowledge and skills, and to facilitate understanding. The principle of active learning using online-based learning

resources in a constructivist view is an important point for teachers as learning planners. Learning is the process of people actively building knowledge. Traditional teaching methods, such as memorizing, demonstrating, and imitating, are considered incompatible with the notion that learning is a process of constructing new knowledge and understanding.

The application of designing online-based learning resource can improve the effectiveness of learning and facilitate the learning process for teachers. The teachers have a positive attitude towards online-based learning models for problem solving in order to improve their competences. The facts found in the trial process of designing online-based learning resource users were relevant to the research findings of Varol (2014) and Herguner (2016) who revealed that trained students consider it important to have competences in information technology. In this context, the online-based learning resource in sync with efforts to develop teacher competences regarding the integration information technology enables them to evaluate their technological competences in an independent way. In accordance with the guidelines for formative evaluation of development projects, the results of field trials show that the use of online-based learning resource is feasible and effective.

The quality of the results of the instructional design conducted by the teacher would have an impact on the quality and success of learning. As an agent of learning, it is important for teachers to carry out design-based learning activities. Teachers must be able to adapt and make changes. The teacher (Fullan, 2000), is part of the learning unit; each unit must be able to develop abilities, move and make changes, and develop new skills and attitudes. In short, each unit must develop learning abilities. In the process of design and learning activities, teachers do not only rely on individual abilities. As a process with a broad impact, the design activities undertaken by the teachers must involve other units. Like students, colleagues, leaders, or experts who can be asked for their opinions. This is important because the design-based learning is the first and foremost element that must be present in learning. A design-based learning becomes an umbrella for the implementation of the components in the learning process.

Conclusion and Implications

Research regarding Indonesian teachers' competency in designing good and effective learning was still limited. With the ability to master computers and network systems, teachers want specific online-based learning resources to become a guide in designing learning. Development of online-based learning resources is carried out with the correct procedures following the methods, principles, and development models that are guided, starting from needs analysis, planning, design, evaluation, and testing. The use of online-based learning resource effectively increases competences and performances of teachers in designing learning. The effectiveness, efficiency, and attractiveness of the resources are evidenced by the quality of teacher design-based learning that have met required indicators.

The online-based learning resource is a product that provides a broad impact, especially for teachers. On that basis, it is important to be considered by the stakeholders who run the policy so that the product can be widely used for teachers at all levels of

education. The online-based learning resource can be used by teachers in design-based learning activities in teacher working groups. This was seen not only during trials, but also in routine activities at school. Another implication, the internet networks in schools should be used more optimally by teachers in an effort to improve competences. In an effort to support wider product dissemination and implementation, the local government needs to facilitate and make policies, to improve facilities and funding for the development of the support system in the form of increasing the capacity of existing accessibility in schools and training institutions. Thus, it will be easier to access modules online quickly.

Some limitations are found in this project. Online-based learning resources have experienced rapid changes in their development from time to time. The latest technology and upgrading products are needed continuously to align with these developments. Required planning and design as well as accurate calculations for research and development starting from preparation, producing, validation, working with multimedia experts and trial process. The results of this study are limited to the subject of Indonesian junior high school language teachers. In addition, the internet network is a problem that is occasionally encountered by teachers during the implementation of online learning. In certain conditions, teachers have difficulty getting internet access. In online learning that utilizes the internet network, a problem that often occurs is the condition in which there is a network that is disconnected during learning process. Access to the internet must be one of the considerations in determining online-based learning. Thus, learning developers need to pay attention to the percentage of conventional (face-to-face) and online learning that emphasizes more independent learning. Therefore, the initial analysis steps for all components involved in learning are important. Furthermore, the data found in the study is qualitative data from the facts found during the development process to formative evaluation. It is important for researchers and subsequent developers to conduct more in-depth research with various methods.

Disclosure statement

No conflict of interest was reported by the authors.

Acknowledgments

We would like to thank all participants who participated in this study. Also we would like to thank IRJE and reviewers for accepting our article.

References

- Alessi, S.M., & Trollip, S.R. (2001). *Multimedia for learning: Methods and development (3rd ed.)*, Boston, MA: Allyn & Bacon, Inc.
- Allen, I. E., & Seaman, J. (2013). *Changing course: ten years of tracking online education in the United States*. Babson Survey Research Group.

- Aman, A., Prasojo, L. D., Sofwan, M., Mukminin, A., Habibi, A., & Yaqin, L. N. (2020). Factors affecting Indonesian pre-service teachers' use of m-LMS: A mix method study. *International Journal of Interactive Mobile Technologies (ijIM)*, 14(06), 137-147.
- Arkun, S., & Akkoyunlu, B. (2008). A study on the development process of a multimedia learning environment according to the ADDIE model and students' opinions of the multimedia learning environment. *Interactive Educational Multimedia*, 17, 1-19.
- Cathorall, M. L., Xin H., Blankson F., Kempland M., & Schaefer C. (2018). Assessing student performance in hybrid versus web-facilitated personal health courses. *The Turkish Online Journal of Educational Technology*, 17(1), 11-16.
- Chai, C. S., Tan, L., Deng, F., & Koh, J. H. L. (2017). Examining pre-service teachers' design capacities for web-based 21st century new culture of learning. *Australasian Journal of Educational Technology*, 33 (1), 1-20.
- Chen, I. (2011). Instructional design methodologies. In M. Khosrow (Ed.), *Instructional Design: Concepts, Methodologies, Tools, and Applications*, Hershey, New York: Information Science Reference.
- Denscombe, M. (2007). *The good research guide for small-scale social research projects (3rd Ed.)*. New York, NY: McGraw-Hill Education, Open University Press.
- Dick, W., & Carey, J.O. (2009). *The Systematic design of instruction (7th Ed.)*, New Jersey, NJ: Pearson.
- Dick, W., & Carey, J.O. (2015). *The Systematic design of instruction (8th Ed.)*,. Boston, Columbus: Pearson.
- Erlina, D., Marzulina, L., Pitaloka, N.L., Astrid, A., Yansyah, F., Mukminin, A. (2018). Research on Educational Media: Balancing between Local and Target Language Cultures in English Electronic Textbooks. *The Turkish Online Journal of Educational Technology*, 17(2),11-119.
- Frey, B.,A., & Sutton, J. M. (2010). A Model for developing multimedia learning projects. *MERLOT Journal of Online Learning and Teaching*, 2(2), 491-507.
- Fullan, M. (2000). *Change forces the sequel*. Philadelphia: George Muchamm.
- Gagne, R.M., & Briggs, L.J. (1978). *Principles of instructional design second edition*. New York, NY: Holt, Rinehart and Winston.
- Gagne, R.M., Wager, W.W., Golas, K.C., & Keller, J.M. (2005). *Principles of instructional design (5th Ed.)*, New Jersey, NJ: Thomson Wadsworth.
- Göksün, D. O., & Kurt, A. A. (2017). The relationship between pre-service teachers use of 21st century learner skills and 21st century teacher skills. *Education & Science/Eğitim ve Bilim*, 42 (190).
- Guion, L.A. (2002). *Triangulation: Establishing the validity of qualitative studies*. Institute of Food and Agricultural Sciences, Gainesville: University of Florida.
- Gustafson, K.L. and Branch, R.M. (2002) *Survey of instructional development models (3rd)*. New York, NY: Clearinghouse on Information & Technology Syracuse University.
- Habibi, A., Yusop, F. D., & Razak, R. A. (2020). The role of TPACK in affecting pre-service language teachers' ICT integration during teaching practices: Indonesian context. *Education and Information Technologies*, 25, 1929-1949.

- Hadiyanto, Mukminin, A., Makmur, Hidayat, M., & Failasofah. (2013). Teaching in a digital era: English lecturers' readiness toward the internet use in teaching and learning at selected higher education institutions in Indonesia. *Asia-Pacific Collaborative Education Journal*, 9 (2), 113-124.
- Herguner, G. (2016). Tablet computer literacy levels of the physical education and sports department students. *Malaysian Online Journal of Educational Technology*, 4(2), 58-65.
- Ivers, K.S., & Barron, A.E. (2002). *Multimedia projects in education: Designing, producing, and assessing* (2nd Ed.). Westport, Connecticut USA: Libraries Unlimited Teacher Ideas Press.
- Jones, P., & Davis, R. (2011). *Instructional design methods integrating instructional technology*. New York, NY: Information Science Reference.
- Keller, J.M. (2010). *Motivational design for learning and performance the ARCS model approach*. New York, NY: Springer.
- Mujiman, H. (2007). *Manajemen pelatihan berbasis belajar mandiri*. Yogyakarta: Pustaka Pelajar.
- Muhaimin, Habibi, A., Mukminin, A., Pratama, R., Asrial, & Harja, H. (2019). Predicting factors affecting intention to use web 2.0 in learning: Evidence from science education. *Journal of Baltic Science Education*, 18(4), 595-606. doi:10.33225/jbse/19.18.595
- Muhaimin, M., Habibi, A., Mukminin, A., Saudagar, F., Pratama, R., Wahyuni, S., Sadikin, A., Indrayana, B. (2019). A sequential explanatory investigation of TPACK: Indonesian science teachers' survey and perspective. *Journal of Technology and Science Education*, 9(3), 269-281. doi:10.3926/jotse.662
- Mukminin, A., Habibi, A., Muhaimin, Asrial, Haryanto, E., Setiono, P., & Sofyan. (2019). Vocational technical high school teachers' beliefs towards ict for the 21st century education: Indonesian context. *Problems of Education in the 21st Century*, 77(1), 2538-7111.
- Nurdin S. (2005). *Model pembelajaran yang memperhatikan keragaman individu peserta didik dalam kurikulum berbasis kompetensi*. Jakarta: PT Ciputat Press.
- Prasojo, L. D., Mukminin, A., Habibi, A., Hendra, R., & Iqroni, D. (2019). Building quality education through integrating ICT in schools: Teachers' attitudes, perception, and barriers. *Quality - Access to Success*, 20(172), 45-50.
- Prasojo, D. L., Habibi, A., Mukminin, A., Sofyan, Indrayana, B., & Anwar, K. (2020). Factors Influencing Intention to Use Web 2.0 in Indonesian Vocational High Schools. *International Journal of Emerging Technologies in Learning (ijET)*, 15(5), 100-118.
- Prasojo, L. D., Mukminin, A., Habibi, A., Marzulina, L., Sirozi, M., & Harto, K. (2018). Learning to teach in a digital age: ICT integration and EFL student teachers' teaching practices. *Teaching English with Technology*, 18(3), 18-32.
- Prasojo, L. D., Habibi, A., Mukminin, A., Muhaimin, Taridi, M., Ikhsan, & Saudagar, F. (2017). Managing digital learning environments: Student teachers' perception on the social networking services use in writing courses in teacher education. *Turkish Online Journal of Educational Technology*, 16(4), 42-55.

- Posner, G. J. & Rudnitsky, A. N. (2001). *Course design*. New York, NY: Longman.
- Pritchard, A., & Woollard, J. (2010). *Psychology for the classroom: constructivism and social learning*. New York, NY: Routledge.
- Richey, R.C., dan Nelson, W.A. (2000). *Development research: Handbook of research for educational communication and technology*. New York: Maximillan Library.
- Ross, S.M. & Kemp, J. E. (2004). *Designing effective instruction*. John Wiley and Sons, Inc.
- Rothwell, W.J. dan H.C. Kazanas. (2004). *Mastering the instructional design process (3rd Ed.)*. San Francisco: Pfeiffer.
- Santrock, John W. (2007). *Psikologi pendidikan*. Jakarta: Kencana Prenada Media.
- Smith, P.L., & Ragan, T.J. (2005). *Instructional design (3rd E.)*. Hoboken, NJ: John Wiley & Sons, Inc.
- Syaiful, S., Mukminin, A., Habibi, A., Marzulina, L., Astrid, A., & Tersta, F. W. (2019). Learning in the digital era: Science education students' perception on the snss use in the context of english for specific course. *Elementary Education Online*, 18(3), 1069-1080. doi:10.17051/ilkonline.2019.610143
- Varol, Y. K. (2014). The relationship between attitudes of prospective physical education teachers towards education technologies and computer self-efficacy beliefs. *The Turkish Online Journal of Educational Technology (TOJET)*, 13(2), 157-167.
- Vaughan, T. (2006). *Multimedia: making it work (Ed.)*. Yogyakarta: Andi.
-

Biographical notes

Dr. SOFYAN works at the Faculty of Teacher Training and Education, Universitas Jambi, Jambi, Indonesia; sofyanzaibaski68@gmail.com

DAMERIA SINAGA works at Indonesian Christian University, Indonesia.

RUBIATI works as a teacher at Sekolah Menengah Pertama Negeri 10, Kota Jambi, Jambi, Indonesia; rubiaturubiati@yahoo.co.id