Pre-Service Teachers' Experiences in Developing Digital Learning Designs using ADDIE Model Amid COVID-19 Pandemic

Asep Nuryadin[1]✉, Dindin Abdul Muiz Lidinillah[2], Muhammad Rijal Wahid Muharram[3]
Bachelor of Digital Business Study Program, Universitas Pendidikan Indonesia[1]
Bachelor of Elementary School Teacher Education Study Program, Universitas Pendidikan Indonesia[2,3]
E-mail: asep.nuryadin@upi.edu[1], dindin_a_muiz@upi.edu[2], rijalmuharram@upi.edu[3]

Abstrak

Penelitian ini bertujuan untuk mengetahui pengalaman para calon guru dalam mengembangkan desain pembelajaran digital di masa pandemi COVID-19. Hasil penelitian ini diharapkan dapat membantu dosen, mahasiswa, perguruan tinggi, dan pemangku kepentingan terkait lainnya dalam menyiapkan pelaksanaan pembelajaran di tengah pandemi global atau krisis terkait lainnya, terutama terkait dengan melaksanakan pengembangan desain atau produk tertentu menggunakan model ADDIE. Metode yang digunakan dalam penelitian ini adalah studi kasus dengan pendekatan deskriptif. Subjek penelitian atau partisipan yang terlibat dalam penelitian ini adalah 41 orang calon guru yang mengambil unit "Desain Sistem Pembelajaran Digital atau *Digital Learning System Design*" yang ditawarkan pada semester VI di Program Studi S1 Pendidikan Guru Sekolah Dasar, UPI Kampus Tasikmalaya. Kajian ini menghasilkan beberapa temuan terkait pengalaman para calon guru dalam mengembangkan desain pembelajaran digital menggunakan model ADDIE di tengah pandemi COVID-19. Selain itu, penelitian ini juga telah menemukan informasi mengenai desain pembelajaran digital dan materi/perangkat pembelajaran digital yang dikembangkan oleh para calon guru tersebut.
Kata Kunci: desain pembelajaran digital, ADDIE, calon guru.

Abstract

This study aims to discover pre-service teachers' experiences in developing digital learning designs during the COVID-19 pandemic. It is expected that the findings of this study can help lecturers, university students, higher education institutions, and other relevant stakeholders in preparing the implementation of learning amid a global pandemic or other relevant crises, especially related to conducting the development of a particular design or product using ADDIE model. The method used in this study was a case study with a descriptive approach. Research subjects or participants involved in this study were 41 pre-service teachers who took a unit named "Desain Sistem Pembelajaran Digital or Digital Learning System Design" offered in the sixth semester in the Bachelor of Elementary School Teacher Education Study Program, UPI Tasikmalaya Campus. This study results in several findings related to pre-service teachers' experiences in developing digital learning designs using the ADDIE model amid the COVID-19 pandemic. In addition, this study also has discovered information regarding digital learning designs and digital learning materials/tools developed by the pre-service teachers.
Keywords: digital learning designs, ADDIE, pre-service teachers.

PENDAHULUAN

Covid-19 has forced all sectors in the world to make various adjustments to ensure the safety of everyone and simultaneously maintain all necessary activities to continue to run. The covid-19 outbreak was first declared as a global pandemic in March 2020 by World Health Organisation (WHO) (Cucinotta & Vanelli, 2020) and still affects various sectors until more than a year later including the field of education. As a response to this situation, online learning has become one of the solutions chosen by governments in many countries including the Indonesian government to ensure the continuity of the educational process without neglecting the safety of the students. Although in this time of crisis online learning is considered to be a necessity rather than an option, its implementation is not that simple, especially for those institutions that never or have little experience in running online educational programs. Online learning indeed has many strengths including in the time of crisis such as (1) allowing location and time flexibility; (2) reaching out wide audience; (3) providing a large number of courses and contents; and (3) providing immediate feedback (Dhawan, 2020). However, there are some weaknesses of online learning such as (1) technical issues; (2) different levels of learners' competencies and confidence; (3) time management issues; and (4) distractions, confusion, and even frustration (Dhawan, 2020). Therefore, careful adaptation and preparation of the implementation of online learning need to be done to minimize or overcome the disadvantages of online learning.

In the first semester of 2021, the Indonesian government made a policy to reopen schools, especially elementary and secondary levels while still paying attention to strict health protocols to ensure safety (Nurita, 2021). However, this policy has not been implemented optimally until the second semester of 2021 due to the increase in the number of people contracting Covid-19 (EKONID, 2021). This condition has turned out to significantly affected the teaching and learning process in various Indonesian universities that hold teacher education programs including in the Bachelor of Elementary School Teacher Education Study Program, Universitas Pendidikan Indonesia (UPI) Tasikmalaya Campus. Besides the emergence of various challenges of conducting online learning, the pandemic situation has made it difficult for pre-service teachers to practice what they have learned in a normal elementary school situation.

One of the units affected is the "Digital Learning System Design" which focuses on facilitating the pre-service teachers in understanding and developing digital learning designs based on several digital learning models including online learning, blended learning, flipped learning/classroom, personalized learning, mobile learning, Digital Game-Based Learning (DGBL), immersive learning, and assessment in online and blended learning. Considering this situation, this study aims to discover pre-service teachers' experiences in developing one of the digital learning designs during the COVID-19 pandemic. It is expected that the findings of this study can help lecturers, university students, higher education institutions, and other relevant stakeholders in making adjustments and preparing the implementation of learning amid a global pandemic or other relevant crises, especially related to conducting development of particular design or product.

In developing the learning design, the pre-service teachers were directed to use the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model as a framework for developing instructional design (Branch, 2009). An overview of how this five-stage framework can be utilized to develop designs of instructions is presented in Table 1.

Table 1. Activities in Each ADDIE Stage

No.	ADDIE Stage		Common Procedures
1	Analysis	a.	Validate the Performance Gap (e.g., assess the actual and desired performance, and analyze the causes of the performance gap).

		b.	Determine Instructional Goals (e.g., create instructional goals based on Bloom's Taxonomy).
		c.	Analyze Learners (e.g., number of students, students' characteristics, students' attitudes, and students' experience levels).
		d.	Identify Available Resources (e.g., content resources, human resources, instructional facilities, and technology resources).
2	Design	a.	Conduct a task inventory (e.g., cognitive task, order task, and motor task).
		b.	Compose performance objectives (e.g., create performance objectives consisting of performance, condition, and criteria).
		c.	Generate Testing Strategies (e.g., assess whether students can demonstrate the performance objectives and meet the determined criteria in the specified condition).
		d.	Calculate Return on Investment (e.g., calculate the costs of the program/activities, calculate benefits obtained, and compare the costs and the benefits).
3	Development	a.	Generate Content (e.g., choose strategies to deliver learning content consisting of knowledge, skills, and procedures).
		b.	Select or Develop Instructional Media (e.g. select or develop media to improve learning quality, present and/or reinforce learning content, and accommodate different learners' learning styles).
		c.	Develop Guidance for the Student.
		d.	Develop Guidance for the Teacher.
		e.	Conduct Formative Revisions (e.g., one-to-one trial, small group trial, and non-credit-bearing field trial).
		f.	Conduct Pilot Test (i.e., conduct credit-bearing field trial).
4	Implementation	a.	Prepare the Teacher (e.g., identify qualified teachers to deliver instruction, create a schedule to prepare the teachers, train the trainers/teachers).
		b.	Prepare the Student (e.g., confirm learners' learning styles, create a schedule for students participation, perform pre-course communication, and perform tracking related to students records process).
5	Evaluation	a.	Determine Evaluation Criteria (e.g., three levels of evaluation, namely, level 1: students' perception, level 2: students' knowledge and skills acquisition, and level 3: students' performance/actual learning transfer).
		b.	Select Evaluation Tools (e.g., observations, questionnaire, interview, and open-ended questions).
		c.	Conduct Evaluations (e.g., using 5W+1H, that is Who, What, When, Where, Why, and How to evaluate each level of evaluation).

Source: Branch (2009)

As a development framework, the ADDIE model has been widely used concerning digital learning in various contexts. For example, ADDIE has been used to develop digital learning materials for adult learners (Karademir et al., 2019), for secondary school students (Mamolo & Wang, 2019; Pradina & Suyatna, 2018; Setiyani et al., 2020), and for elementary school students (Tang et al., 2017). The ADDIE framework has also been utilized for developing various digital software or applications such as digital games (Tanjung & Sitompul, 2020), e-learning applications (Stapa & Mohammad, 2019), and Massive Open Online Course (Fondo & Konstantinidis, 2018). In addition, the ADDIE model has also been used by pre-service teachers to develop lesson plans and a digital storytelling project based on the lesson plans (Bugis, 2018), multimedia e-content (Thakur, 2014), and e-books (Usta & Güntepe, 2017). Moreover, the study conducted by Usta & Güntepe (2017) has also successfully revealed problems faced by pre-service in each stage of ADDIE during the process of creating the e-books. Thus, the ADDIE model can be considered suitable to be used as a

framework in the context of digital learning including for developing pre-service teachers' competency. However, the number of studies on how pre-service teachers use the ADDIE model for developing digital learning designs in an online environment is still limited. Therefore, this study aims to discover pre-service teachers' experiences in developing digital learning designs using the ADDIE model amid the COVID-19 pandemic.

METHODS

The method used in this study was a case study with a descriptive approach. The case study can be defined as a form of research that aims to understand the complexity and particularity of a single case such as project, institution, program, policy, and system within important circumstances (Cohen et al., 2018). Similarly, Tight (2010) states that a case study is a "detailed examination of a small sample". Therefore, a case study method is considered suitable to be used in this research as this study aims to understand the complexity of pre-service teachers' experiences in a particular project in an online environment and under pandemic circumstances.

Research subjects or participants involved in this study were 41 pre-service teachers who took a unit named "*Desain Sistem Pembelajaran Digital* or Digital Learning System Design" offered in the sixth semester in Bachelor of Elementary School Teacher Education Study Program, UPI Tasikmalaya Campus. After learning about designing digital learning based on various models as mentioned in the previous section, the pre-service teachers were asked to create groups of two or three by themselves. As a result, 14 groups were involved in this study. These groups then were asked to conduct the project, that is developing digital learning designs, for five weeks. They were directed to use the ADDIE model as a framework. Moreover, as an effort to ease the process, some resources (e.g., a book, relevant journal articles, and an article on a website) regarding the ADDIE model were provided. The final products of this project were lesson plans (compulsory), learning materials and/or tools created (optional as the students were allowed to utilize existing learning materials and/or tools), and journal articles (compulsory).

The data collection process was done through a questionnaire and document analysis. The questionnaire consisted of three semi-open questions and six open-ended questions delivered through google form after the pre-service teachers had finished the project. As for the document analysis technique, it was used to analyze articles that had been written by the research participants. Two data collection techniques (i.e., questionnaire and document analysis) and two sources of data (i.e., questionnaire results and students' journal articles) were selected to ensure the validity of the data obtained. As a means to ensure the validity of qualitative research, researchers can use "triangulation of data, investigators, perspectives, methodologies, instruments, time, location, and contexts" (Cohen et al., 2018, pp. 381-382). The questions used in the questionnaire is presented in table 2.

Table 2. List of Questions in the Questionnaire

No.	Aspect	Question	Provided Options
1		In general, what type of learning design that your group has developed?	Offline Learning; Online Learning; Blended Learning; Other.
2	Products Developed	What specific learning model/strategy that your group has developed?	Flipped Learning/Classroom; Gamified Learning (Game-Based Learning/Gamification); Personalized Learning; Mobile Learning; Immersive Learning; and Other(s).
3		What type(s) of learning material(s) and/or	Lesson Plan; Student Worksheet;

		tool(s) that your group has developed?	Instructional Video; Instructional Audio; Digital Image; Digital Assessment Tool; Augmented Reality; E-Book; Mobile Application; and Other(s).
4		What challenges did you face when trying to understand the ADDIE development model?	-
5		What challenges did you face when planning and implementing the Analysis phase?	-
6	Teachers' Experiences	What challenges did you face when planning and implementing the Design phase?	-
7		What challenges did you face when planning and implementing the Development phase?	-
8		What challenges did you face when planning and implementing the Implementation phase?	-
9		What challenges did you face when planning and implementing the Evaluation phase?	-

After the data had been gathered, the data were then analyzed. The stages of data analysis were adapted from Cohen et al. (2018) and Creswell (2014), namely, (1) preparing and organizing the data; (2) analyzing the data; (3) interpreting the data; (4) drawing conclusions; (5) reporting the findings; and (6) ensuring the validity of the findings.

RESULTS AND DISCUSSION

Learning Designs Developed

In the process of developing digital learning designs, the pre-service teachers base their designs on a general model of digital learning, namely, offline learning, online learning, and blended learning. Since learning using technology is different from learning through technology (Wheeler, 2012), digital learning in this context is not only limited to online learning (Lin et al., 2017). Each group used only one learning model as the basis for developing digital learning designs.
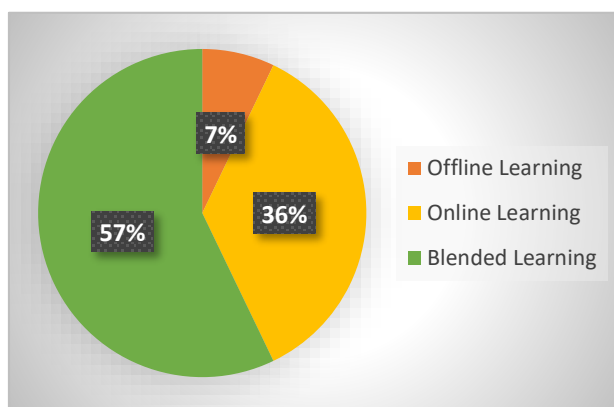

Figure 1. General learning designs developed

Figure 1 shows that more than half of the groups used blended learning model as the basis to develop their digital learning designs, following by online learning as much as 36%, and only 7% of the groups chose offline learning. Further investigation, that is by reading articles written by the pre-service teachers, indicated that blended learning was perceived to be very useful by the pre-service teachers. This finding is also in line with the current trends in digital learning which suggest that blended learning is considered to be "the most effective and most popular mode of instruction adopted by educational institutions due to its perceived effectiveness in providing flexible, timely and continuous learning" (Rasheed et al., 2020, p. 1). In fact, blended learning is not a new thing since several studies have been conducted since around 15 years ago (Boelens et al., 2017). Therefore, by starting to more popularity including in Indonesia, especially during the Covid-19 pandemic situation, it is expected that blended learning could be used optimally as an effort to enhance the quality of education.

In terms of choosing a specific model or strategy, each group was allowed to choose more than one; thus, they could use, for example, flipped learning and gamified learning simultaneously. The learning model most chosen by the pre-service teachers for developing digital learning designs was flipped learning or also known as the flipped classroom. Six groups chose this model to develop their digital learning designs as shown in Figure 2. The basic concept of the flipped classroom is that activities that are usually done in class are done at home, and activities that are usually treated as homework are performed in class (Bergmann & Sams, 2012). The flipped classroom is considered to be one of the further sub-categories of blended learning. According to Tucker et al. (2017), this model is a subcategory of the rotation model (one of the categories of the blended learning model) that allows an educator to transfer information and knowledge online and later guide the application stage in the classroom. In other words, one of the causes of blended learning became the most chosen learning model (as shown in Figure 1) is because the pre-service teachers believed that the flipped classroom could make learning more effective. For example, Group 4 utilized flipped classroom model to help fifth graders who had difficulty in learning geometry. Similarly, Group 10 also chose flipped classroom model to help fifth graders who struggle in learning about the classification of animals based on their food habits. This model is indeed considered suitable to be used by teachers who have struggling students. It is because instead of using most of the time for doing a presentation in front of the class, flipped classroom model allows teachers to spend more time to help their students who struggle most (Bergmann & Sams, 2012).
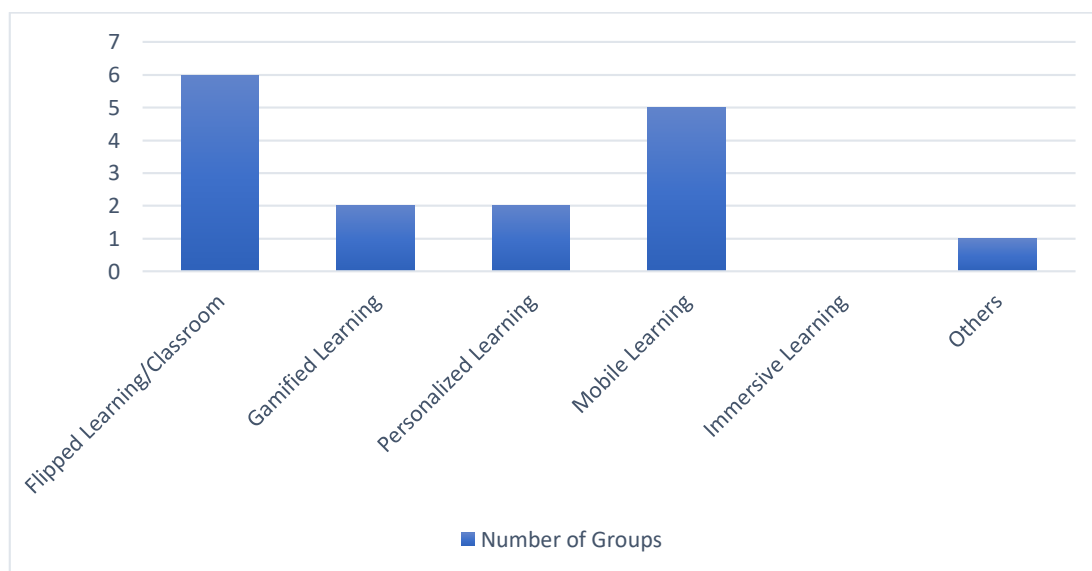

Figure 2. Specific learning model/strategy developed

Furthermore, in relation to utilizing time effectively, some groups also stated that the reason that they use the flipped classroom model was that they wanted to use class time effectively. For instance, Group 5 asked fourth-graders to learn about creative dance through an instructional video before they came to the class; thus, class time can be utilized for practicing creative dance. Similarly, Group 13 also decided to choose flipped classroom model as an effort to make class time in outdoor learning for the science subject in fourth grade more effective. They believed that by delivering information before the class, later students can deepen their understanding through discussion, demonstration, and presentation in the class. According to Tucker et al., (2017), the flipped classroom also facilitates more student-centered learning in the classroom. Thus, the flipped classroom can become an alternative when it comes to utilizing time effectively during the pandemic situation.

Learning Materials/Tools Developed

In the process of designing learning based on several digital learning models, the pre-service teachers developed several learning materials/tools as a part of learning design. Besides developing a lesson plan, which was compulsory, they were also encouraged to develop learning materials or tools based on the learning models that they chose. Several products developed are presented in Figure 3 below.

Figure 3.a Lesson plan

Figure 3.b Student e-worksheet

Figure 3.c Instructional video

Figure 3.d Mobile application

Furthermore, the results of the questionnaire regarding the learning materials/tools developed by the pre-service teachers are presented in Table 3 below.

Table 3. Learning Materials/Tools Developed by the Pre-Service Teachers

Learning Materials/Tools Developed	Groups	%
Lesson Plan	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,	100

Student Worksheet/E-Worksheet	1, 3, 9, 11	28.57
Instructional Video	3, 4, 5, 7, 8, 9, 13	50
Instructional Audio	12, 13	14.29
Digital Image	13	7.14
Digital Assessment Tool	7, 11	14.29
Augmented Reality	-	0
E-Book	-	0
Mobile Application	2, 6	14.29
Others	1, 14	14.29

Based on table 3, besides developing a lesson plan, it can be seen that instructional video became the most chosen tool to deliver the learning content with half of the groups chose to develop it, followed by student worksheet/e-worksheet. Among the seven groups that developed instructional videos, four of them utilized instructional videos to support flipped classroom model. It is in line with various publications suggesting that instructional video was chosen to be the main option concerning implementing the flipped classroom (Bergmann & Sams, 2012; Cheng et al., 2019; Tucker et al., 2017; van Alten et al., 2020). One thing teachers should be aware of is the urgency of providing support (e.g., by prompts) when students do self-study before the class (van Alten et al., 2020). Therefore, the benefits of using instructional videos in the implementation of the flipped classroom can be maximized.

Pre-Service Teachers' Experiences in Using ADDIE model
Challenges in Understanding the ADDIE model

With regard to challenges in understanding the ADDIE model, most groups mentioned a similar issue, namely, unfamiliarity with the ADDIE model. For example, Group 12 expressed their concern regarding their lack of understanding of the ADDIE model.

"The challenge was because our group knew and developed using the ADDIE model for the first time, so we still had not really understood and explored the ADDIE model."

Similarly, Group 8 also stated that because they had never used the ADDIE model, it took longer for them to write the article as they had to learn about the model first.

"Because it was the first time we used the ADDIE development model, the challenge was that we had to learn about it first so it took more time to work on the article."

It should be noted that despite "The simplicity of the ADDIE concept combined with multiple prompts for inclusiveness continues to prove its effectiveness" (Branch, 2009, pp. 1-2), those who will utilize the ADDIE model cannot just start the project without proper understanding. This finding indicates that a more comprehensive discussion regarding the ADDIE model needs to be conducted to ensure everyone has an adequate understanding of the model before starting the development project.

Challenges in the Analysis Stage

Challenges faced by the pre-service teachers in the analysis stage were varied such as having communication problems, experiencing difficulty in selecting a topic, and having trouble in accessing literature needed. One problem encountered by several groups was related to finding out students' needs and determining the most appropriate design. For instance, Group 7 shared their experience of discovering the main problem faced by students and considering whether a particular learning design would be effective to overcome the problem.

"*(We encountered challenges) in the selection of a learning topic that became the main problem in students' understanding. We had to really consider whether the problem would be solved effectively if the learning would be carried out using a flipped classroom model combined with gamification.*"

Similarly, Group 9 also said that the challenge they faced was related to analyzing students' needs and the effectiveness of the learning design that they would develop.

"*(We encountered challenges) when analyzing students' needs, and whether the design or teaching materials for students that would be developed would provide benefits or be effective.*"

According to Branch (2009) "Clients and other primary stakeholders should be considered as people for whom you are providing a service" (p. 1). Therefore, it is necessary to guide the pre-service teachers to talk and have a discussion with the in-service teachers in the target schools and see them like the ones that will receive their services. By talking to the in-service teachers, the pre-service teachers can discover the real problem experienced by their students and also get information on whether a particular learning design has ever been used or would be effective.

Challenges in the Design Stage

In the design stage, one of the challenges faced by the pre-service teachers was related to creating the learning design in the form of a lesson plan and aligning it with other components that would be utilized to support the learning design. To illustrate, Group 7 shared their experience regarding the complexity of designing the learning.

"*In our opinion, that stage was a stage that required extra thought because we had to match the design of learning (lesson plan), instructional video, and interactive PowerPoint.*"

Similarly, Group 4 also experienced the same challenge, that is regarding designing a lesson plan.

"*In the design stage, we found problems when designing appropriate lesson plan and what topic should be selected.*"

In the process of designing a lesson plan, one of the challenges is related to selecting teaching methods and techniques. According to (Usta & Güntepe, 2017), "...using different teaching methods and techniques that are suitable for the content might enrich the learning environment and cause the learners with different learning styles to be more active" (p. 206). Therefore, in this context, it is crucial to guide pre-service teachers in selecting suitable teaching methods which are in line with the learning content as well as digital learning models chosen.

Challenges in the Development Stage

Regarding challenges faced in the development stage, several groups pointed out several issues regarding the development of learning materials or learning tools, especially related to technical problems. For example, Group 2 pointed out the challenging situation regarding the software used.

"*We got confused in choosing software that could be helpful for creating applications; thus, there was a moment when we had to change the software used.*"

While Group 2 experienced difficulty in terms of software usage, Group 4 had an issue with limited hardware capacity.

"*In the development stage, we had difficulty in making videos because the tools we used were still very inadequate.*"

It is evident that the technical aspect could be one of the challenges in the process of developing learning materials and tools as part of developing a learning design. Issues related to the software used in the development of electronic materials can affect the willingness of the users of the software (Usta & Güntepe, 2017). Thus, educators need to be aware of this issue and anticipate the occurrence of technical problems such

as by equipping students with better technical skills (e.g., through specific unit or course), providing support in terms of computer hardware (e.g., using the computer lab available at the campus), and/or directing students to use reliable software.

Challenges in the Implementation Stage

It should be noted that the majority of the groups did not implement the design and learning materials/tools that had been chosen or developed. Two main causes mentioned by the pre-service teachers were time constraints and the pandemic situation that made it difficult to conduct learning. For instance, Group 6 explained why they did not reach the implementation stage.

"...our group has not reached this stage because schools were still implementing online learning; when in fact, to run this application students had to use a laptop and no student had a laptop at home."

Although few groups (4 out of 14) managed to implement the learning designs and learning material/tools that had been developed, they faced several difficulties. For example, Group 2 said that they had very limited participants in the process of implementation.

"In this stage, there was an obstacle related to the limited participants because learning activities were not taking place at school."

As explained before, since most of the teaching and learning processes were conducted through an online platform as a consequence of the high number of COVID-19 cases (EKONID, 2021), the pre-service teachers cannot be required to conduct the implementation stage in an offline environment. In this case, finding alternative solutions is everyone's responsibility.

Challenges in the Evaluation Stage

As explained before, the majority of the groups could not reach the implementation stage due to several reasons; thus, those groups also could not conduct the evaluation (summative evaluation). For the groups that managed to conduct the implementation, there were no significant problems that could hinder/fail the process of evaluation. For example, Group 11 stated that in the process of evaluating students' knowledge, they did not face challenges.

"In the evaluation stage, we used a pre-test, post-test, and student worksheet, and found no challenges."

Another group (Group 4) also stated that they only faced insignificant challenges during the evaluation stage.

"In the evaluation stage, we only had difficulty in presenting the results."

In the evaluation stage, one of the things evaluated is related to measuring knowledge and skill acquisition (Branch, 2009). This finding suggests that when the implementation process could be performed, there will be relatively no issues in the evaluation process.

CONCLUSIONS

Based on the findings of this study, it can be concluded more than half of the groups used the blended learning model as the basis to develop their digital learning designs. This finding is also in line with the current trends in digital learning which suggest that blended learning is considered to be the most popular and the most effective mode of instruction. Moreover, the learning model most chosen by the pre-service teachers for developing digital learning designs was flipped learning or also known as the flipped classroom which is one of the subcategories of the rotation model (one of the categories of the blended learning model). As for the learning materials/tools developed, besides developing a lesson plan, it was evident that instructional

video became the most chosen tool to deliver the learning content with half of the groups chose to develop it, followed by student worksheet/e-worksheet. These findings can become the basis for conducting further research regarding digital learning designs and digital learning materials/tools.

In terms of experiences in developing digital learning designs using the ADDIE model amid the COVID-19 pandemic, the pre-service teachers' experienced several challenges. In understanding the ADDIE model, the issue of unfamiliarity with the model has caused the pre-service teachers had to spend more time in running the development project. In the analysis stage. In the analysis stage, one problem that was encountered by several groups was related to discovering the students' needs and choosing the most suitable learning design. As for the design stage, one of the problems was regarding the complexity of designing a lesson plan. With regard to the development stage, the problem was related to technical issues such as the software and hardware used. In terms of the implementation stage, the COVID-19 pandemic has caused most of the groups could not reach the implementation stage; whereas, those who could implement the learning designs faced several challenges such as the limited number of participants. Finally, concerning the evaluation stage, for those who managed to conduct the implementation, no significant challenges were found. These findings can be used as the basis for conducting development projects using the ADDIE model, especially in a time of crisis. It is expected that by understanding the potential challenges, those who will use the ADDIE model can make necessary preparations.

ACKNOWLEDGEMENTS

REFERENCES

Bergmann, J., & Sams, A. (2012). *Flip Your Classroom Reach Every Student In Every Class Every Day*. Oregon: International Society For Technology In Education.

Boelens, R., De Wever, B., & Voet, M. (2017). Four Key Challenges To The Design Of Blended Learning: A Systematic Literature Review. *Educational Research Review*, *22*, 1–18. Https://Doi.Org/10.1016/J.Edurev.2017.06.001

Branch, R. M. (2009). *Instructional Design: The Addie Approach* (1st Ed.). Dordrecht: Springer. Https://Doi.Org/10.1007/978-0-387-09506-6

Bugis, Y. M. (2018). *Creating Digital Stories With Saudi Arabian Pre-Service Teachers: Using The Analysis, Design, Development, Implementation, And Evaluation Model To Promote Lesson Plan Development* [Proquest Dissertations Publishing]. Https://Digscholarship.Unco.Edu/Cgi/Viewcontent.Cgi?Article=1486&Context=Dissertations

Cheng, L., Ritzhaupt, A. D., & Antonenko, P. (2019). Effects Of The Flipped Classroom Instructional Strategy On Students' Learning Outcomes: A Meta-Analysis. *Educational Technology Research And Development*, *67*(4), 793–824. Https://Doi.Org/10.1007/S11423-018-9633-7

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods In Education* (8th Ed.). Oxon: Routledge.

Creswell, J. W. (2014). *Educational Research: Planning, Conducting, And Evaluating Quantitative And Qualitative Research* (5th Ed.). Sydney: Pearson Education, Inc.

Cucinotta, D., & Vanelli, M. (2020). WHO Declares COVID-19 A Pandemic. *Acta Bio-Medica De l'Ateneo Parmense*, *91*(1), 157–160. Https://Doi.Org/10.23750/Abm.V91i1.9397

Dhawan, S. (2020). Online Learning: A Panacea In The Time Of COVID-19 Crisis. *Journal Of Educational Technology Systems*, *49*(1), 5–22. Https://Doi.Org/10.1177/0047239520934018

EKONID. (2021). *COVID-19 Developments In Indonesia*. Https://Indonesien.Ahk.De/Infothek/News/News-Details/Covid-19-Developments-In-Indonesia

Fondo, M., & Konstantinidis, A. (2018). Design Of A MOOC On Personal Language Learning Environments For Digital Language Skills Development. In P. Taalas, J. Jalkanen, L. Bradley, & S. Thouësny (Eds.), *Future-Proof CALL: Language Learning As Exploration And Encounters–Short Papers From EUROCALL 2018* (Pp. 64–69). Https://Doi.Org/10.14705/Rpnet.2018.26.814

Karademir, T., Alper, A., Soğuksu, A. F., & Karababa, Z. C. (2019). The Development And Evaluation Of Self-Directed Digital Learning Material Development Platform For Foreign Language Education. *Interactive Learning Environments*, *29*(4), 600–617. Https://Doi.Org/10.1080/10494820.2019.1593199

Lin, M.-H., Chen, H., & Liu, K.-S. (2017). A Study Of The Effects Of Digital Learning On Learning Motivation And Learning Outcome. *Eurasia Journal Of Mathematics, Science And Technology Education*, *13*(7), 3553–3564. Https://Doi.Org/10.12973/Eurasia.2017.00744a

Mamolo, L. A., & Wang, S. (2019). Development Of Digital Interactive Math Comics (Dimac) For Senior High School Students In General Mathematics. *Cogent Education*, *6*(1), 1–13. Https://Doi.Org/10.1080/2331186X.2019.1689639

Nurita, D. (2021). *Kemendikbud Tegaskan Pembelajaran Tatap Muka Tidak Wajib [Ministry Of Education And Culture Affirms Face-To-Face Learning Is Not Mandatory]*. Https://Nasional.Tempo.Co/Read/1419723/Kemendikbud-Tegaskan-Pembelajaran-Tatap-Muka-Tidak-Wajib#:~:Text="Tatap Muka Sifatnya Diperbolehkan Tidak,%2C Ahad%2C 3 Januari 2020.

Pradina, L. P., & Suyatna, A. (2018). Atom Core Interactive Electronic Book To Develop Self Efficacy And Critical Thinking Skills. *TOJET The Turkish Online Journal Of Educational Technology*, *17*(1), 17–23. Https://Files.Eric.Ed.Gov/Fulltext/EJ1165751.Pdf

Rasheed, A. R., Kamsin, A., & Abdullah, N. A. (2020). Challenges In The Online Component Of Blended Learning: A Systematic Review. *Computers And Education*, *144*, 1–17. Https://Doi.Org/10.1016/J.Compedu.2019.103701

Setiyani, Putri, D. P., Ferdianto, F., & Fauji, S. H. (2020). Designing A Digital Teaching Module Based On Mathematical Communication In Relation And Function. *Journal On Mathematics Education*, *11*(2), 223–236. Https://Doi.Org/Http://Doi.Org/10.22342/Jme.11.2.7320.223-236

Stapa, M. A., & Mohammad, N. (2019). The Use Of ADDIE Model For Designing Blended Learning Application At Vocational Colleges In Malaysia. *Asia-Pacific Journal Of Information Technology And Multimedia*, *8*(1), 49–62. Https://Dx.Doi.Org/10.17576/Apjitm-2019-0801-05

Tang, W.-L., Tsai, J.-T., & Chen, C.-H. (2017). Research On ADDIE Model Applied To Develop The Digital Material Of MCRLC In Taiwan. *2017 56th Annual Conference Of The Society Of Instrument And Control Engineers Of Japan (SICE)*, 561–563. Https://Ieeexplore.Ieee.Org/Abstract/Document/8105551

Tanjung, M. A. P., & Sitompul, O. S. (2020). "Kian Santang" Game As Historical Educational Media Using Digital Storytelling Concept. *Education And Information Technologies*, *25*(6), 5379–5388. Https://Doi.Org/10.1007/S10639-020-10209-0

Thakur, G. R. (2014). *Training And Effectiveness Of Multimedia E-Content Based On ADDIE Model Prepared By Student Teachers In Economics For The Students Of STD. IX*. Https://Files.Eric.Ed.Gov/Fulltext/ED586172.Pdf

Tight, M. (2010). The Curious Case Of Case Study: A Viewpoint. *International Journal Of Social Research Methodology*, *13*(4), 329–339. Https://Doi.Org/10.1080/13645570903187181

Tucker, C. R., Wycoff, T., & Green, J. T. (2017). *Blended Learning In Action: A Practical Guide Toward*

Sustainable Change. California: Corwin Press.

Usta, N. D., & Güntepe, E. T. (2017). Pre-Service Teachers' Material Development Process Based On The ADDIE Model: E-Book Design. *Journal Of Education And Training Studies*, *5*(12), 199–210. Https://Files.Eric.Ed.Gov/Fulltext/EJ1163263.Pdf

Van Alten, D. C. D., Phielix, C., Janssen, J., & Kester, L. (2020). Self-Regulated Learning Support In Flipped Learning Videos Enhances Learning Outcomes. *Computers And Education*, *158*, 1–16. Https://Doi.Org/10.1016/J.Compedu.2020.104000

Wheeler, S. (2012). E-Learning And Digital Learning. In N. M. Seel (Ed.), *Encyclopedia Of The Sciences Of Learning* (Pp. 1109–1111). Boston: Springer. Https://Doi.Org/10.1007/978-1-4419-1428-6