Developing E-Learning Based Remedial Videos to Overcome Learning Loss in Trigonometry

Mailizar Mailizar[1*], Mifta Gebrina Cahya[1], and Mukhlis Hidayat[1,2]
[1]Department of Mathematics Education, Universitas Syiah Kuala, Banda Aceh, Indonesia
[2]The Research Center of Realistic Mathematics Education, Universitas Syiah Kuala, Banda Aceh, Indonesia
mailizar@usk.ac.id

Abstract. Mathematics learning in Indonesia is worrying because it results in learning problems called learning loss. To overcome such problem remedial learning is necessary. The current situation shows the remedial teaching implemented by teachers still uses the conventional method. Therefore e-learning based remedial learning is necessary. The material will be made into a short animation video which then will be uploaded to an e-learning. The aim of this study is to develop remedial videos on the topic of trigonometry which then will be shown to the students who require remedial learning. The method used in this study is research and development using the Plomp model which consists of three phase that are the preliminary research phase, the prototyping phase and the assessment phase. The Readability test includes eight students from one senior high school that are heterogeneously chosen according to the level learning achievement. The remedial videos were tested to students, teachers and a lecturer for the validity and readability. If the results are not readable and valid then the researcher will revise the videos. This study resulted in the video developed to be readable and valid.

Keywords: Remedial learning, E-learning, Learning loss.

1 Introduction

The methods used by teachers in Indonesia whilst teaching mathematics is very teacher centered and does not follow a well panned teaching program [1]. Because of Indonesia's problematic approach in teaching mathematics, students experience learning difficulties. One of the common learning difficulties students experience is a phenomenon called learning loss, an event when students forget learnt information and lose academic skills due to school closure or learning procedures that are not planned well [2]. The negative impact of learning loss was proven by a research conducted in 2022 which showed learning loss resulted in a decrease of student's numeric skills [3]. Besides that, school closure or other factors resulting in a flawed learning process and learning loss, the consequences are students will find it hard to find jobs in the market field and there will be a decrease in the quality of human resource hence increases poverty rate [4]. Learning loss happens more often in mathematics than in other subjects [5]. An observation done in 2022 showed that one

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of the complicated chapters according to students in mathematics is trigonometry [6]. The observation also found that students often experience learning loss whilst learning trigonometry. Remedial learning is one of the strategies that is proven effective to overcome learning loss. Remedial learning could be done in various forms such as group studies, peer teaching, private tutoring and by using electronic [7]. Remedial learning is an activity where teachers reteach students who were not able to achieve the minimal score required to pass an exam, quiz etc. [8]. Within the 2013 curriculum evaluation guide book of the Indonesian Education Ministry stated that remedial learning is conducted by teachers for students that are not able to reach the minimal score required at a school in hopes to pass on the next attempt.

Besides the advantages of remedial learning, it is important to consider that conventional remedial learning is not effective because it can take up time after school and increases teacher's work [9]. Hence teachers opt not to perform remedial learning despite the crucial benefits. Teachers and students can take advantage of the technology. One of the uses of technology in education is electronic learning or usually known as e-learning. E-learning has been used a lot by teachers for some time but has recently become a trend since the COVID-19 pandemic [10]. The common definition of e-learning is formal learning activity that could be done inside or outside of the classroom and uses electronic devices and the internet in the learning activity [11]. A study conducted in 2019 found that students who are exposed to an e-learning environment had better performance and attitude towards learning [12].

The use of e-learning in remedial is called an e-learning based remedial. An e-learning based remedial could simplify teacher's work and time as it could be done anywhere and anytime and it also increases student's motivation to study [13]. Some of the electronic medias that can be used in an e-learning based remedial are study applications, website, and online conference videos [14]. E-learning based remedial has been widely developed in countries such as Europe and Taiwan [15]. Therefore, the researcher believes it is necessary to develop remedial learning materials in a form of short videos, then to be uploaded to an e-learning. Based on the explanation mentioned earlier, the formulation of the problem in this study is "How is the validity and readability of the developed e-learning base remedial videos to overcome learning loss in trigonometry".

2 Method

This study uses Research & Development (R&D) method, using the Plomp 2013 model. There are three stages of the Plomp model, a preliminary research, the prototyping stage, and the assessment stage [16]. The preliminary research phase is conducted to inform the researcher about the problems and identify the solution. The next phase is the prototyping phase, which the development of the product is carried out. It is important to take note before proceeding to the last phase, evaluation of the developed product must be done to inform the researcher of the flaws in the products. The evaluation process must be measurable. The instrument used for the evaluation process is a validation sheet which consists of questions relating to the video adapted from the principles and guidelines for maximizing student learning from video content. The questions for the readability are also adapted from the same reference as

the questions for the validation sheet. The scores given to the validation sheet references the score criteria which was already developed by previous researcher [17]. There are two validators which consists of media expert, material expert and practitioner. Media and material expert are a lecturer of Syiah Kuala University meanwhile the practitioner is a teacher from one of the high schools in Banda Aceh. The validation sheet that is given to the validators as presented in Table 1.

Table 1. Validation sheet

No	Aspects	Indicators	Question Numbers
1	Video content	1. Video is in accordance towards the studied material. 2. Questions are integrated in the video. 3. Questions that guides students are used.	1,2,3
2	Video appearance	1. Important keywords for important parts are used. 2. Color or contrast to emphasize relations between information are used. 3. A brief explanation about the purpose and context of video is included. 4. Music is avoided. 5. Complex background is avoided. 6. Uses animation. 7. Video is made according to the topics (the duration for one video is not more than 6 minutes). 8. The video engages students by using the word “you”. 9. Speaking rates in the 185-254 words per minute range 10. The expression of the narrator’s voice shows enthusiasm. 11. Size of font is in accordance for students. 12. The texts in the video are clear and obvious. 13. The texts layout is clear and obvious.	4,5,6,7,8,9, 10,11,12,1 3,14,15,16, 17

The score criteria for the validation sheet are presented in Table 2 which was referenced form previous researcher on a previous similar study [18].

Table 2. Score criteria

Score	Criteria
4	Excellent
3	Good
2	Satisfactory
1	Unsatisfactory

The data obtained from the validation sheet which are the scores given by the validator will then be analysed using descriptive statistics by the formula referenced by previous researcher from similar previous study [18] which are given below.

$$\text{Percentage } (\%) = \frac{sum\ of\ the\ score\ given}{sum\ of\ the\ criterium\ score} \times 100\% \quad (1)$$

The average percentage score from the validators will then be converted using the validity criteria [19] that are presented in Table 3.

Table 3. Validity criteria

No	Score Interval (%)	Criteria
1	81-100	Strongly Valid
2	61-80	Valid
3	41-60	Neutral
4	21-40	Not valid
5	0-20	Strongly not Valid

The last phase is the assessment phase where the developed product will be tested towards the students. The purpose for this is to inform the researcher about the practicality and the affectivity of the product. To achieve such information the students are interviewed. There are total of 8 students which were chosen heterogeneously based on the level of academic achievement which are high, medium and low and are all in the same grade which are twelfth graders and the same class. The interview questions are presented in Table 4.

Table 4. Interview question

No	Questions
1.	Are materials in the video corresponds the materials you have studied?
2.	Does the video files interactive questions?
3.	Are the questions filed helps you to understand the materials?
4.	Does the video files important key word that you find important?
5.	Did the colors and contrast used in the video helped you understand the information given?
6.	Did the video include a brief explanation of the purpose and the context of the video?
7.	Is the background used interesting?
8.	Is the animation used interesting and did it help you understand the materials?
9.	Do you think the duration of the video is fast, medium or slow?
10.	Do you feel included by the video?
11.	Is the articulation of the video fast, medium or slow and is it heard clearly?
12.	Is the narrator's voice shows enthusiasm?
13.	Are the font sizes small, medium or big and is it clearly seen?
14.	Are the texts in the video could be seen clearly?
15.	Are the layouts of the texts suitable?
16.	Are the pictures and the appearance of the video in good quality?

3 Results and Discussion

The development of e-learning based remedial videos in trigonometry aims to overcome student's learning loss. The videos developed in this study are short videos with the duration of maximum of 4 minutes for different topics. After developing the remedial learning videos. The videos were validated by experts. The result of the validation of the developed remedial learning videos by two experts are presented in Table 5 as follows.

Table 5. Results of validation of remedial videos

Validators	Validity percentage (%)		
	V1	*V2*	*V3*
Media expert 1	97, 05%	82, 35%	85 %
Media expert 2	85%	88%	85%
Average	91. 02%	85. 17%	85%
Validity criteria	Strongly Valid	Strongly Valid	Strongly Valid

Table 5 shows that both of the validators gave scores that resulted all three videos to be categorized as strongly valid. However, based on validation results by the two experts, there are several suggestions for improving the developed remedial learning videos in trigonometry to overcome student's learning loss. One of the experts suggested that the narrator should make the students feel engaged in the videos, this can be improved if the narrator uses different vocabularies that emphasizes engagement instead of always using the word students for engagement. The experts believe that the narrator should ask students interactive questions in the videos. Besides making students feel more engaged, interactive questions could also invites students to think whilst watching the videos. Besides validation data and suggestions from experts, the researcher also needs data from students. Data collected on students are done by conducting readability test. Readability test is conducted so the researcher is informed on whether the videos could be seen well and understood by the students. To conduct readability test students are divided into two groups, each group consists of 4 students. The students then watch the videos and interviewed after. The result of the interview for the readability test of the product are as followed in Table 6.

Table 6. Results of interview for readability test

No	Questions	Answer	
		Group 1	Group 2
1.	Is the video in accordance with the material being studied?	Yes, the material shown in the videos are all in accordance to the materials studied at school	The materials shown in the videos are in accordance to the material that have been studied.

2.	Are interactive questions posed in the video?	Yes they are asked in the videos however the amount of the questions are still too little.	There are interactive questions being asked in the videos however the amounts of questions are too little.
3.	Do the questions posed in the video help you understand the material??	The questions posed in the video helps me understand the materials better.	Yes, the questions asked helps a lot in understanding the materials. Besides that it also intrigues my thinking skills.
4.	Does the video contain keywords for the parts that you consider important??	Yes, there are a few keywords that highlight important parts of the videos but could have been more obvious	There are keywords that contains in the videos however it would have been nice if the keywords looked more obvious.
5.	Is the color or contrast used in the video suitable and helpful in understanding the provided information??	Yes the colors and contrast used in the video suitable however the colors could be changed so the writing could be seen clearly.	The colors and contrast used in the videos are suitable except for a few videos where the writing could not be seen clearly.
6.	Is the purpose and context of the video briefly explained?	Yes, in all the videos it is clear what the purpose of the videos are.	Yes, the videos states clearly what the purpose of the videos are.
7.	Is the background used interesting?	Yes, the color of the background is in accordance.	Yes, the background of the video is in accordance.
8.	Is the animation used interesting and helpful in understanding the material?	Yes, the animation used in the videos are interesting and even engaging.	Yes, the animation used in the videos are interesting.
9.	According to you, is the video duration fast/medium/slow?	The duration of the videos are medium and it is in accordance.	The duration of the videos are medium and it is in accordance.
10.	Do you feel engaged in the video?	Yes, I do feel engaged in the videos.	Yes, however it would have been better if the narrator uses other engagement words rather than just the word “you” or “students”.
11.	Is the articulation in the video fast/medium/slow, and does it sound clear?	The articulation of the video is medium and it is in accordance and the sound of the narrator is clear.	The articulation in the video is medium and the sounds are clear.
12.	Does the voice in the video sound cheerful?	Yes, the narrator’s voice sounds cheerful	Yes, the narrator’s voice sounds cheerful.
13.	Is the font size small/medium/large and clearly visible?	The font sizes are medium and clearly visible in all the videos.	Yes the font sizes are clearly visible and sized medium.

14.	Is the placement of text or writing appropriate?	Yes, the placement of text or writing is appropriate.	The placement of the text or writing is appropriate.
15.	Is the image and video display of good quality?	Yes, the pictures and the video displays are in good quality	The image and video displays are in good quality.

Based on the readability test it can be concluded that the videos developed are readable with a slight revision. This could be seen by the answers from the students. The students answer the question with the word yes or they agreed to the questions being asked [19]. However, many students gave suggestions for the videos to be revised. Some of the suggestions students gave were relating towards the audio. Students suggests the audio should sound clearer and the volume to be stabilized throughout the videos. Besides audio students also suggests the narrator should insert more keywords that highlights important parts in the videos and the keywords should be obvious. Concluding the data received both form the experts and students it can be concluded that the remedial learning videos developed considered to be valid [20]. It is also expected that the videos will help students overcome learning loss, but several things need to be revised. Among them are words the narrator used in the videos and the stability of the audio's volume.

4 Conclusion

Based on the results and discussion, the developed e-learning based remedial learning videos to overcome learning loss in trigonometry is declared valid and readable with slight revision.

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