Senior high schools teachers and students’ needs for the e-learning in a remedial program of mathematics

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Abstract. Remedial is a program designed in line with students’ need that aims to improve their understanding of a topic before the student move forward to learn the next following topic. The implementation of remedial in Indonesia, particularly in Aceh, does not meet the requirement, because most of the teachers conduct a remedial by repeating the test or giving additional assignment. This study aims to design and develop an e-learning based remedial program to improve remedial in teaching and learning upper secondary schools mathematics. This study is developmental research employing System Development Life Cycle (SDLC) model. The model has five stages of development that are—planning phase, analysis phase, design phase, implementation phase and support phase. It is important to note that this paper reports results of planning phase, analysis phase, and a preliminary part of design phase. The result from planning phase revealed problems regarding to the implementation of remedial programs in schools. In the analysis phase, the results showed that, in delivering a remedial program, most of teachers gave the same questions as they provided for examination without any extra lesson or tutorial for the students. In addition, there was no teacher who used e-learning for the remedial.

1. Introduction
Remedial is a teaching and learning activity designed by teachers for students who achieve a low learning outcomes. It is learning strategies that can be used to achieve learning goal [1] and it is based on students’ needs and abilities. This is reinforced by objective of remedial implementation that is to improve students’ understanding of a topic before they continue to the next topic [2]. According to National Association of EMS Educators, there are three process in planning the implementation of remedial namely identifying problems faced by students, retraining students and reevaluating students.

Implementation of Remedial in Indonesia is based on regulation of the minister of education in 2016 about the standard process stated that is a remedial is not repeat a test but rather a process of re-learning that is required if the students still have not mastered the subject that have been taught by a teacher. According to the regulation, activities that can help teachers to implement remedial as quipper, staff room, home work. These activities can be implemented by the use of e-learning.

E-learning becomes a new trend in learning of mathematics. This is in line with education ministry regulations that require learning process can take place after school hours. E-learning aims to enhance the learning process and become a solution to improve students’ learning experience [3]. E-learning has a potential to transform and transfer learning for all high school students [4]. Moreover, it has a system that allows user to teachers learning materials simultaneously, control learning process and organize interaction between learners [5, 6, 7, 8, 9].
The development of remedial programs using e-learning for learning mathematics has been developed in Europe and Taiwan. Math-Bride and GPAM-Wata are example of e-learning based remedial programs. Math-Bridge was developed and being used for remedial of mathematics in several universities in Europe, while GPAM-Wata was developed for elementary school children in Taiwan [10]. Both these studies showed that e-learning based remedial can help the learners to relearn a topic that is still not understood after school hours. This is reinforced by the statement [11] says that in order to improve the success rate of education, remedial courses online can offer a solution to the problem (lack of) knowledge beforehand. Remedial using e-learning has several advantages more effective than traditional remedial [12]. Previous studies showed positive impact of implementation e-learning based remedial in learning mathematics. The advantages are: (i) following the remedial program with the time and place are not limited to [11], (ii) to help learners to find solutions [13], (iii) enhance students’ understanding of a material [2], (iv) help to increase confidence and motivation of learners [14], (v) diagnose weaknesses and difficulties of students in a personal way [15], and improve students’ learning outcomes [16].

Based on the explanation of the problem, researchers want to develop an e-learning based remedial program for teaching high school mathematics. Because, high schools students can manage their own learning[4]. In this paper, the authors present the results of the senior high school teachers and students’ needs for the remedial program using e-learning in learning mathematics in Banda Aceh.

2. Methods
This is Research and Development (R&D) project that employ System Development Life Cycle (SDLC) model [17]. SDLC is a process of building, deploying, using and updating information or an application system information developed by a programmer. The approach contained waterfall models that assume that every stage of a project can be undertaken and completed entirely in order. There are several phases in waterfall models, the Project Planning Phase, Analysis Phase, Design Phase, Implementation Phase and Support Phase. Each phase can be seen in Figure 1. Figure 1 describes waterfall SDLC models approach that consists of planning, analysis, design, implementation and support. Table 1 provide brief explanation of each phase of the model.

![Figure 1. The waterfall models of the SDLC](image-url)
Table 1. Explanation of each phase.

| SDLC Phase       | Objective                                                                                                                                 |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Planning Phase   | The planning stage is a stage that is most important to identify the scope of the new system, the product can be ensured decent, and allocate time, planning resources and costs required to set up the product. |
| Analysis Phase   | The analysis phase is the phase with the aim to understand and document the business requirements and the terms of the process of the new system. |
| Design Phase     | Stage design is to design a system solution based on the conditions set in the analysis and decision making.                               |
| Implementation   | Implementation stage is the stage to build, test, and apply a reliable information system with an expert user who is ready for the benefit as expected from the use of such systems. |
| Support Phase    | Support stage is a stage to help ensure a productive system during the lifetime of the system that has been set.                         |

Planning phase was conducted in order to investigate issues related to the implementation of remedial according to the theory and the reality in schools. Analysis phase was carried out to analyze the remedial that have been implemented in schools and students and teachers need about remedial program. The design phase aims to design the prototype of e-learning based remedial programs. We designed an e-learning based remedial program using Moodle 3.8.

In design and analysis phases, we have collected data from three schools in Banda Aceh. We classified schools into three levels that are low, medium and high level schools based on students’ national examination scores. We randomly selected one school form each level, therefore three schools were selected. Researchers distribute a questionnaire containing questions descriptive and has been validated and conducted interviews to the head of curriculum, teacher of mathematics and head laps and randomly select two students in each school. Once the data is collected, researchers analyze all the answers contained in the questionnaires and interviews. Then the researchers will make a preliminary design remedial programs that fit those needs. Here is a chart of the procedure of research conducted by researchers based on SDLC. Figure 2 shows research procedure of SDLC approach. As mentioned earlier. Green boxes indicates the project phases reporting in this paper.

![Figure 2. Procedure SDLC research based approach](image-url)
3. Result and Discussion

3.1. Planning phase
In this phase, we explored issues on the implementation of remedial in secondary schools in Banda Aceh. The result show that the implementation of remedial in learning mathematics at secondary schools in Banda Aceh did not meet the ministry requirement. Also the implementation did not satisfy the current curriculum. According to literature, the implementation of remedial would be better if it is integrated with the use of learning technology. Therefore, we developed an e-learning platform to enhance the implementation of remedial program in learning mathematics.

3.2. Analysis phase
In this phase, we collected data from school vice principle, head of laboratory, mathematics teacher and students. The results are provided in Table 2.

| Vice principle, Head of Lab, and Mathematics Teacher | Student |
|-----------------------------------------------------|----------|
| • Learning mathematics didn’t use e-learning.       | • Remedial programs are by working on the same questions and without integration of ICT. |
| • Remedial programs are carried out without the integration of ICT. | • Schools have carried out national exam using computer |
| • Remedial programs do not meet the curriculum requirement since the limited time. | • Students strongly agree with the implementation of e-learning based remedial programs in mathematics learning. |
| • Schools have carried out national exam using computer |          |
| • Teachers strongly agree with the implementation of e-learning based remedial programs in mathematics learning |          |

The result from questionnaires and interviews showed that all the mathematics teachers did not use e-learning in teaching of mathematics. We also found different opinions between teachers and students. Some teachers said remedial programs implemented according to the curriculum. On the other hand, students revealed that the implementation of remedial programs do not satisfy the curriculum requirements.

3.3. Design phase
In the design phase, we designed an e-learning based remedial program using Moodle 3.8 platform. We design a new plugin for remedial and will embedded into Moodle 3.8. The plugin is available in Moodle itself. Therefore, we develop a plugin for Moodle. Figure 3 shows the first question on remedial programs. The student will choose the options of the multiple choice questions. If the answers is wrong, the students will be directed to review page where the can learn topic related to the question (see as Figure 4). Students are given the opportunity to read and relearn material relate the question. After they learn the topic, students are allowed to come back to the question page in order to retake the test (see Figure 5). If the student choose a correct answer, they are allowed to continue the next question. After all the questions are answered correctly, then the students will get the final score. Finally, on the assessment result page, students will be able to see amount of time needed to complete the remedial and the number of times repeated on each question (see as Figure 6).
4. Conclusion
Based on data from the first three phases of the SDLC model, we conclude that, in Banda Aceh, the implementation of remedial has not met the curriculum requirement. Furthermore, the finding revealed that technology has not been integrated in implementing remedial. Teachers and students strongly agree with e-learning based remedial program. Therefore, in the next phase of the project, we will develop an e-learning based remedial program for teaching of mathematics using Moodle 3.8.

5. References
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