Develop learning methods IMR (integrated material realistic) alternative mathematics learning during a pandemic

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Abstract. The learning methods used by teachers in schools in Serang City are very ineffective, especially during the pandemic. This is because not integrated content of material in one subject with other subjects. Never mind between subjects, sometimes the material is not well integrated. The purpose of this study is to provide an alternative learning method during a pandemic, namely a method that integrates material with the realities of life which is abbreviated as IMR (Integrated Realistic Material). The method in this research is Research and Development (RnD) with the ADDIE model. In making this learning method according to the stages from the ADDIE study. The results of this study are in the form of learning methods that are integrated with the realities of life during the pandemic.

1. Introduction
The world is experiencing rapid changes in the field of knowledge. With dramatic scientific and technological advances, such as the emergence of big data, machine learning, and artificial intelligence, many unskilled jobs around the world can be taken over by machines, while the need for skilled labor, especially those involving mathematics, computer science, and Science data, in conjunction with multidisciplinary skills across the sciences, social sciences and humanities, will be increasingly in demand. With climate change, increasing pollution, and depleting natural resources, there will be considerable changes in the way we meet the world's energy, water, food and sanitation needs, once again generating the need for a new skilled workforce, especially in the fields of biology, chemistry, physics, agriculture, climate science, and social science.

The rise of epidemics and pandemics that continue to increase will also require collaborative research in infectious disease management and vaccine development and the resulting social problems heighten the need for multidisciplinary and integrated learning. There will be an increasing demand for integrating material in every subject, one of which is mathematics. Because if the material in mathematics is only limited to theory, then negative views on mathematics will continue to exist.

range of conflicts has resulted, from a lack of clarity in curriculum design to real tension among teachers [1]

The Covid-19 pandemic is indeed a world problem today. The pandemic has affected many core sectors including the education sector. Students cannot go to school to learn and have to do social distancing by staying at home. What the government has done so that students can still study at home is by developing distance learning methods. In this study, we will find out more about the design of how students learn mathematics at home and their learning attitudes towards learning activities. This
study will use a development research method. The first and fundamental thing is that the researcher conducts a needs analysis. Researchers also conducted interviews with parents and students to find out problems in learning activities experienced during the Covid-19 pandemic. The results of this study will indicate that an integrated learning method with realistic mathematics material (daily life problems) is needed. This learning condition can potentially make student be more active and self-confident when learning a certain topic [2].

The development of this learning method derived from activity theory has been widely used as a theoretical framework to explore real-world problems that connect the workplace / daily life with mathematics education. Activity theory aims to describe all activities or work systems (including work tasks, organizations, etc.) embedded in the community. In addition, Distance Education Technology (DE) was introduced at Ternopil National Medica University (TNMU) in 2006. In that same year the Moodle Learning Management System (LMS) was introduced to evaluate the results of students' self-preparation for practical classes. Assessments were made using Moodle's "quiz" activity only [3].

The use of the Moodle LMS has continued to develop over the following years [4-8]. Finally, at the end of 2019, all training materials from all TNMU courses were fully presented at Moodle in a variety of training activity formats ("workshops", "assignments"), or as Moodle resources ("files" and "folders", usually filled with a pdf document) or even as an external link (link to the video lecture on Youtube).

If abroad, distance learning already uses LMS, distance learning in Indonesia only utilizes the WhatsApp Group where each student is asked to do the assignment given by the teacher. So this will make the educational process not going well. Because students only get subject matter but don't get education. Therefore, it is necessary to develop learning methods that are able to bridge virtual meetings with real meetings. This paper aims to develop an integrated mathematics learning method between realistic material or in accordance with the conditions of everyday life during the Covid-19 pandemic.

2. Methods
This research is a research on the development of learning tools carried out using the ADDIE design research. According to Richey & Klein, there are five (5) stages in this model, namely the analysis stage, the design stage, the development stage, the implementation stage and the evaluation stage [8]. This model was chosen based on a research development approach by solving problems that arise from an early stage. The procedural flow of the ADDIE design development stages can be seen in the figure below.

![ADDIE Model Process](image)

Figure 1. Stages of the ADDIE Model Process.

3. Results and Discussion

3.1. Analysis
The design analysis phase focuses on the need for learning that can be accepted by students in the pandemic period and identifies the learning objectives of each of the mathematics materials in the primary school mathematics curriculum. Because one of the goals underlying the design is to create learning methods that are more consistent and effective during the pandemic. Existing learning objectives are developed from the existing primary school curriculum. Student difficulties were identified through the analysis of the provided initial ability tests. Then the learning objectives are arranged by paying attention to the order and structure of the existing subject matter. After the
learning objectives are made, it is continued by identifying the learning objectives that are the most difficult for students to solve. Then analyze students' attitudes towards mathematics taught through online classes. This is very important because at the design stage attitudes can help inform online and in-person activities that will be created.

3.2. Design
The initial design process is carried out by analyzing the needs required by the teacher when teaching from home. Convey the concept of material suitable for students and create a study appropriate to the pandemic. The design stage is the stage of designing a product, designs are made for the content and flow of the program [9]. The results show that the school is requires a learning method that is able to make students enthusiastic about learning so that the material presented can be received well. In addition, the material provided would be better if it was based on local wisdom which turned out to be positively perceived and contributed to increasing perceptions about the importance of education in small islands [10]. Furthermore, the learning material is made according to students and the realities of life. The purpose of a good design is to adjust the emotions between students' emotions existing theories to improve learning outcomes.

At this stage, it explains the overall appearance of the design, structure, teaching approach, types of media and technology to be used, content and script/storyboard. This phase is very important for planning strategies in developing teaching and outlining how to achieve teaching goals. The purpose of the activity at this stage is to make a prototype of teaching materials. Although a lot is produced at the defining stage, the results are seen as an initial version of the teaching material that must be carried out before becoming an effective final version. Feedback is obtained through formative evaluation and is used to revise teaching materials [11]. Apart from learning notes, the design of activities, training and quizzes/tests should also be developed. The development should be appropriate and check the means or methods of conveying information in the software to make it more user friendly. Among the things that need to be emphasized at this design stage is the design of the learning method that will be developed.

3.3. Development
The purpose of the activity at this stage is to modify the prototype of teaching materials. Although much has been produced at the defining stage, the results are seen as preliminary versions of instructional materials that must be modified before they become final, effective versions. Feedback is obtained through formative evaluation and is used to revise teaching materials. Techniques for obtaining suggestions for improving teaching materials (materials) or instructional materials. A number of experts were asked to evaluate the instructional material and from a technical point of view. Based on feedback, materials are modified to make them more adequate, effective, usable, and technically of high quality.

3.4. Implementation
The implementation of this research was carried out in a primary school in the middle of Serang City. The implementation is carried out in class V. The number of grade V students is 40 students but the data entered was 33 students, because 7 students were not willing and some did not collect. Selection of classes based on input from teachers in related schools suitability of research with students. At the implementation stage the school is divided into several stages, namely the division of learning groups material, providing material in virtual classrooms, and the use of learning materials by teachers to students other than in a virtual classroom. The distribution of learning material is carried out by the teacher to all class members. After all students get integrated reality learning material. Providing material in virtual classrooms so that learning takes place interactively, then what is given is the basic concept and students are asked to express their opinion about the concept of material conveyed in the reality of life, so that students can issue ideas and be able to communicate to express their opinions. In addition, when they have finished providing concepts and communication, students are given examples of questions that help in learning. During implementation in a virtual classroom, the teacher must be able to explore and provoke curiosity about what concepts students already have. This is to see how it affects learning outcomes. Use Learning materials that are integrated with other materials are carried out by all students, they are asked to have their opinions and express ideas.
3.5. Evaluation

Evaluation was carried out from the beginning of the study to the final study. Evaluation is carried out in relation to the research process and related learning materials. Evaluation of the research process is carried out through discussion of the research process with research experts from universities. Evaluation of learning materials is carried out from learning materials and interactive learning materials that are being developed. In addition to material evaluation and interactive evaluation, it is carried out in the language used to make it suitable with Indonesian which is good and correct and suitable for students.

Evaluation was carried out from the beginning of the study to the final study. Evaluation is conducted related to the research process and related learning material. Evaluation of the research process conducted through discussion of the research process with research experts from the University of Mathematics Education. Evaluation of learning materials is carried out from learning materials and learning methods that are being developed. Apart from evaluating the material, evaluation is also carried out in the language used so that it is in accordance with Indonesian that is good and correct and appropriate with the development of the student's age.

There are several things that can be found in the process of this needs analysis, including the informal email conversations with colleagues around the world (including China and Italy) showing many challenges and concerns related to life and education. Most of the challenges are transdisciplinary, but some have unique characteristics for learning mathematics. There was research on pre-pandemic mathematics learning through non-traditional media, but we hope the consequences of this pandemic will inspire more such research. Much of our conversation lately turns to deep reflection in an effort to remain calm and clear-headed. In this editorial, we summarize some of the experiences that people have shared with us, hoping that the right study will help people formulate lessons for today and tomorrow. It is very challenging at a time when change is so fast. As educators and researchers, we find ourselves in the tensions eloquently formulated by Søren Kierkegaard [13].

The shift in learning paradigm from offline (face-to-face) to online platforms, from the point of view of the activist, is not about adapting face-to-face pedagogical strategies by simply following a defined curriculum towards some optimal goal through prescriptive logic; It means, "what is not allowed is prohibited". It is, more precisely, about finding other pedagogical strategies while maintaining the viability of the mathematics education system and moving towards the logic of prohibition - "what is not forbidden is allowed". Understanding that what is not prohibited is allowed opens up opportunities for reorganizing mathematics education. Online platforms encourage education stakeholders to reimagine the possibilities of teaching and learning mathematics and structuring the learning environment.

In development research, the development result can be in the form of a prototype model or learning device. To obtain quality development results an assessment is required. To determine the quality of the results of the development of models and learning tools, generally three criteria are needed: validity, practicality, and effectiveness. In the context of a pandemic, switching to online teaching practices needs to be done quickly with teachers who may have little experience with online teaching. Through a activism lens, a proper mathematics education system is redesigned. This indicates the need for further research to document and conceptualize this phenomenon. In addition, educational researchers need to rethink methodologies and theoretical frameworks to understand the realities of education that have emerged in the context of the COVID-19 pandemic.

This research is still in the form of an analysis which will later become a prototype of an appropriate learning method in learning mathematics during the COVID-19 pandemic. So that later we all have the right learning methods if the pandemic has not ended or later a pandemic that is more severe than today will occur.

Exploration of mathematics education during the COVID-19 pandemic highlights the importance of the right framework for studying the emerging realities of education. Educational researchers must heed this call to action while recognizing that such action is accompanied by challenges that require time, resources, and funds. The following research questions deserve further attention: What new possibilities (theoretical and pedagogical) emerge from online teaching and learning? What are the dynamics of the environment and the developing mathematics education community? How is the math community after COVID-19? By answering these questions, educational researchers will make practical and theoretical contributions to studying the mathematical environment and the community,
which develops together as members of this community. The co-evolution of educational researchers and the online mathematics education community is at the heart of a viable and sustainable mathematics education system.

Face-to-face communication is important for many colleagues, especially young undergraduates who want to make new friends and become acquainted with their fields. But senior colleagues, too, stressed how happy they were with emails from all over the world asking about their emails situation [14]. Fortunately, several successful conferences have continued via online platforms. Japanese educators have even managed to organize online conference dinners. Most educators recognize the value in students understanding and recognizing the connections between these disciplines in addition to the fundamental differences between them [15].

So, after this research at least will answer how to contribute to learning mathematics during this pandemic. So that the results of the analysis that have been obtained and then conveyed will be further material for the development of learning methods that are being developed, namely the integrated learning method for realistic mathematics material during the pandemic.

4. Conclusions
In carrying out development research, researchers need a research design. This research design can refer to or modify the development research model that has been developed and designed by educational experts. In order to obtain higher quality research results, in modifying the research design, the researcher should conduct a qualitative-descriptive analysis based on logical scientific arguments adapted to the characteristics of the research [16].

Research development (research and development) models or learning tools oriented to research products and using a prototype approach. To obtain a prototype of a quality learning device, a quality test is required. The prototype quality test can use the validity, practicality and effectiveness test. The criteria of each quality test can be determined by the researcher according to the characteristics of the research.

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