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Developing *Ancermat* (Anthology of Mathematics Story) Digital Learning Media to Improve Students' Problem-Solving Ability

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Abstract

The use of digital-based learning media is very necessary for teachers. The existing limited media becomes the main reason why *Ancermat* (anthology of mathematical stories) learning media is developed and expected to be able to improve elementary school students' problem solving skills. This study aims to describe the stages of the development of *Ancermat* learning media and find out whether it meets valid, practical criteria, and its effectiveness. The method used was the development research. The data analysis comprised of validity test analysis, practicality test analysis, and analysis of *Ancermat* media effectiveness using descriptive statistics and gain normalization test. The results showed that *Ancermat* learning media met the valid score of 4.53 with very high criteria and fulfilled the practicality test based on the students' responses reaching an average score of 4.41 with very good criteria. Based on the gain test, it reached 0.580 with moderate criteria and met the minimum criteria of mastery learning with t count = 27.33> t table = 2.042, meaning that the average score of the problem-solving skill tests met the minimum criteria of mastery learning. So, it can be concluded that the *Ancermat* learning media meets the criteria of being valid, practical, and effective in improving the mathematical problem solving abilities of elementary school students.

Keywords: *Ancermat, digital learning media, problem solving skills, elementary school students.*

Abstrak

Penggunaan media pembelajaran berbasis digital sangat diperlukan bagi para guru. Keterbatasan media yang ada menjadi alasan utama dikembangkannya media pembelajaran *Ancermat* (antologi cerita matematika) dan diharapkan dapat meningkatkan kemampuan pemecahan masalah siswa sekolah dasar. Penelitian ini bertujuan untuk mendeskripsikan tahapan pengembangan media pembelajaran *Ancermat* dan mengetahui apakah memenuhi kriteria valid, praktis, dan efektif. Metode yang digunakan adalah penelitian pengembangan. Analisis data meliputi analisis uji validitas, analisis uji kepraktisan, dan analisis efektivitas media *Ancermat* menggunakan statistik deskriptif dan uji normalisasi Gain. Hasil penelitian menunjukkan bahwa media pembelajaran *Ancermat* memenuhi skor valid sebesar 4,53 dengan kriteria sangat tinggi dan memenuhi uji kepraktisan berdasarkan respon siswa mencapai skor rata-rata 4,41 dengan kriteria sangat baik. Berdasarkan hasil uji n-gain mencapai 0,580 dengan kriteria sedang dan memenuhi kriteria ketuntasan minimal dengan t hitung = 27,33 > t tabel = 2,042, artinya skor rata-rata tes keterampilan pemecahan masalah matematika siswa memenuhi kriteria ketuntasan minimal. Sehingga dapat disimpulkan bahwa media pembelajaran *Ancermat* memenuhi kriteria valid, praktis, dan efektif meningkatkan kemampuan pemecahan masalah matematika siswa sekolah dasar.

Kata kunci: *Ancermat, media pembelajaran digital, keterampilan pemecahan masalah, siswa sekolah dasar.*

INTRODUCTION

The educational paradigm in the era of industrial revolution 4.0 has become the main topic to talk about in the field of education. As it is known that industrial revolution 4.0 is a trend in the industrial world, combining automation technology and cyber technology. The world changes as now entering the industrial revolution 4.0 era or the fourth world industrial revolution where information technology has become the basis in human life (Subekti, et.al, 2018). Obviously, the industrial revolution 4.0 has greatly affected the world of education. The utilization of information technology is needed to create creative, competitive, and innovative generations.

Monotonous learning activities are no longer happening in classrooms nowadays, neither teachers using out-fashioned teaching models, nor using non-IT-based- teaching media (Satriani 2016). If those do exist, it will make students tend to be bored in the classrooms, so in the end, the knowledge won't properly be received by the students (Zhen et al. 2020). Teachers as human resources playing main roles in learning and teaching activities. These are necessarily supposed to always keep updated with their knowledge and adjusted to the development of IT (Agyeiwaah et al. 2021).

One effort to do that, in the field of education, to adjust the Industrial Revolution 4.0 era is by utilizing IT advancement for learning (Shahroom & Hussin 2018). The fast development of softwares on the internet and smartphones doesn't guarantee that the utilization of IT is a

whole lot maximum in the education sector. Teachers still find themselves busy with teaching administrations and pay less attention to practical matters in learning and teaching. The effect of the industrial revolution is the use of the internet in various ways and is better known as the Internet of Things (IoT) (Oke & Fernandes 2020). Despite its gradual progress,the world of education will change into betterment, such as the early use of virtual learning and teaching (Sa'diyah & Marwing 2016). Thus, it can be said that the learning and teaching process assisted by the use of technology and information becomes the initial step in implementing today's learning.

A learning process by utilizing information technology has begun to be developed to provide many benefits as stated by Fitriyadi (2013) that the use of information and communication technology offers so many opportunities that it can lead to better and more interesting learning experiences. This will be a significant challenge to change what technology promises into reality in the learning and teaching process. In the school environment, teachers improve the quality of human resources through training and technical assistance related to learning innovations regarding technology and media use (Isrokatun, Yulianti, & Nurfitriyana 2021). So that the teaching and learning process is designed by technological developments, in the end, teachers can use it to make students feel enthusiastic in the learning activities.

Technological developments can also be seen from the existence of many applications which have been made. One of them is Ispring suite 8 application which can be utilized in learning and teaching process. It is integrated in Microsoft PowerPoint. This application has many features and is easy to operate. In making information technology-based media, you can use ispring suite 8 application. One of the features is making a book-shaped media with an attractive out-look. In order to provide input and to meet the needs related to the instructional media in education, *Ancermat* can be used as an alternative learning media can be selected since it is IT-based. *Ancermat* is presented with a variety of stories containing mathematical contents and developed along with ispring suite 8 app.

The ispring suite app in the learning process has been used before. Among of which is the creation of a media developed with ispring suite 7 app by Sasahan (2017) in developing interactive media for university students. Ispring suite as an integrated tool in Microsoft PowerPoint makes this application easy to use for beginners. After that, an experiment and certain data collection are carried out to analyze the student's mind. From this activity, the learning process of students runs very effectively and independently. As Wijaya, Sudjimat, and Nyoto (2016) stated that the formulation of hypothetical learning trajectory serves as a

guideline for the implementation of learning as well as an anticipatory action toward possible problems faced by students in the learning process. In the context of learning, the time is also considered as Jupriyanto et al. (2020) said that the learning is carried out for a long time for 7 hours a day according to the international education standards. Looking at the complexity of learning task, it is not surprising that excellent task planning and progress monitoring should be provided (Janssen et al. 2012).

In fact, many junior high school students fail to enroll in high school math and science classes. It's not concluded that they don't have abilities, they have negative dispositions or negative perceptions of mathematics (Kusmaryono et al. 2019). An appropriate learning model is needed for learning mathematics in elementary schools that emphasizes or encourages students to really understand the problems and know how to solve its problems well. The students realized that there is no reason to rely on friends when given assignments by the teacher (Ulia, Kusumadewi, & Islamiati, 2017). Facing such problems, a solution is needed in the use of innovative learning that is more fun and interesting. It will make students more active in learning activities so that they understand the basic concepts of mathematics (Ulia & Sari 2018). Problem-solving skill is one of the targets in the 21st Century education. In the learning process, students are not only supposed to receive knowledge but also in applying it for solving the problems. Based on sources from the Future of Jobs Report, the World Economic Forum, one of the ten soft skills required to face of the Industrial Revolution 4.0 is complex problem-solving. Problem-solving as the 21st-century learning framework, as stated by Wijaya, et. al (2016) that the 21st-century learning paradigm emphasizes critical thinking and problem-solving skills. Students should think critically, laterally, and systemically, in the context of problem-solving. So, it can be concluded that problem-solving becomes important in educational targets. Based on the background explained above, media adjusted with the development of information technology and with the latest learning innovations should be developed in improving students' problem-solving skills.

The Problem-based skill will train students' thinking skills. From this thinking, the process produces a solution using a certain strategy. As Arifuddin (2018) stated that problem-solving ability is an attempt to find a way out of a difficulty to achieve a goal that is not so easy to achieve immediately. Problem-solving skills are also based on a good understanding of concepts. Increasing the understanding of concepts can also improve problem-solving, one of the efforts to improve conceptual mathematics by developing learning media because it can stimulate student thought patterns through ideas from the conceptual material being studied (Walid et al. 2019). Learning media are very diverse, including those that are by technological

developments, both printed and non-printed. Technological advances used in learning media have a powerful potential in transforming learning (Kusumadewi, Neolaka, & Yasin 2020). The application of technology in the learning process has slowly begun to be applied in Indonesia. In line with the continued development of technology and the expansion of technological advances to the interior, although with the limitations, learning can be done through the computers and the internet (Arifin & Herman 2018). Learning media can increase the effectiveness of learning goals. The use of media can attract and motivate students in the learning activities. One of the media that teachers can use in learning is by using computer media in improving learning outcomes (Hakim & Windayana 2016). The development of science and technology leads to increasingly significant changes and towards a practical era. In the education sector, the development of information technology is being great. Exploring the management system as well as the learning system in the classroom, students will be more interested in using contemporary and familiar facilities with the students' daily situations (Putra, Wijayati, & Widhi, 2017).

In training the complex problem solving skills that accommodate various things such as human problem solving, expertise, decision making, and intelligence (Wüstenberg et al. 2012), as well as related problem solving skills which are closely related to critical thinking skills (Arifuddin, 2020) can utilize literacy-based learning media. As in this study, the *Ancermat* learning media was developed in the form of an anthology of mathematical stories that combines problem solving through literacy. Considering that literacy culture must be immediately instilled in children because their passion of reading is greatly influenced during learning. If a child likes to read from an early age, it is believed that this hobby will carry over into adulthood (Ulia, Ismiyanti, & Setiana, 2019).

In contrast to the previous research on the development of learning media to improve problem solving skills in the form of comics (Gumilang, Wahyudi, & Indarini, 2019), games (Sejati & Koeswanti, 2020) and learning applications (Hodiyanto, Darma, & Putra, 2020), this study develops the learning media combines literacy and problem solving in the form of an anthology of digital-based math stories. Practicing problem solving through literacy with the development of digital technology is expected to be a valid, practical, and effective media innovation.

METHODS

The method used was Research and Development (R&D) with descriptive analysis, because this study developed a certain product and tested its effectiveness. The product mentioned was *Ancermat* learning media assisted with Ispring suite 8 application. In addition, a descriptive method was used to describe the results of data analysis, concluding the results and formulated in terms of suggestions or recommendations. The development of instructional media used a modified Plomp (1997) model that is, excluding the implementation of the stage after the test, evaluation, and revision stages completed. The activities carried out the development including the initial investigation stage. At this stage, the activities carried out were identifying, studying existing problems and reviewing the development of the *Ancermat* learning media assisted by the ispring suite 8 application. The next is the design stage, at this stage, the *Ancermat* learning media is developed with the application ispring suite 8 in improving the problem solving abilities of the elementary school students. In the realization (construction) stage, prototype 1 (initial) is produced as the realization of the results of the model design. The results of this activity are called learning media prototype 1 *Ancermat* learning media.

The last is the stage of test, evaluation, and revision. At this stage, validation and prototype 1 testing were carried out. The instrument type used in this stage was the validation sheet. In this activity, inputs from experts and practitioners were inserted in terms of the prototype 1 feasibility, which had previously been realized. Furthermore, an analysis of the validation result from the validators and the revision based on inputs and practicality and effectiveness tests were conducted.

This study was conducted in one of the elementary schools in Semarang City, Central Java, Indonesia. The instrument used in this study was problem-solving test questions in the form of essay, to find out the students' problem-solving skills. Besides, validation questionnaire on learning media was occupied to determine the validity of the *Ancermat* learning media by expert validators. Students' response questionnaires were also used to determine the students' responses after the implementation of learning process using *Ancermat* learning media. Based on the results of expert validation and the limited scale trials, the teaching material developed was revised again and made the improvements according to suggestions and input (Ulia et al. 2020).

The data analysis was using descriptive statistical analysis comprising of counting the average, median, mode, variance and standard deviation. Furthermore, one-sample t-test was used to determine the students' learning achievement based on the result of problem-solving

tests. In the validity test, the validators gave an assessment result on the media. The validators' assessments were based on several categories according to the rubric of each indicator made by the researchers. The validation sheet contains the assessment data of each validator toward *Ancermat* learning media and then analyzed based on the average scores. The average scores of each validation were calculated by counting the average scores by adding up the validator scores in each aspect divided by the number of aspects of the assessment. A description of the average scores from the media assessment used on a five scale includes: 1.0 ≤ average <1.8 means 'bad', 1.8 ≤ average <2.6 means 'poor', 2.6 ≤ average <3.4 means 'fair', 3.4 ≤ average <4.2 means 'good', 4.2 ≤ average ≤ 5, means 'very good'. The Criteria in the validity test are that learning media was said to be valid if the average scores of each validator was in category 'good' or 'very good'.

In the practical analysis, the students' response questionnaire data were analyzed by finding the average scores of students' choice by following under the statement given. Students' response criteria were analyzed based on the average students' choice on the questionnaire sheets with each statement given a choice of scores 1, 2, 3, 4 or 5. The media was said to be practical if the teachers' responses were in 'good' or 'very good' category and the students' responses were also in 'good' or 'very good' category.

The Analysis of the students' problem-solving improvement was calculated using the normalized gain test. The magnitude of the improvement of pre and post learning was measured by referring to the normalized gain category (g) including $-1.00 \leq g < 0.00$ which interpreted decreasing, $g = 0.00$ interpreted no development, $0.00 < g < 0.30$ interpreted low, $0.30 \leq g < 0.70$ interpreted Moderate, $0.70 \leq g \leq 1.00$ interpreted high (Sundayana, 2016)

RESULTS AND DISCUSSION

In the initial investigation stage, observation and interviews related to the students' problem-solving skills and mathematics learning in grade V was conducted. From the result of the initial investigation, it was obtained information that the mathematics learning process in the elementary school has so far never made use of technology. There haven't been many innovations in the form of learning media used by teachers. They have only made use of the PowerPoint app. Also, the students' problem-solving skills were still low, this was based on the observation previously conducted when they were asked to work on the essay or stories related to problem-solving. They were still complaining, asking for the teacher's guidance, finding it difficult to finish, and eventually, the scores of problem-solving did not reach the minimum completeness criteria. The result of initial investigation was used as a background

for the development of *Ancermat* learning media to improve the students' problem-solving skills.

At the design stage, *Ancermat* learning media in terms of algorithm was made, assisted with ispring suite 8 app. This was aimed to improve the students' problem-solving skills. The app used was the combination of several programs, such as PowerPoint, Ms Word, Visual Basic and Ispring Suite 8. The application design was interestingly made by putting the instruments inside. The design of *Ancermat* learning media was done through several stages, such as making algorithms, determining patterns and designs, preparing mathematical stories, and uploading mathematical stories, and combining stories in an application.

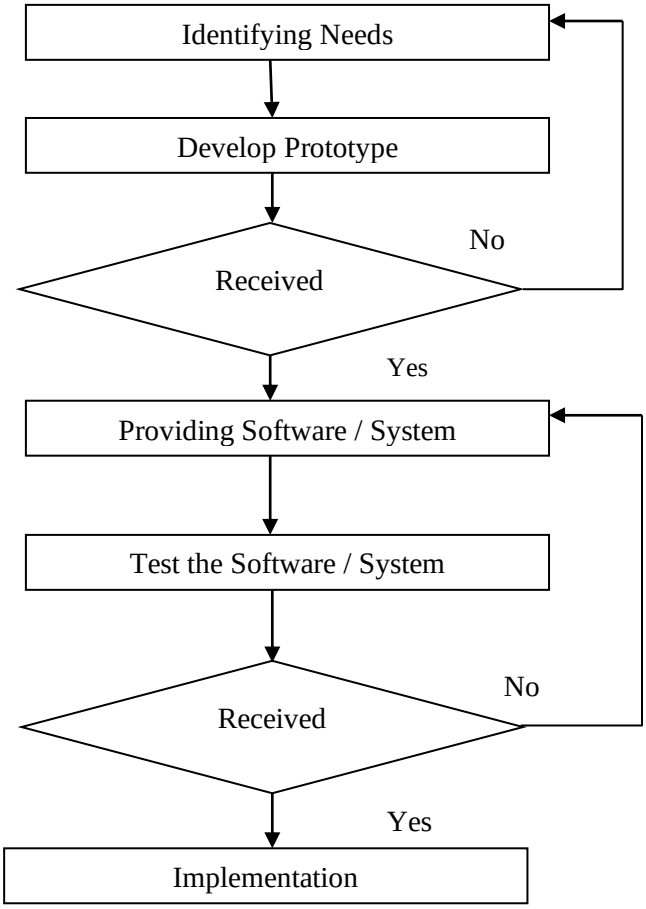


Figure 1. Algorithm for media development

Next, prototype 1 was produced as a realization of the design result of the model. The result of this activity is called prototype 1 of *Ancermat* learning media. The result of the design of *Ancermat* learning media was in the form of drafts which needed to be re-checked whether the media was by following under the concept given or not. From the result of prototype 1 which has been revised based on the inputs of the validators, it is called *Ancermat* learning media.

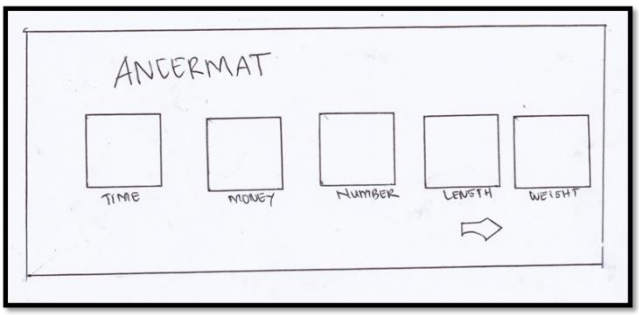


Figure 2. The design of *Ancermat* prototype

Indeed, the initial design required inputs from the validators. At this stage, the researchers provided inputs related to design and application contents which were synchronized with the learning process.

Next, evaluation and revision are repetitive processes related to the improvement of the product being developed. This test is called the expert validation test. The experts appointed were 2 class teachers and 3 lecturers of the elementary school education department. Whereas, the experts' validation related to the application resulted in a score of 4.51 with 'very good' criteria. At this stage, there was also a revision process before the valid criteria were obtained. The recapitulation of the revised prototype draft is as follows.

Table 1. The Results of the Experts' Validation Revision

No.	Validators' Inputs	Revision
1	The writing on the app still looks small and unclear.	Azoom icon facility should be given on the app to magnify the screen.
2	The color used is too striking.	The colors in the design are made softer.
3	There is only 1 musical instrument that looks monotonous.	There should be additional music instruments on the app.
4	The story given is too long for children.	The story should be shortened but does not change the content.
5	the connection with the hypothetical Learning Trajectory (HLT) Model has not concretely been seen	It will be developed during the learning process in the implementation of the Hypothetical Learning Trajectory (HLT) Model.

After doing revisions based on the inputs from the validators, the researchers proceeded to the practicality and effectiveness stages of the *Ancermat* learning media.

The stages of the *Ancermat* learning media development are initial investigation, designing, construction, evaluation and revision. As explained earlier, each stage has a process with certain procedures. The *Ancermat* learning media here is created by using Isping

suite 8 app supported by the Microsoft PowerPoint app. On the application, there are stories containing mathematical calculations. From the results of the application in mathematics learning in grade V of elementary schools, any learning model can be used. The *Ancermat* is an applicable learning media. Since this study applies the hypothetical learning trajectory (HLT) model, the learning steps used are by following under the stages of the learning model. The main elements in the HLT model are learning objectives, learning processes, and hypotheses. As Bakker (2004) defines that HLT consists of three components, namely 1) learning objectives that define goals, 2) learning activities, and 3) hypotheses of the learning process to predict how students' thoughts and understanding will develop in learning. The *Ancermat* learning media has five menus containing stories in accordance with the themes on the selected menu. The five menus are currency, weight, time, number and weight. The home page of the *Ancermat* can be seen as follows.

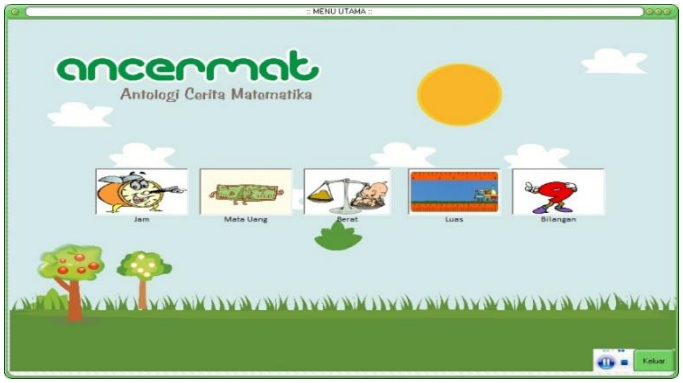


Figure 3: The home page of *Ancermat* display

The *Ancermat* app cover looks nice, funny, and interesting for elementary school students. The learning process using digital-based learning media makes them more motivated to learn. This is shown when they use the *Ancermat* app. They are very enthusiastic about learning mathematics. They are very interested in learning applications as a learning media which is appropriate to the present era, because children are very familiar with android and smartphone applications. In Indonesia, the increasingly developing technology needs to be directed to the education sector. The computer is now an important part of education as a study conducted by Wood and Howley (2012) in US schools shows that the use of computers for students will be more sophisticated and innovative in learning. The effect of technology media on social environment can be found everywhere, in today's world; the media has become a way of life, the media informs us, comforts us, and connects us to the world. The advent of technology into new media can potentially change education radically. Media technology is important to be understood by academics and practitioners as a good intention

that will affect student behavior. Thus, *Ancermat* as one of the technological products developed in the field of learning is expected to have a good effect on students.

At the stage of the *Ancermat* learning media development, there are tests, evaluations, and revisions. Validity and practicality tests are available at this stage after the construction stage. Validity test aims to determine whether the *Ancermat* learning media supported with ispring suite 8 app meets the valid criteria or not. To test the validity of the media, a validator is needed as a validation expert related to the content and construct of the media. The validation experts consist of 2 teachers and 3 lecturers. The aspects assessed on the validation sheet include aspects of format, language, content, conformity to the learning model, as well as the relationship of the material to the problem-solving variables. During validity testing, the researchers show that the *Ancermat* application assisted with ispring suite 8 app as an assessment material. From the result of the expert validation questionnaires, the following recapitulation is obtained.

The results of the expert validation test related to the *Ancermat* media format obtained an average score of 4.36 with very good criteria. The format assessed is related to application cover design, choice of music and instruments, font size and type, layout settings, spacing and images and visual appearance. While the validator's assessment of language on the *Ancermat* media obtained an average score of 4.46 with very good criteria. As for the language elements assessed on the structure of the language used, the suitability of sentences with the level of cognitive thinking, reading ability and age of students as well as instructions for using media is clear. on the validator's assessment of the content on the *Ancermat* media, an average score of 4.64 was obtained with very good criteria. In content assessment, it is related to the suitability of the media with the material, the suitability of the practice questions on the material, the suitability of the problem solving ability, the suitability of the learning objectives, and the learning process. From the summary of the expert validation results, an average result of 4.53 is obtained. Based on the criteria, it is in ‘very good’ category. Even so, the validators also provide criticism for the media improvements.

The researchers immediately respond to them with revisions so that they can be used for the next stages. After meeting the ‘valid’ criteria, then a practicality test can be carried out. The practicality test in this study is based on the student response questionnaires. From the results of the questionnaires, the average score is 4.41 with ‘very good’ criteria. So, it can be concluded that the students give good responses to the *Ancermat* learning media. From the average results, the highest scores are in the statements dealing with the *Ancermat’s* interesting design and its benefits in improving problem-solving skills, both in understanding

problems and even problem-solving itself. The students play an active role in learning. The use of IT-based media indeed gives its impression to students. As the research conducted by Hadi (2013) related to application based-learning, claiming that students can better understand the material and be more interested and favorable to learning by using three-dimensional models for the material enrichment. Learning media is also a helping tool in teaching and learning activities (Nugrahani, 2007). This tool can represent something that cannot be conveyed by teachers to the fullest, so that students' difficulties in learning can be overcome by using learning media.

Therefore, teachers should always use media, especially the ones interesting to students. Since by using media, the material presented will easily be understood and digested by students. Also, it becomes easy to convey the material. As Umiyati (2015) argues that teachers are required to be more creative and innovative in designing and using learning media in creating an active, creative, effective and fun learning atmosphere.

In this study, the *Ancermat* learning media assisted with Ispring suite 8 application is applied in grade V using hypothetical learning trajectory model. The stages of learning activities include an introduction which comprises of learning objectives delivery, core activities consisting of learning activities and hypotheses of the learning process and final activities. Before using the *Ancermat*, the students are given hypothetical learning trajectory learning. They are trained in how to construct hypotheses from an activity. Then they test the hypotheses which have been made with the ongoing learning process.

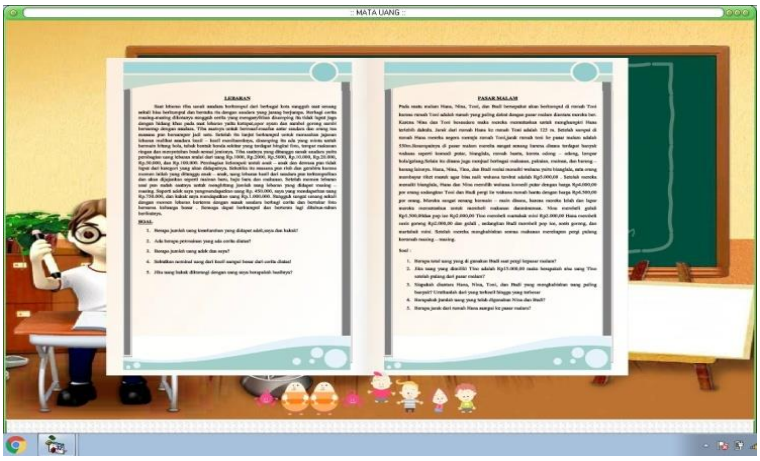


Figure 4. The *Ancermat* Media Display

In this activity, the use of *Ancermat* is as a medium for presenting problems. The *Ancermat* contains stories that comprise mathematical calculations. The delivery technique to students is by directing the questions first, the students then predict, and look at the readings in the *Ancermat* to check whether the prediction is right or wrong, and they can eventually

give their reasons. The problem-solving skills of elementary school students are initially still low as seen from the pre-test score given. The average score obtained has not reached the minimum criteria of mastery learning yet, which is 65, but the average score only reaches 60.33. More details can be seen in the following table.

Table 2. The Recapitulation of Problem-Solving Test Results

No.	Description	Pre-test	Post-test
1	Average	60.33	83.33
2	Median	60.00	83.5
3	Mode	60.00	80
4	Standard Deviation	5.4	3.7
5	Variant	29.5	14.00

After being analyzed, the students still cannot understand the problems, nor plan for a solution. They straightly go to problem-solving, but it's still incorrect. Some students can solve problems but are not careful enough. Some are still unable to re-check the results of problem-solving they find. Thus, based on the pre-test results, it is necessary to develop learning innovations in the form of learning media that can improve the students' problem-solving skills.

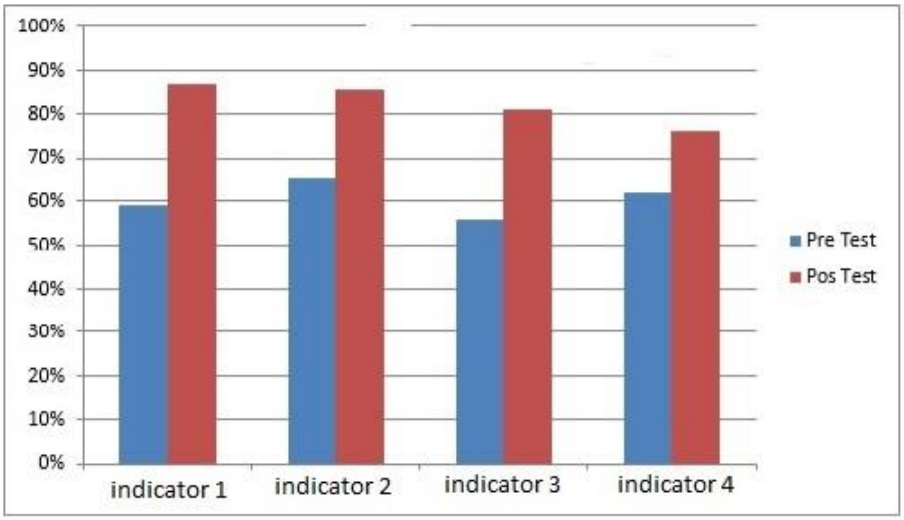
In the hypothetical learning trajectory model, there is a hypothetical learning flow which means a conjecture of a series of activities that children go through in solving a problem or understanding a concept. And, learning flow is a series of activities that are traversed by children in solving a problem or understanding a concept. During the implementation of hypothetical learning flow test, it may undergo several changes or improvements. The flow obtained is based on many revisions called ‘learning flow’. So, learning flow is the result of revisions of the hypothetical learning flows based on the events occurring during the learning process. This certainly affects the students' problem-solving skills. The indicators of students' problem-solving ability are as follows.

Table 3. The Indicators of The Problem-Solving Achievement

No.	Indicators	Pre-test	Post-test
1	Understanding the problem	59%	87%
2	Planning to problem-solving	65%	86%
3	Solving the problem	56%	81%
4	Re-checking the results of the solution	62%	76%

Changes in problem-solving skills between pre and post-learning processes using the *Ancermat* seem significant. The difference between the pre-test and post-test and the

achievement of each indicator is very clear. This increase possibly occurs because of digital-based learning media. The previous research has been carried out by Kalelioglu and Gülbahar (2014) who has taught computer programming to elementary school students because it is considered an important competency to develop problem-solving skills in addition to logical reasons. It turns out to be true, because students like studying and have their problem-solving skills trained and improved. The achievements of each indicator can be seen in the following figure.



Graph 1. The Achievement of the Problem Solving Students

The improvement in problem-solving skills is obtained from the data processing using n-gain. From the normalized gain test results, the class average obtained a gain value of 580 with moderate criteria.

Besides conducting the normalized gain test, analysis was also done using one-sample t-test from the data of students' problem-solving skills. One sample t-test was used to compare students' problem-solving skills with the minimum criteria of mastery learning of y 65. Based on the calculation of the data obtained t count = 27.33> t table = 2.042, thus H0 is rejected and H1 is accepted. So, it can be concluded that the average score of the students' problem-solving skills test more than 65 is correct.

Students are enthusiastic about learning, it can be seen when they are having a discussion, communicating, asking questions and so on. Their confident and independent attitude emerges. This is also because of the trajectory learning, which consists of learning activity components that on its application serve as a learning flow in problem-solving and is a process (Chen & Chuang, 2021). They don’t feel any fear of making a mistake, especially in operating the *Ancermat* app. This atmosphere is very influential on students' problem solving skills as stated in a research conducted by Parkinson and Creswell (2011) which concluded

that students with high levels of worry make problem-solving skills, self-confidence and perception lower. Therefore, it needs a learning atmosphere that makes students' self-confidence in solving problems increase so that their problem-solving skills also increase. From the discussion that has been presented, it can be stated that the *Ancermat* learning media meets the valid, practical and effective criteria to be applied to learning and therefore, it can improve the problem-solving ability of elementary school students.

CONCLUSION

The stages of developing *Ancermat* learning media consist of initial investigation, design, construction, evaluation and revision test. The *Ancermat* learning media has met the valid and practical criteria. The validity test obtained an average score with very good criteria so that it can be said to be valid. And also practically based on the student's response to achieve an average score with the criteria of very good. The *Ancermat* learning media can effectively improve the problem-solving abilities of elementary school students based on an increase with moderate criteria and the results of the problem-solving ability test have met the minimum criteria. The developed *Ancermat* learning media that combines literacy in the form of stories and problem solving can be an innovation in learning mathematics in elementary schools that is by following under technological developments in the digital era. Practicing problem solving through literacy activities packaged in the form of the *Ancermat* learning media which was developed with the development of digital technology can be a valid, practical, and effective media innovation.

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