



## Development of Computer-Aided Media Operating Materials Calculate Integers

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### Abstract

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This study aims to develop computer-assisted learning media for Integer Arithmetic operations for fourth grade students elementary education. The method used was the Luther-Sutopo version of the development method or better known as Research and Development (R&D). This study was limited to only 5 steps from stage 1 to stage 5, namely Concept, Design, Material Collecting, Assembly, and Testing (Validation, Revision, and Trial). Development of computer-assisted learning media on this Integer Arithmetic operation material in the form of instructional videos. After going through the process of testing media experts, material experts and the revision process and field testing in class IVa SD Negeri 2 Tomohon, the average learning outcome was 83.84. Achievement of average learning outcomes was in the category of excellent learning outcomes. Then the results of the attractiveness trial show the percentage of the mean value of the student's response is 91.35 with very attractive criteria. Thus it is concluded that the computer-assisted learning media on Integer Arithmetic operations are feasible.

**Keywords:** Computer assisted learning media, Integer arithmetic operations.

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## INTRODUCTION

Elementary school is the initial level of education for every child to get basic knowledge according to the concepts in each learning resource so that it is useful for facing the next level of education. To obtain a good understanding related to existing learning resources, learning activities are carried out. Learning is a process of interaction between students, teachers and learning resources in a particular learning environment (Uno, 2007). In every learning process, everything is done by teachers including pouring their creativity and innovation to make the right understanding for students. Likewise with learning Mathematics as one of the elementary subjects, in providing the basic concepts the teacher plays the role of doing the best for the success of learning. Moreover, Mathematics has an important role in meeting the needs of students' lives both now and in the future. However, often in learning Mathematics what the teacher explains is not well received by students, because Mathematics has become the subject they do not like the most. The reasons also vary, such as the delivery of lesson concepts that are not interesting, lessons that are too difficult because they contain letters and numbers, require full concentration in understanding them, and so on.

In the era of modernization like now, the rapid development of technology has a positive impact on all aspects, including in the world of education. Global demands

require the world of education to always and constantly adapt technological developments to efforts to improve the quality of education, especially in the learning process. In this case, the teacher uses technology as a learning medium to get students' interest in understanding the concept of the lesson given. Through digital media and various types of educational technology can support students with various learning abilities, providing more educational opportunities (Molnar, 2010). In line with that, Batubara, HH (2018) revealed that in order to support the use of information and communication technology in the classroom or school, it is necessary to do three things, namely: 1) there must be an access to digital technology and the internet both in the classroom, school, and teacher education institutions, 2) there must be quality, meaningful, and universally supported materials for students and teachers, and 3) teachers must have the knowledge and the skills to use digital tools and resources to help students achieve academic standards.

Learning media are everything that can be used to channel messages from sender to message recipient (Arief.S, 2008). The sender in this case refers to the teacher, the recipient refers to the student. According to Arsyad (2015), more specifically the notion of media in the teaching and learning process tends to be defined as graphic, photographic, or electronic tools for capturing, processing and rearranging visual and verbal information. The media is considered to have a positive influence on the success of learning. One of the right media to use today is learning media using Information and Communication Technology (ICT).

The previous development research that produces a product that is feasible and effective to be used as a learning medium includes; development of interactive learning multimedia (Putra, 2015), development of android-based educational game media (Defrianto, 2015), interactive multimedia adobe flash in interactive thematic learning (Prasetyo, 2016), development of letter sharing media (Afifah E. I, 2016), development of android-based learning media (Yektyastuti, 2016), development of learning tools characterized by active knowledge sharing (Rusnilawati, 2016), AB-MHPP learning multimedia in accounting learning (Sumarsih, 2016).

Based on previous research and development, this research develops ICT-based learning media which has its own advantages when compared to other learning media. Munir (2008) reveals the advantages of ICT-based learning media as follows: (1) Can provide a deeper understanding of the learning material being discussed; (2) Can explain learning material or objects that are abstract (not real) into concrete (real can be seen, felt or touched); (3) Attract and arouse students' attention, interest, motivation, activity, and creativity; (4) And can provoke student participation in the learning process and give a deep impression in the formation of student concepts.

One of the ICT learning media is computer-assisted learning media. Computer-assisted media can be classified into computer media and internet or online media. Computer media can be in the form of learning through the use of Microsoft Office (Word, Excel, Power point, and Access), learning through applications that exist in android mobile phones (mini computers) and so on. While online learning media can be in the form of interactive learning media, blogs, Edmodo-based media, YouTube, etc. Computer-assisted media can be very interesting media if they are packaged with the right teacher's creativity and innovation. Therefore, researchers are interested in conducting research on "Development of computer-assisted media for Integer arithmetic operations in fourth grade elementary school students."

## METHODS

The method used was the Luther - Sutopo version of the media product development method (Binanto, 2010) who had been modified in 6 stages, limited to the 5th stage. The simplification and limitation of the six steps to five steps were due to the factors of limited manpower, funds and time. The determined research objective was to increase students' understanding of the subject matter by using video facilities that were easy to understand. The subject matter taken in this study was the operation of counting Integers for fourth grade students at SD Negeri 2 Tomohon. The applications used by the researchers were Ms. PowerPoint and Wondershare Filmora as video editing applications and use Youtube and Google Drive as video menu displays. Data collection in the form of syllabus and lesson plans was based on the 2013 curriculum. The feasibility and attractiveness tests were carried out by material experts and media experts, which were then revised based on suggestions and input, then field tests were carried out in class IVa SD Negeri 2 Tomohon. The results of the trial using the media were obtained from the tests given at the end of the lesson to determine the learning outcomes, as well as to determine the level of success of learning using the media produced by researchers. Meanwhile, the results of the attractiveness trial of the computer-aided media produced were by looking at the data analysis of students' responses to this media. The following is a design of study for the development of the Luther – Sutopo version (Binanto, 2010), which can be seen in Figure 1.



Figure 1. Stages of Development of the Luther-Sutopo version

## RESULTS & DISCUSSION

### *Results*

The results of this study follow the stages of the Luther-Sutopo version of research (Binanto, 2010) including Concept, Design, Material Collecting, Assembly and Testing.

#### *1. Concept*

In this research, at the concept stage, a narration is made from the learning video product with learning materials in class IV about Counting Operations on Integers. The narration of this learning video is divided into two parts, namely the first lesson about addition and subtraction on Integers and the second about multiplication, division and mixed arithmetic operations on Integers. The narrative is explained in the form of a storyboard.

## 2. Design

In this design stage, research is given in the form of a sketch of the image and the finished video footage, accompanied by an explanation. This product design consists of the first learning video about addition and subtraction on Integers and the second learning video about multiplication, division and mixed arithmetic operations.

## 3. Material Collecting

The data collected is in accordance with the 2013 Curriculum, which is used by schools today, especially the school where the researchers conducted research, namely SD Negeri 2 Tomohon. The data collected is in the form of lesson plans and syllabus, while the material collected for this media is several images from the internet, the background used is free from copyright or commonly called No Copy Right Song, a headset for sound editing, a mic for recording sound, and examples examples of learning animation videos.

## 4. Assembly

The learning video product is produced based on the Integer Count Operation material in class IV. And the process of making it using the Ms. application. PowerPoint and Wondershare Filmora. Then the results can be seen in the Google Drive and Youtube applications.

## 5. Testing

The next step taken after the learning video has been completed is to conduct product testing, including: Design Validation, Product Revision, and Trial. In design validation, testing is carried out by material experts and media experts to assess whether the product development design can be said to be feasible for testing. From each assessment given by the experts, the media developed is said to be suitable for use as learning media after revision. The following are the results of the validation from the experts as shown in Table 1 and Table 2.

Table 1. Material Expert Validation Results

Score	Criteria	Description
3,62	Worthy	With revisions according to suggestions

Table 2. Media Expert Validation Results

Score	Criteria	Description
3,65	Worthy	With revisions according to suggestions

Based on table 1 and table 2, the score obtains from the validation of material experts and media experts. The score from the material expert is obtained at 3.62 in the criteria for use with revisions according to suggestions. The score from the media expert was 3.65 within the appropriate criteria with revisions according to suggestions. This means that the resulting learning video development product can be continued to the next stage.

The product development that has been validated by experts is then revised according to the suggestions so that it becomes a computer-aided media design in the form of a proper learning video, then used in the trial phase. The product trial is carried out by field testing the use of media in fourth grade students of SD Negeri 2 Tomohon. And the results as in table 3 are obtained from the tests given at the end of the lesson to determine the learning outcomes, and determine the level of success of learning using the media produced by researchers.

Table 3. Learning Outcomes of Integer Counting Operations

Learning Outcomes	Frequency	Percentage
80 – 100	17	65,38
60 – 79	9	34,6
40 – 59	0	0
20 – 39	0	0
0 – 19	0	0

The average value of learning outcomes achieved by students is as follows:

$$\bar{x} = \frac{\sum x}{\sum N} = \frac{2180}{26} = 83,84$$

The average value obtained in the calculation above is 83.84 and based on the category of learning outcomes in table 3, it can be concluded that the average value of learning outcomes is in the “Very Good” category.

As for the results of the trial of the attractiveness and effectiveness of computer-assisted learning media in the form of learning videos, it is by looking at the assessment questionnaires that have been given to students. The test results from student assessment questionnaires are as shown in table 4.

Table 4.6 Attractiveness Trial Results

No	Aspect	Results	Criteria
1	Content	88,08	Very Interesting
2	Language	89,62	Very Interesting
3	Attractiveness	96,15	Very Interesting
4	Technical Quality	91,54	Very Interesting
Average Percentage		91,35	Very interesting

Based on the results of the attractiveness test in table 4, the percentage of the average value is 91.35 with the criteria “Very Interesting” for computer-aided learning media on Integer arithmetic operations with a total of 26 students.

### **Discussion**

The study carried out by researchers is the development of computer-aided media, especially learning videos from Mathematics subjects with Integer Arithmetic operations, based on the Luther-Sutopo version of the product development method (Binanto, 2010), the stages include: Concept, Design, Material Collecting, Assembly and Testing.

At the Concept stage, researchers encounter problems in making plans through Storyboards about the Learning Videos made. Especially in making the narration of the learning video, researchers are not used to narrating, so researchers search for information related to how to compose a narrative from a Video Storyboard by reading related articles so that the information directs researchers to be able to compose a narrative from the learning video. For example, the storyboard in Sri Maryati’s research (2013) which shows how the parts, layout, and narrative are good from a storyboard.

Then at the Design stage, researchers carry out the process of designing products according to the scenario and planning that has been done at the Concept stage. In this stage it is intended to make detailed specifications regarding the initial product design, style, and material requirements for the development of computer-aided learning media products developed (Sohibun, 2017).

Meanwhile, in the data collection stage (Material Collecting), the researchers obtain a collection of data from the observations made before the study. Then it is processed into valid data in the form of lesson plans and syllabus which are in accordance with the learning process in research activities as well as in accordance with the curriculum used by the school, namely the 2013 curriculum.

Furthermore, after planning, product design, and data collection have been completed, it enters the product manufacturing stage (Assembly). In this stage, the researchers make a product using the PowerPoint application first, then proceed with Wondershare Filmora for adding background and editing videos to make it more interesting and fun. Rizqi Ridhona's research (2020) states that Wondershare Filmora is the latest video editing program that allows you to create, edit, trim, and convert all kinds of videos.

However, in product development, researchers have difficulty using PowerPoint and Wondershare Filmora applications in a more specific process to get better results because they are still in the process of learning to use them. So the researchers consult with experts and ask their friends for their opinions, besides finding out from related videos on youtube and searching using digital literacy, so that researchers could complete the making of this Mathematics learning video product properly. Among them, researchers also study tips for making media with power point according to Tejo Nurseto (2011) in his research, namely as follows: Use a simple background; Use consistent, simple, and clear fonts; Visualize your message; Create your own background or template to enhance presentation appeal and clarify the message; If using a background with a light color, then use text with a dark intensity, and vice versa; Use contrasting colors or matching colors; Avoid more than 3 color combinations in one slide; Use letters that have clear and firm characters; Minimum font size is 24 for sentences and 40 for titles; Maximum 6 sentences and 25 words in one slide.

Then the testing stage (Testing), researchers take several stages in R&D research (Sugiyono, 2011) which includes design validation, product revision and trials. Testing is carried out online because it coincides with the current Corona Virus Pandemic, which requires all activities to be carried out by keeping a distance and activities from home. In line with this, Roida Pakpahan (2020) in their research explains that during the current corona pandemic, online learning, online or distance learning itself aims to meet educational standards by utilizing Information Technology by using computer devices or gadgets that are connected to each other, students and teachers as well as between students and lecturers so that through the use of technology the teaching and learning process can still be carried out properly.

In the design validation stage, the researchers propose learning video media to material experts and media experts to test products through online media by sending learning videos produced by researchers. At the same time, the researchers also send an online form of a material expert and media expert validation questionnaire that could be filled out directly by the examiner. The results of the tests by material experts and media experts along with the suggestions given were then followed up by the researchers as a reference in revising the product for maximum results.

Likewise, with the trial phase which was carried out in two groups, namely small group trials and field trials, carried out in accordance with the rules during the Corona Virus pandemic. In a small group trial conducted on student colleagues through online media, the same as testing by media experts and material experts, and obtained a very good response. So that the trial is continued in a field trial conducted on fourth grade students of SDN 2 Tomohon, still with the rules during the Corona Virus pandemic. Field

trials were carried out by researchers by distributing video instructions on the YouTube application to each student at their home as well as a student guide book for students themselves which is equipped with pre-test and post-test question sheets. In addition, researchers also provide instructions and directions to students and to their parents in the use of instructional video media and their guidebooks. In this study, researchers use YouTube as a medium for presenting the resulting learning video products because this application can be accessed anytime and anywhere by anyone, including elementary school students. Apart from being easy to access, the YouTube application is also very well known by today's children or students, many of whom like to use Android phones because they want to watch various interesting videos from YouTube. As in Lurita Sari's research (2020) which argues that one of the media that supports internet-based learning that can visualize good learning techniques and materials is YouTube.

Mathematics learning that is created during the COVID-19 pandemic is really challenging and felt heavy, but with the development of this computer-assisted learning media, it is able to make students think creatively which is understood to be one of the important components in solving math problems (Daiana, Surahmat, & Fathani, 2021). ) and make students understand the material for counting Integer operations so that they can solve the problems presented in learning. The students easily understand addition, subtraction and multiplication as well as the division of two numbers positive and positive, positive and negative, negative and negative. Learning Mathematics using computer-assisted learning media arouses the enthusiasm and motivation of students to learn, thus providing an average final test result in the field test for grade IVa students of SDN 2 Tomohon, which is 83.84 and is included in the "Very Good" category. Then the computer-assisted media in the form of learning videos on Arithmetic operations on Integers developed by researchers can convey learning messages that make students achieve learning outcomes in the "Very Good" category.

## CONCLUSION

In this computer-assisted media development research, the researchers use five stages of Luther – Sutopo's version of research, namely Concept, Design, Material Collecting, Assembly and Testing. The main result of this research and development is computer-assisted learning media in the form of learning videos in Mathematics learning. And the results of field trials on students show that the use of computer-assisted media in the form of learning videos produced by researchers is very interesting and effective in increasing success in learning mathematics with Integer Arithmetic operations.

## REFERENCES

- Afifah, E. I., Triyono, T., & Hotifah, Y. (2016). Pengembangan media letter sharing untuk meningkatkan keterampilan komunikasi siswa introvert. *Jurnal Kajian Bimbingan dan Konseling*, 1(1), 27-32.
- Arief S. Sadiman, dkk. (2008). *Media Pendidikan: Pengertian, Pengembangan, dan Pemanfaatannya*. Jakarta: PT Raja Grafindo Persada.
- Arsyad, A. (2015). *Media pembelajaran*. Jakarta: RajaGrafindo Persada.
- Batubara, H. H. (2018). Pengembangan media pembelajaran matematika berbasis android untuk siswa SD/MI. *Muallimuna: Jurnal Madrasah Ibtidaiyah*, 3(1), 12-27.

- Binanto, I. (2010). *Multimedia Digital - Dasar Teori dan Pengembangannya*. Yogyakarta: Andi Offset.
- Daiana, P., Surahmat, S., & Fathani, A. H. (2021). Profile of students' mathematical creative thinking ability in solving mathematical problem. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 11(1).
- Defrianto, D., Kridalukmana, R., & Windasari, I. P. (2015). Pengembangan permainan edukatif ragam budaya nusantara berbasis android. *Jurnal Teknologi dan Sistem Komputer*, 3(3), 379-386.
- Hamzah, B. Uno. 2007. *Model Pembelajaran Menciptakan Proses Belajar Mengajar yang Kreatif dan Efektif*. Jakarta: Bumi Aksara.
- Maryati, S., & Purnama, B. E. (2013). Pembuatan video profil sekolah menengah pertama negeri 4 polokarto kabupaten sukoharjo dengan menggunakan multimedia. *Speed-Sentra Penelitian Engineering dan Edukasi*, 5(1).
- Molnar, V. (2010). Reframing public space through digital mobilization: Flash mobs and the futility (?) of contemporary urban youth culture. *Theory, Cult. Soc.*, 1–33.
- Munir. (2008). *Mata pelajaran Berbasis Teknologi Informasi dan Komunikasi*, Bandung, CV. ALFABETA.
- Pakpahan, R., & Fitriani, Y. (2020). Analisa pemanfaatan teknologi informasi dalam pembelajaran jarak jauh di tengah pandemi virus corona covid-19. *Journal of Information System, Applied, Management, Accounting and Research*, 4(2), 30-36.
- Prasetyo, G., & Prasajo, L. D. (2016). Pengembangan adobe flash pada pembelajaran tematik-integratif berbasis scientific approach subtema indahny peninggalan sejarah. *Jurnal Prima Edukasia*, 4(1), 54-66.
- Putra, L. D., & Ishartiwi, I. (2015). Pengembangan multimedia pembelajaran interaktif mengenal angka dan huruf untuk anak usia dini. *Jurnal Inovasi Teknologi Pendidikan*, 2(2), 169-178.
- Ridhona, R. (2020). *Desain dan uji coba video pembelajaran dengan bantuan software wondershare filmora pada materi asam basa*. Doctoral Dissertation, Universitas Islam Negeri Sultan Syarif Kasim Riau.
- Rusnilawati, R. (2016). Pengembangan perangkat pembelajaran matematika bercirikan active knowledge sharing dengan pendekatan saintifik kelas VIII. *Jurnal Riset Pendidikan Matematika*, 3(2), 245-258.
- Sari, L. 2020. Upaya menaikkan kualitas pendidikan dengan pemanfaatan youtube sebagai media ajar pada masa pandemi covid-19. *Jurnal Tawadhu*, 4(1), 1074-1084.
- Sohibun, S., & Ade, F. Y. (2017). Pengembangan media pembelajaran berbasis virtual class berbantuan Google Drive. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, 2.
- Sugiyono. 2011. *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.
- Sumarsih, S., & Mukminan, M. (2016). Pengembangan multimedia akuntansi biaya metode harga pokok pesanan bagi mahasiswa jurusan pendidikan akuntansi UNY. *Jurnal Inovasi Teknologi Pendidikan*, 3(1), 92-105.
- Yektyastuti, R., & Ikhsan, J. (2016). Pengembangan media pembelajaran berbasis android pada materi kelarutan untuk meningkatkan performa akademik siswa SMA. *Jurnal Inovasi Pendidikan IPA*, 2(1), 88-99.