

# E-SW Development Using Google Slides Combined with a Learning Account Material for Arithmetic Sequences and Series

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**Abstract:** *This research aims to produce a development product, namely E-SW, which meets the criteria of being valid, practical and effective using Google Slides combined with a learning account on arithmetic sequence and series material. Researchers took the research location at Christian Vocational School 3 Tomohon. The design of this research is the Research Develop Model ADDIE (Analyze, Design, Develop, Implement and Evaluate). Based on the results of the validation of the interview instrument, the average percentage result was 82.67, which is in the very valid interpretation criteria. E-SW validation results have an average percentage result of 82.56 which is in the very valid interpretation criteria, validation of the learning result test has an average of 89.44 which is in the very valid interpretation criteria, teaching module validation has an average percentage result of 83.20 which is in the very valid interpretation criteria, validation of the student response questionnaire instrument with an average of 85.56 in the very valid interpretation criteria, validation of the teacher response questionnaire instrument with an average percentage result of 85.56 in the very valid interpretation criteria, validation of the observation instrument for learning implementation with E-SW using Google Slides combined with a learning account of sequence and arithmetic series material with an average of 88.57 is in the very valid interpretation criteria. Based on the average student response questionnaire results of 88.93, E-SW is categorized as very practical. The average teacher response questionnaire result was 88%, so the E-SW using Google Slides combined with a learning account of arithmetic sequences and series material was categorized as very practical. The average results of the observation questionnaire on the implementation of learning with E-SW using Google Slides combined with a learning account on sequences and arithmetic series material was 84.17%, so that the E-SW using Google Slides combined with a learning account on arithmetic sequences and series material was categorized as very practical. Effective with the results of the learning achievement test meeting classical completeness of 86.67%.*

**Keywords:** E-SW, Google Slides, Learning Account, ADDIE Model Development, Arithmetic Sequences and Series

## 1. Preliminary

Mastery of mathematics is very important because it contributes to learning other sciences. Therefore, it is very important for teachers to facilitate mathematics learning so that students can improve their thinking abilities optimally. This is also contained in the decision of the Head of the Standards, Curriculum and Educational Assessment Agency of the Ministry of Education, Culture, Research and Technology Number 033/H/KR/2022 that mathematics is a science or knowledge about learning or logical thinking that humans really need for life which underlies development. modern technology. Learning mathematics can improve students' abilities in thinking logically, analytically, systematically, critically and creatively. These competencies are needed so that students have the ability to obtain, manage, and utilize information to survive in conditions that are always changing, full of uncertainty, and competitive. Based on observations and surveys at Christian Vocational School 3 Tomohon, it can be concluded that there are several weaknesses in mathematics learning. Teachers present more material in front of the class so that students only memorize. Apart from that, students are not trained to have the thinking skills needed to solve problems in life, because the questions given are not contextual. The teacher provides teaching

materials but students find it difficult to understand. The material in the book is too dense and does not explain the material in detail, the presentation of the material is less interesting and the practice questions given are too difficult. Student Worksheets (SW) are expected to guide students to be active and able to work together so that they are able to solve mathematical problems that are difficult for students to understand. SW is less structured so it doesn't help students to discover the concept of material. One of the materials that requires problem solving is Arithmetic Sequences and Series. Based on research conducted by Silaban, et al (2022) that "from the results of the data that has been grouped and analyzed, it is concluded that: (a) Most students cannot work on Arithmetic Sequences and Series questions; (b) Only a few students achieve learning outcomes that are classified as high; (c) The average student score does not meet the minimum completeness criteria standards." According to Timbuleng & Salajang (2021), one of the efforts that can be made to overcome weaknesses in mathematics learning is the application of a problem-based learning model that actively involves students, both physically, emotionally and socially. The learning model includes problems in learning in schools to improve student learning outcomes, so one learning model that can actively involve student learning is the Problem Based Learning learning model. Since the Covid-19 pandemic and the implementation of online learning, students

Volume 13 Issue 6, June 2024

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

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have begun to adapt to technology, either via smartphones or computers or laptops. This situation results in students having a lot of time with technology which is considered more enjoyable than the teacher's monotonous and uncreative way of teaching. According to Widodo (2017), Google Apps for Education (GAPE) is an information technology solution that can be used by schools/universities so that the entire academic community can communicate and collaborate. Students and lecturers can share ideas more quickly and effectively in obtaining information, creating documents, spreadsheets, presentations, and collaborating with each other in real time. According to Jonassen (Tran 2008) that using Google tools together has the potential to improve students' transference skills by giving them a platform to build connections between previously learned concepts and ideas through various statements. In implementing learning using the Problem Based Learning model, one of the activities to increase student activity is the availability of Student Worksheets (SW) as a learning medium. Dengan adanya kelemahan penggunaan SW cetak, maka penggunaan SW elektronik (E-SW) semakin ditingkatkan. The advantage of E-SW is that it can simplify and narrow space and time so that learning becomes more effective (Suryaningsih and Nurlita, 2021). The results of student responses regarding the use of Android-based E-SW were 85% with very good criteria (Fitriyah and Ghofur, 2021). Purnama and Pramudiani, (2021) stated that the interactive learning media based on Google Slides that

was developed was feasible and could be used as a learning medium to improve students' understanding of concepts. According to Purnamasari (2019) that in the learning process using Google Slides media, students are interested in the learning process, enthusiastic, because the material is easy to understand. According to Asrori & Suparman (Suryaningsih and Nurlita, 2021) that the need for innovative E-SW reduces boredom in the 21st century learning process by creating various E-SW innovations in accordance with learning needs and objectives, including E-SW based on Problem Based Learning (PBL). to improve creative thinking skills. The aim of this research is to produce electronic student worksheets using Google Slides combined with learning accounts on arithmetic sequences and series material that are valid, practical and effective. According to Ghani et al (2021, page 2) that problem-based learning (PBL) is an educational approach that utilizes the principles of collaborative learning in small groups, first introduced by McMaster Medical University. According to Samsudin et al (2021), in general, the use of PBL consists of five stages; (1) Students are oriented to the problem presented, (2) then describe and organize learning tasks, (3) investigate the problem, (4) develop and present work, (5) analyze and evaluate the problem-solving process. These phases refer to the practical stages carried out in PBL learning activities as presented in **Table 1.1**.

**Table 1.1:** Syntax of Problem Based Learning according to Arends

Fase	Aktivitas Guru
Fase 1: Mengorientasikan mahasiswa pada masalah	Menjelaskan tujuan pembelajaran, logistic yang diperlukan, memotivasi siswa terlibat aktif pada aktivitas pemecahan masalah yang dipilih
Fase 2: Mengorganisasi siswa untuk belajar	Membantu siswa membatasi dan mengorganisasi tugas belajar yang berhubungan dengan masalah yang dihadapi
Fase 3: Membimbing penyelidikan individu maupun kelompok	Mendorong siswa mengumpulkan informasi yang sesuai, melaksanakan eksperimen, dan mencari untuk penjelasan dan pemecahan
Fase 4: Mengembangkan dan menyajikan hasil karya	Membantu siswa merencanakan dan menyiapkan karya yang sesuai seperti laporan, video, model, dan membantu mereka untuk berbagi tugas dengan temannya
Fase 5: Menganalisis dan mengevaluasi proses pemecahan masalah	Membantu mahasiswa melakukan refleksi terhadap penyelidikan dan proses-proses yang digunakan selama berlangsungnya pemecahan masalah.

## 2. Research Procedure

This research uses Research and Development (R&D) research and development methods which are used to produce certain products, and test the effectiveness of these products (Septiawan & Abdurrahman, 2020). In this research, the product that will be produced is an electronic student worksheet that meets the requirements of being valid, practical and effective. The research will be carried out at Tomohon Christian Vocational School 3 located at Jalan Raya Tondano Tomohon, Central Tomohon District, Tomohon City. The research will be carried out in the even semester of the 2023/2024 academic year. The development procedure that the researcher will carry out is the ADDIE model development procedure.

According to Awuy, et al (2023) this model consists of 5 steps, namely (1) Analysis, (2) Design, (3) Development, (4) Implementation, (5) Evaluation. Evaluation of development products is carried out using Nieveen's (1999) criteria. According to Nieveen, in research on developing learning models, quality criteria are needed, namely validity, practicality and effectiveness. Based on Nieveen's criteria,

this research created an E-SW using Google Slides combined with a valid, practical and effective learning account of arithmetic sequences and series material.

In accordance with Nieveen's (1999) criteria, E-SW using Google Slides combined with a learning account for Sequences and Series material must meet the requirements of being valid, practical and effective.

## 3. Results and Discussion

**Analysis:** To find out problems in the learning process, researchers conducted interviews. This interview was carried out at Christian Vocational School 3 Tomohon with the deputy principal for curriculum affairs who has a background in mathematics education as well as being on the teacher performance assessment team and 6 phase E students. Data was obtained from the teacher that one of the materials that was difficult for the students was rows and series, because the material on rows and series has a lot of story questions. Then the student worksheets printed by the teacher are limited so that other students have difficulty learning and other students appear less active. Furthermore, data from phase E students

was obtained that all answered that the teacher had conveyed the objectives to be achieved in the learning process, the teacher had conveyed the title of the material, models,

methods and assessment aspects during learning, but in general answered that mathematics was difficult because there were many formulas and the material difficult.

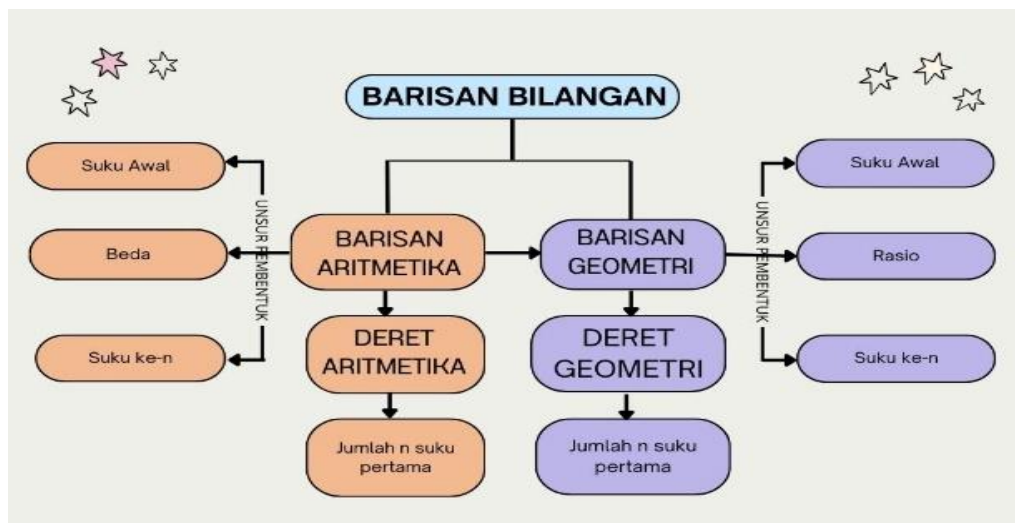


Figure 3.1: Number Sequence Concept Map

In learning the teacher gives students worksheets but the printed ones are limited. Furthermore, problem solving cannot be done via cellphone. The factor that causes students to feel that learning is less enjoyable is because there are limited printed student worksheets, so that only certain students carry out the steps according to the instructions given by the teacher even though student worksheets are a media tool that can help all students become active, can find for themselves concepts from material that are in accordance with the objectives of the problem based learning model, namely in a series of learning activities, students do not just note down, listen and memorize formulas or lesson material, but students actively think, communicate, search and process data until they are able to draw their own conclusions. The curriculum is a set of plans that are prepared, developed and implemented to carry out educational activities at a certain educational level to achieve predetermined educational goals. The curriculum used by Christian Vocational School 3 Tomohon for Class XII 2013 Curriculum and Phase E and Phase F uses the independent curriculum. Based on interviews, one of the materials that is difficult to understand is Arithmetic Sequences and Series, with a concept map structure in Figure 3.1. After analyzing the material according to learning outcomes, the learning objectives for the Lines and Series material are shown in Table 3.1.

Table 3.1: Material analysis according to learning outcomes

Materi	Tujuan Pembelajaran
Barisan dan Deret	1) Menentukan pola dari suatu barisan bilangan
	2) Menjelaskan pengertian barisan aritmetika
	3) Menentukan suku ke-n suatu barisan aritmetika
	4) Menyelesaikan masalah kontekstual yang terkait dengan barisan aritmetika
	5) Menjelaskan pengertian deret aritmetika
	6) Menentukan jumlah n suku pertama suatu deret aritmetika
	7) Menyelesaikan masalah kontekstual yang terkait dengan deret aritmetika.

Design: At this stage the researcher designs E-SW using Google Slides combined with a learning account.

Develop: At this stage, it needs to be validated by a validator, namely interview instruments, teaching modules, E-SW, learning outcomes tests, teacher questionnaire instruments, student questionnaire instruments and observation sheet instruments. The results of the validation of the interview instrument were validated by the validators. It is known that the average percentage result from the three validators was 82.67, which is in the very valid interpretation criteria and does not need to be revised. From the results of validation by validators, it is known that the average percentage result from the three validators is 82.56, which is in the very valid interpretation criteria and does not need to be revised. Validation of the Learning Results Test shows that the average percentage result from the three validators is 82.56, which is a very valid interpretation criterion and does not need to be revised.

At the Develop stage, a trial was carried out on a small class of 12 people to test the validity and reliability of the Learning Outcomes Test which would be used at the implementation stage. The validity test is carried out to determine the validity of each question that the teacher has created. The validity test uses the biserial correlation coefficient formula with the help of Microsoft Excel with the results of each Learning Outcomes Test item meeting the valid criteria. The reliability test uses the Kuder Richardson (KR-20) formula with the help of Microsoft Excel which is calculated after carrying out a validity test, the results of each item in the Learning Outcomes Test meet the reliable criteria. The results of the validation of the Teaching Module show that every aspect that is assessed meets the valid criteria with slight revisions. Validation of the student response questionnaire instrument shows that the average percentage result from the three validators is 85.56, which is in the very valid interpretation criteria and does not need to be revised. Validation of the Teacher Response Questionnaire Instrument shows that the average percentage result from the three validators is 85.56, which is in the very valid interpretation criteria and does not need to be revised. Validation of observations of the implementation of learning with E-SW using Google Slides

combined with learning accounts. It is known that the average percentage result from the three validators is 88.57, which is in the very valid interpretation criteria and does not need to be revised.

**Table 3.2:** Student Response Questionnaires

No.	Pernyataan	Skor (%)	Kategori
1.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran memiliki tampilan menarik	94, 67	Sangat setuju
2.	Bahasa dalam E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran jelas dan mudah dipahami	86, 67	Sangat setuju
3.	Soal pada E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran sesuai dengan materi	89, 33	Sangat setuju
4.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran tidak ada <i>error</i> saat digunakan	82, 67	Sangat setuju
5.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran membuat saya lebih mudah memahami materi	88	Sangat setuju
6.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran membuat suasana baru dalam belajar	94, 67	Sangat setuju
7.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran menambah semangat saya dalam belajar	89, 3	Sangat setuju
8.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran dapat digunakan di mana saja	84	Sangat setuju
9.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran membuat saya aktif dalam belajar	89, 3	Sangat setuju
10.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran membuat saya senang belajar matematika	90, 67	Sangat setuju
Rata-rata		88, 93	

**Implementation.** At this stage, the results of all instruments have been validated, then implementation is carried out. The E-SW that has been developed is implemented in real situations in the classroom. The implementation of this product was carried out on 15 students and 1 teacher at Christian Vocational School 3 Tomohon. After implementation is carried out, teacher questionnaires and student questionnaires are distributed regarding the implementation of learning using the product, namely E-SW.

The results of the student response questionnaire are shown in Table 3.2.

From this table, the average student response questionnaire result is 88.93 so that E-SW is categorized as very practical. Teacher response questionnaire results: From Table 3.1. It can be obtained that the results of the teacher response questionnaire were 88%, so that E-SW using Google Slides combined with a learning account on Arithmetic Sequences and Series material was categorized as very practical.

**Table 3.3:** Teacher Response Questionnaire Results

No.	Pernyataan	Skor	Kategori
1.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran memiliki tampilan menarik	4	Setuju
2.	Bahasa dalam E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran jelas dan mudah dipahami	4	Setuju
3.	Materi pada E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran sesuai dengan Tujuan pembelajaran	4	Setuju
4.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran menumbuhkan minat belajar peserta didik	5	Sangat Setuju
5.	Penggunaan video dalam E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran sangat revelan dan membantu pemahaman peserta didik	5	Sangat Setuju
6.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran membuat suasana baru dalam Belajar	5	Sangat Setuju
7.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran menambah semangat belajar pada peserta didik	4	Setuju
8.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran dapat di gunakan peserta didik dengan mudah	5	Sangat Setuju
9.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran dapat dipelajari peserta didik secara individu maupun kelompok	4	Setuju
10.	E-SW menggunakan <i>google slide</i> dipadukan akun pembelajaran menumbuhkan kemampuan berpikir peserta didik	4	Setuju
Jumlah		44	
Skor Maksimum		50	
P		88	

#### 4. Conclusions and Suggestions

Based on the results of research and data analysis, the development of E-SW using Google Slides combined with learning accounts regarding arithmetic sequences and series at Christian Vocational School 3 Tomohon is concluded as follows:

**Validity:** Based on the results of the validation of the

interview instrument, the average percentage result was 82.67, which is in the very valid interpretation criteria. The E-SW validation results have an average percentage result of 82.56 which is in the very valid interpretation criteria, the validation of the learning result test has an average of 89.44 which is in the very valid interpretation criteria, the teaching module validation has an average percentage result of 83.20 which is in the very valid interpretation criteria, validation of the student response questionnaire instrument with an average

of 85.56 in the very valid interpretation criteria, validation of the teacher response questionnaire instrument with an average percentage result of 85.56 in the very valid interpretation criteria, validation of the observation instrument for learning implementation with E-SW uses Google Slides in a combined learning account with material on sequences and arithmetic series with an average of 88.57 which is in the very valid interpretation criteria.

**Practicality:** Based on the average student response questionnaire results of 88.93, E-SW is categorized as very practical. The average teacher response questionnaire result was 88%, so E-SW using Google Slides combined with a learning account of arithmetic sequences and series material was categorized as very practical. The average results of the observation questionnaire on the implementation of learning with E-SW using Google Slides combined with a learning account on sequences and arithmetic series material was 84.17%, so that E-SW using Google Slides combined with a learning account on arithmetic sequences and series material was categorized as very practical.

**Effectiveness:** With test results, learning outcomes meet classical completeness as much as 86.67%. E-SW development using Google Slides combined with learning accounts can be developed on other materials.

### Acknowledgement

The author as a student at the Masters Program in Mathematics Education PPs State University of Manado expresses his highest gratitude to the Manado State University in this case the Postgraduate Program which has provided the opportunity for researchers to study as well as explore the theory and practice of developing mathematics learning tools so that the authors gain the ability more that supports the author's task as a Mathematics teacher.

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