AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 11, No. 1, 2022, 276-290

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

FLIP-STIK FOR FLIPPED CLASSROOM: STATISTICS LEARNING E-MODULE ASSISTED BY FLIPBOOK TO PROMOTE STUDENTS' NUMERACY

Mayang Purbaningrum[1*], Thoiffatul K. Nisa'[2], Indri R. F. Febriani[3], Ahmad W. Kohar[4]

[1,2,3,4] Universitas Negeri Surabaya, Surabaya, Indonesia
*Corresponding author.
E-mail: mayangpurbaningrum99@gmail.com [1*)]
thoiffatul.19023@mhs.unesa.ac.id [2)]
indrirohmatul.2009@mhs.unesa.ac.id [3)]
ahmadkohar@unesa.ac.id [4)]

Received 14 November 2021; Received in revised form 03 March 2022; Accepted 18 March 2022

Abstrak

Adanya Covid-19 menyebabkan perlunya inovasi pembelajaran yang mendukung pembelajaran daring dan numerasi untuk memahami data. Integrasi e-modul dengan Flipbook pada materi statistika diharapkan dapat meningkatkan kemampuan numerasi siswa dalam pembelajaran daring. Ini merupakan penelitian pengembangan yang bertujuan untuk menyusun e-modul berbentuk Flipbook yang valid dan praktis untuk pembelajaran statistika yang berpotensi dapat meningkatkan kemampuan numerasi siswa dalam bentuk pembelajaran terbalik. E-module dikembangkan melalui tahapan evaluasi formatif dengan melibatkan 15 orang siswa SMP kelas 8. Data dikumpulkan dan dianalisis dengan *walkthrough*, kuesioner, wawancara, dan *review* dokumen. Hasil penelitian menunjukkan bahwa e-modul mendemonstrasikan tahapan-tahapan pembelajaran terbalik dari kegiatan di luar kelas (pengalaman belajar mandiri di rumah, mengerjakan tugas, dan mencatat hal-hal yang kurang dimengerti) ke kegiatan di dalam kelas (pendalaman pemahaman statistika melalui diskusi kelas dan latihan pemecahan masalah). E-modul yang dikembangkan memenuhi kriteria validitas dari segi isi dan tampilan serta kemudahan penggunaan. Selain itu, memiliki efek potensial untuk mengembangkan kemampuan numerasi siswa berdasarkan analisis dokumen tanggapan siswa mengenai proses merumuskan masalah secara matematis, menggunakan konsep matematika, dan menafsirkan solusi untuk menyelesaikan masalah.

Kata kunci : E-module; *Flipbook*; numerasi; pembelajaran terbalik

Abstract

The existence of Covid-19 causes the need for learning innovations supporting online learning and numeracy to understand data. The integration of e-modules in flipbook on statistics material is expected to improve students' numeracy in online learning. This is a development study that aims to produce an e-module assisted by Flipbook which is valid and practical for learning statistics that has a potential effect on students' numeracy in a flipped classroom learning design. The e-module was developed through a formative evaluation stage involving 15 students of 8th grade junior high school. Data were collected and analyzed utilizing walkthroughs, questionnaires, interviews, and document review. Results indicate that the flipbook demonstrates the stages of flipped learning from out-of-class activities (independent learning experience at home, do assignments, and takes notes of less understandable) to in-class activities (deepening understanding of statistics through class discussions and working on problem-solving tasks). The flipbook developed meets the criteria of validity in terms of content and construct and ease of use. In addition, it has the potential effect to develop students' numeracy based on the document analysis of student responses regarding the process of formulating problems mathematically, employing formal mathematical structure, and interpreting solutions on a set of numeracy tasks.

***Keywords**: E-module; Flipbook; flipped classroom; numeracy*

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

INTRODUCTION

Several obstacles occurred in the implementation of mathematics learning during the pandemic. Among them is the lack of interaction between teachers and students. In addition, less attractive material makes the presentation of material during the online learning process monotonous. As a result, there is a feeling of laziness, loss of enthusiasm, stress, difficulty sleeping, tiredness, and bored with lecture material during online learning (Pawicara & Conilie, 2020). Therefore, it is necessary to create a technology that can be utilized and used to facilitate the implementation of learning during the pandemic where its existence can be accessed anywhere and anytime, has interaction space, has contextual content, has a colorful display, and attractive features are needed to attract students' interest in learning from an audio-visual perspective. Teaching materials that can display text, images, animations, and videos through electronic devices such as computers and smartphones are expected to be a new source of learning for students and can further improve understanding of concepts and learning outcomes (Imansari & Sunaryantiningsih, 2017). Studies show that students can learn mathematics more richly and deeply when technology is used effectively in mathematics learning (Drijvers et al., 2011; Kristanto, 2021; Mulyati & Evendi, 2020; Turmuzi et al., 2021).

The existence of a Pandemic does not mean we can ignore the fact that we are currently entering the 21st century. The abilities that are the demands of the 21st century we can briefly call numeracy abilities (Han et al., 2017). According to Han et al (2017), based on the results of the 2015 PISA and 2016 TIMSS tests, showed that Indonesia was ranked below. So that the Indonesian people, especially the younger generation, need to improve their numeracy skills.

To improve students' numeracy skills and answer challenges during the pandemic, the key is in the teaching materials. Teaching materials can be used for teachers in delivering material so that learning objectives can be achieved optimally (Pramana et al., 2020). One form of teaching material that can answer those challenges is e-module because it can be used in distance learning and can be designed as attractive as possible without ignoring students' numeracy skills. E-module is a teaching material that combines with technology. E-module have characteristics as follows: (1) self-instruction (2) self-contained (3) stand-alone (4) adaptive users friendly (Daryanto, 2013). E-module during the Pandemic is suitable to be assisted by Flipbook. With an e-module assisted by Flipbook, students can enjoy learning not only in written form, but in the form of images, sound, and video. Previous studies have developed an e-module based on Flipbook that is considered valid with a percentage of media validation results is 86.67 % (Fonda & Sumargiyani, 2018).

In recent years, the use of e-modules in the form of Flipbooks has attracted the attention of researchers to develop similar media with different focuses and content. For example, Flipbooks were developed to improve learning outcomes in chemistry (Herawati & Muhtadi, 2018), physics (Sriyanti et al., 2021), history (A et al., 2020), and computers (Prasetyono & Hariyono, 2020). More specifically in mathematics, Flipbooks have also been widely used in development research and experiments concerning their

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

effectiveness in improving learning outcomes (Andini et al., 2018; Fahmi et al., 2019; Kurniasih et al., 2021; Mulwanti et al., 2022), mathematical creative thinking (Waluya et al., 2022), mathematical communication (Selvia et al., 2016), and mathematical representation (Baroroh & Fitriana, 2022). Viewed from the type of approach or learning model used to drive the Flipbook, reviews such as the use of ethnomathematics (Fitrianawati & Setiyawati, 2021), realistic mathematical approach (Sari et al., 2021), and discovery learning (Haryanti & Saputro, 2016) has been used as an analytical framework in designing learning activities contained in the Flipbook. While these approaches are reported to be effective in guiding Flipbook designers in presenting mathematics learning activities, considerations about models or approaches that are suitable to be combined with distance learning focusing on improving students' numeracy have not been reported given the current need for digital platforms during this Pandemic.

Based on the need for appropriate teaching materials during the pandemic and to improve numeracy skills, the researchers initiated an innovation of a technology-based mathematical e-module, namely FLIP-STIK. The material discussed in FLIP-STIK is statistics in grade 8. Statistical material is needed to understand Covid-19 data that often appears in various media. Statistics material is a basic material that is needed in the daily life of students. However, students are still often found who have less than optimal performance on the material. So they are less active and critical when participating in learning. Students make many mistakes in solving statistical problems, both factual errors, conceptual errors, principle errors, and procedural errors (Agustiva et al., 2016).

To implement FLIP-STIK effectively during a pandemic, the Flipped Classroom method can be used. As one type of flipping learning, the Flipped Classroom is learned done before class while homework is completed in class (Bergmann & Sams, 2012; Pierce & Fox, 2012; Roehl et al., 2013). One of the advantages of Flipped Classrooms is that classroom learning time is used effectively by teachers and students with a shorter duration (Fulton, 2012). The use of Flipped Classroom will increase the ability of soft skills and hard skills. In line with Yanuarto (2018), through Flipped Classroom students will experience increased learning independence and the use of technology. Basal (2015) stated that Flipped Classroom will provide more time in class so that students have more opportunities to learn and interact with teachers, so they are more motivated to study hard.

The advantages of the FLIP-STIK e-module are the presentation of material in a problem frame to train students' numeracy skills, there are learning videos that can be accessed in FLIP-STIK and there are games so that students learn while playing. FLIP-STIK is offered as a solution to the need for appropriate and effective online teaching material, so that it can make students more motivated to study independently at home and can improve numeracy skills, especially in statistical material. Thus, the formulation of the research problem is: How the validity and student responses to the FLIP-STIK e-module teaching material for 8th-grade students in Flipped Classroom?

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

RESEARCH METHOD

This research is a design research type of development study that uses formative evaluation. The stages carried out are the preliminary stage, self-evaluation, expert reviews and one-to-one, small group, and field test (Tessmer, 2013). The subjects of this research are 8-grade students who will take statistical mathematics material. The following is a formative evaluation flow in Figure 1.

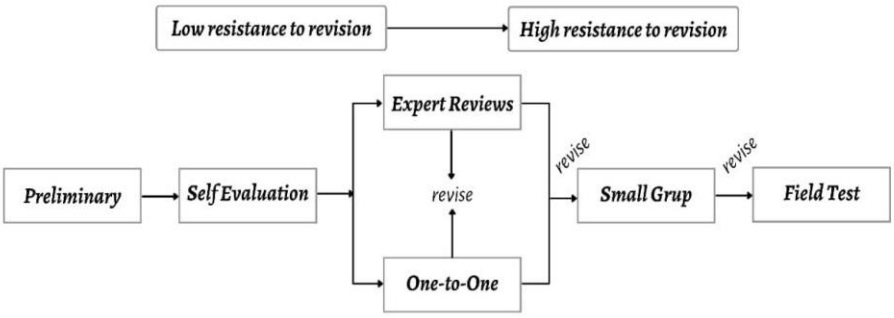

Figure 1. Formative evaluation flow
source: (Tessmer, 2013)

The work in the preliminary stage is reviewed some of the literature, determines the material, makes the initial prototype, and arranges the procedures for implementing research in schools.

In the self-evaluation stage, the researcher evaluates and examines the initial prototype. Furthermore, also designed several instruments, namely flipbook validation sheets, and student response questionnaires.

Furthermore, at the expert reviews and one-to-one stage, teaching materials were validated by experts in ICT media and experts in junior high school mathematics learning. Simultaneously with the expert reviews stage, the researchers conducted tests on students individually (one-to-one) as many as 3 students who had high, medium, and low abilities as seen from the results of the math daily test. The focus of the one-to-one evaluation is to obtain students' comments when using the FLIP-STIK.

In the small group stage, the second prototype revised from the expert reviews and one-to-one stages was tested using 2 groups of students, each consisting of 3 heterogeneous students based on gender, and based on high, medium, low abilities seen from the results of the math daily test.

At the field test stage, the third prototype was tested on one class of 8 grade. The trial stage used Flipped Classroom. Here is the flow of flipped classrooms in Figure 2.

The selected class is a heterogeneous class based on gender and high, medium, and low mathematical ability as seen from the results of math daily test as many as 15 students.

In the initial learning in the Flipped Classroom, students get acquainted with the topic of statistical material through FLIP-STIK. Students can read, watch videos, play games and also try practice questions related to statistical material that has been provided in the FLIP-STIK e-module. Students are asked to write the questions they want to ask when learning is carried out in class (face to

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

face). When learning is carried out in class, the teacher will ask students to submit the questions they have noted and then discuss them together. Learning ends with the provision of feedback or feedback from the teacher and a joint evaluation.

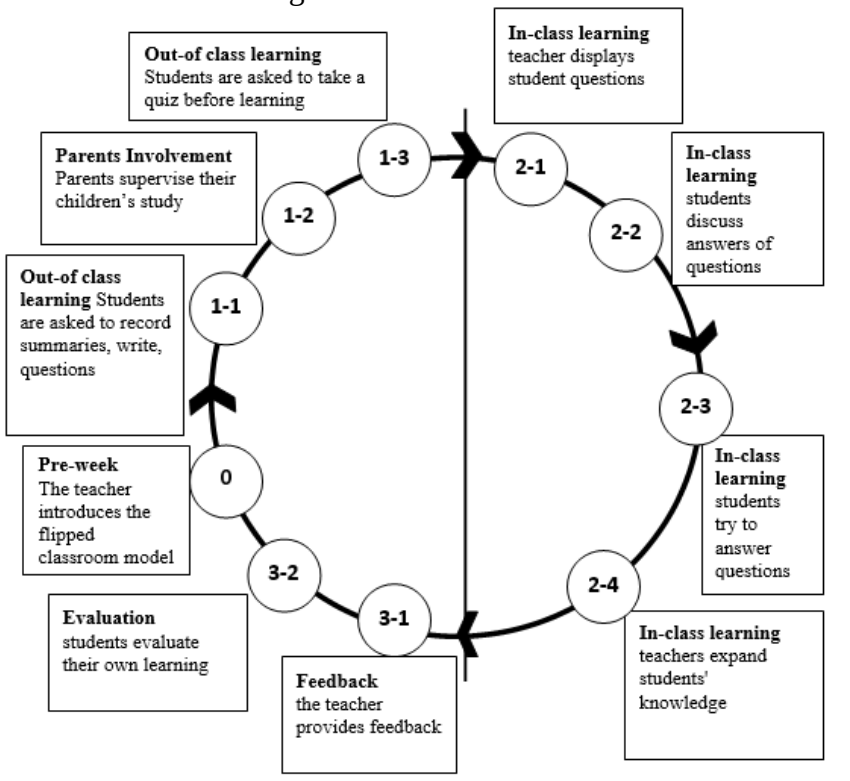

Figure 2. Flipped classroom flow

source : (Wei et al., 2020)

Data collection techniques carried out by researchers are documentation, walk-through, and questionnaires. Documentation is carried out to examine the documents needed in development research. The walkthrough is carried out during expert, one-to-one and small group tests to get suggestions regarding prototypes. The questionnaire used to collect data consisted of a material validation questionnaire, media validation, and a response questionnaire used to determine the validity and practicality of FLIP-STIK. The questionnaire data analysis technique uses a Likert scale for the following formula (1).

$$\text{Response value \& validity value (\%)} = \frac{score\ of\ each\ indicator}{highest\ overall\ score\ \ each\ indicator}\ x\ 100\% \quad (1)$$

For the value of the student response questionnaire (NR), use the following intervals in Table 1 as follows.

Table 1. Interval of respon questionnaire value

Interval	Category
0% ≤ NR < 20%	Very Weak
20% ≤ NR< 40%	Weak
40% ≤ NR < 60%	Enough
60% ≤ NR < 80%	Strong
80% ≤ NR ≤ 100%	Very Strong

(Riduwan, 2012)

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

If 50% of all statement items are included in the very strong or strong category, the subject's response is said to be positive. If <50% is said to be negative.

For the value of validity (NV), use the following interval in Table 2.

Table 2. Interval of validity value

Interval	Category
0% ≤ NV < 39%	Very inappropriate
40% ≤ NV < 60%	Less valid
61% ≤ NV < 80%	Valid
81% ≤ NV ≤ 100%	Very valid

(Sugiyono, 2010)

RESULT AND DISCUSSION

1) Preliminary Stage

Researchers analyzed the needs of students. It was found that students experienced boredom while studying during a pandemic and other obstacles such as the lack of independent learning media and an unstable internet network. Then, the researchers determined the material and research subjects, namely the statistical mean material for grade 8 students. At this stage, the initial prototype was designed and created using Microsoft Word and Canva. The following is the process of creating a FLIP-STIK design in the Canva application.

Then the FLIP-STIK design that has been created is converted to flipbook form using the Flip PDF Professional application which allows books or modules in the form of PDFs to be flipped over like an original book and can be filled with other features such as video, sound, and links. integrated with online math games. The following is the process of making FLIP-STIK on Flip PDF Professional in Figure 3.

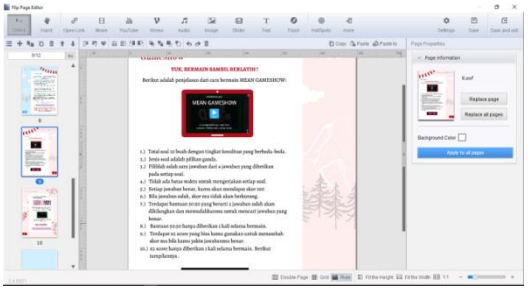

Figure 3. The process of making FLIP-STIK on Flip PDF Professional

For access using a PC, the researcher provides FLIP-STIK in the form of HTML that can be used offline. How to use the FLIP-STIK simply by accessing the FLIP-STIK using the HTML file, then the FLIP-STIK display will appear. The following are the results of the initial prototype of FLIP-STIK on a PC. Here are the initial prototype results on PC in Figure 4.

Figure 4. Initial prototype results on PC

For access using Android, the researchers changed HTML into APK using the WEB2APK application. The application can be accessed after the FLIP-STIK application is successfully installed on Android. The FLIP-STIK contains sub-sections such as "Ayo Menyimak", "Ayo Mencoba", and "Ayo Berlatih" which uses the main problem, namely the trend of sunbathing during the Covid-19 pandemic.

2) Self Evaluation Stage

Researchers evaluate and review the initial prototype. In addition, the researcher also designed several instruments, namely flipbook validation

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

sheets and student response questionnaires to the media and flipped classroom learning. Material validation sheets are made based on material validity indicators, namely in terms of content validity, presentation validity, language assessment, and mathematical literacy assessment. The media validation sheet is based on media validity indicators, namely in terms of module size, module cover design, and module content design. The questionnaire sheet was made according to the needs of researchers to obtain student responses to FLIP-STIK.

3) Expert Reviews and One-to-One Stage

The validation process was carried out by experts in ICT media and experts in junior high school mathematics learning materials by giving a Likert scale assessment. The results of the FLIP-STIK validation are in Tables 3 and 4 as follows.

Table 3. Media validation results

Aspect	Total Item	Score Average	Percentage
Module size	1	3,0	75,00%
Module cover design	3	3,3	83,30%
Module content design	8	3,0	75,00%
Total	**13**	**9,3**	**77,76%**

Table 4. Material validation results

Aspect	Total Item	Score Average	Percentage
Content eligibility	4	2,5	62,5%
Presentation qualification	4	2,5	62,5%
Language assessment	5	3,4	85%
Mathematical literacy assessment	2	2	50%
Total	**15**	**10,4**	**65%**

The validation results show that FLIP-STIK in terms of media is valid with a percentage of 77.76% and in terms of the material, it is valid with a percentage of 65%.

Media and material experts gave some suggestions to make FLIP-STIK suitable for use. Suggestions in terms of media, namely 1.) Fix the full-screen button for videos, 2.) Lack of navigation buttons, 3.) If the link is in the box, don't match the color with the module background so that it is not considered as decoration. 4.) If the theme is Covid-19, then all the backgrounds are related to Covid-19. 5.) Students should be able to open the intended page directly through the table of contents, not open from the start page. 6.) The layout is not neat.

Suggestions in terms of material are: 1.) If the mode and median have not been studied, it is better not to bring up the words mode and median. For the mode that can be replaced with the most data appears, the median is replaced with the middle value. 2.) Preferably sub material: the mean is not necessary, because the mean is material. 3.) The material is not deepened and incomplete. 4.) The place for collecting assignments should be Google Classroom or WhatsApp so that other people can use FLIP-STIK, not just researchers.

Simultaneously with the expert reviews stage, the researcher conducted tests on students individually (one-to-one) as many as 3 students who had high, medium, low abilities seen from the results of the math test. The focus of the one-to-one evaluation is to obtain student comments when using the FLIP-STIK. The three students commented that FLIP-STIK is interesting, can increase enthusiasm for learning, not boring. However, there are a few criticisms that the video cannot be

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

enlarged, the video volume is not loud enough if there is an internet network problem it cannot open the game. Comments from experts and student responses became the basis for the revision of the prototype. Figure 5 is the FLIP-STIK looks like after it was revised.

Figure 5. Display of FLIP-STIK on PC after revision

Here's the display of FLIPSTIK for each design.

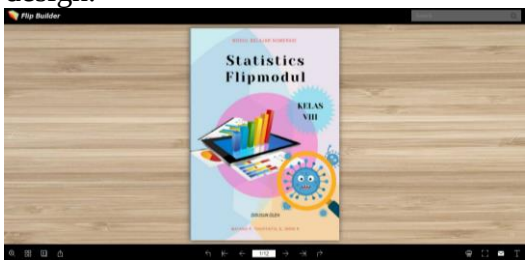

Figure 6. Cover

preferences and table of contents

Figure 7. Preference and table of contents

preliminary module

Figure 8. Preliminary module

learning activity ("Ayo Menyimak" and "Ayo Mencoba")

Figure 9. Learning activities 1 and 2

learning activity ("Ayo Berlatih" and gameshow)

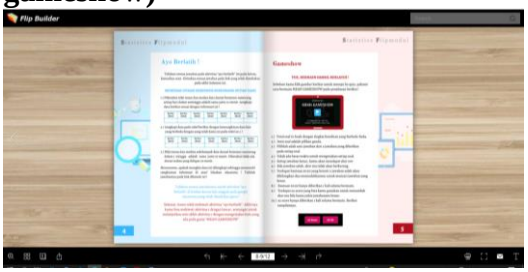

Figure 10. Learning activity 3

closing

Figure 11. Closing

4) Small Group Stage

The researchers used 2 groups of students, each consisting of 3 heterogeneous students based on high, medium, and low abilities. The focus of the small group evaluation is to get student responses after the second prototype trial and ensure that FLIP-STIK is ready to be tested at the field test stage. Students ask for more material and are given examples of questions. Due to time constraints, the researcher will add it to the next FLIP-STIK development.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

5) Field Test Stage

The researcher carried out this stage at SMPN 1 Pogalan, Trenggalek with 15 students in grade 8. The field test was carried out using the flipped classroom learning model. The day before class, students were asked to learn to use the FLIP-STIK and write down what they would ask during in-class learning. The LMS used by the researcher is Google Classroom for a place to discuss and collect assignments. Researchers used Google Meet to discuss the results of student discussions and expand knowledge. After the field test, the researcher asked students to fill out a questionnaire about the use of FLIP-STIK in Flipped Classroom learning. The results of the student response questionnaire showed a positive response in Table 5. Students want to learn media such as FLIP-STIK in other materials.

Table 5. Student response questionnaire results

Aspect	Total Item	Score Average	Percentage
Appearance	2	3,6	89%
Content Presentation	5	3,3	83%
Independent Learning	3	3,4	86%
Usefulness	4	3,4	84%
Total	**14**	**13,7**	**85,5%**

From each indicator in Table 5, there is an interval between 80% - 100% which falls into the very strong category. If 50% of all statement items are included in the very strong or strong category, the subject's response is said to be positive.

The following Table 6, is the step-by-step in-class learning to implement Flipped Classroom.

Table 6. Step by step in-class learning

Class Session	Time	Detail
Display student questions	5 minutes	The teacher presents students with questions that they note during learning outside the classroom.
Group discussion	20 minutes	Students discuss in groups to discuss the existing questions
Explore students' thoughts	15 minutes	Students explain the results of the discussion obtained from group discussions.
Expand knowledge	15 minutes	The teacher guides them to think deeply. Teacher expands knowledge

In terms of developing numeracy skills, FLIP-STIK is effective for training students' numeracy skills as seen from the results of students' work in doing assignments at FLIP-STIK. Students can mention what is known and what is asked in the questions on the formulate stage, students can use their knowledge to solve problems at the "employ" stage, then students can conclude the results obtained to answer questions at the "interpret" stage. This is in line with the results of research related to increasing students' numeracy skills with the help of learning media conducted by Ambarwati & Kurniasih (2021). The results of the study showed an Effect Size of 0.710 with a medium category interpretation related to the influence of YouTube media in increasing the numeracy literacy of 8-grade students. The positive results that

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

this study provides are under the positive results that were also shown in this study. The following is an example of student work.

In the following work, it is shown that students can determine the data in several empty boxes from the existing information (total of the day, mean, and mode).

1. First, students determine the amount of sunbathing duration for 1 week, namely:
   Mean x Number of Days = 12 x 7 = 84 minutes (formulate stage).
2. Next, students use the known mode to determine the value of other data. Where the value of the mode is 12. So it can be ascertained that the number 12 will appear more than 1 time. (formulate stage)
3. Then the students assume the value of mode 12 appears 4 times (4 days) as in the picture above. So that students have the remaining total duration of sunbathing for 1 week, namely:
   total duration of sunbathing for 1 week-4 x mode = 84 - 4 x 12 = 84-48 = 36 minutes. (employ stage)
4. So students can choose any 3 datum values for the remaining 3 days in 1 week with the condition that when added up it is worth 36 minutes. Then students choose 10 minutes, 10 minutes, and 16 minutes. (employ stage)
5. The entire value of the data in the question box has been answered by the students. (interpret stage)

Overall, the result of the research shows that the e-module is valid, practical, and effective for promoting numeracy skills. The development process by the formative evaluation method starting from the preliminary, self-evaluation, expert review, and one-to-one, small group, field tests, and product improvement stages during development support the successful development of e-modules so that they are suitable for use in the learning process. The results of validation from experts and the results of student responses got good results because it was caused by several things, namely: attractive module design, the material provided according to indicators, easy-to-understand language, text readability, learning videos in e-module, the material discussed following daily life, ease of use, and the emergence of learning motivation. Attractive e-module design can facilitate students in understanding the material (Serevina et al., 2018). Easy-to-read text and easy-to-understand language make the message in e-module conveyed to students well (Sudarma et al, 2015) The existence of learning videos in e-module can increase student motivation and learning outcomes (Novita et al., 2019). Learning objectives will be achieved if the material in the e-module is following the indicators (Seruni et al., 2020). Materials that are suitable for everyday life can improve students' numeracy skills (Maryani & Widjajanti, 2020). The ease of using e-modules makes students independent in learning (Diantari et al., 2018). It can be said that the results of this study are in line with previous research studies.

This study has provided a reference for educators in providing innovative use of technology in the flipped classroom learning model during the pandemic that has not been found in previous research. The weakness of this research is that the development of e-modules is still limited, which was tested on the Flipped Classroom in one meeting only. With the e-module that is integrated into the flipbook which is

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

realized in the flipped classroom, it can increase students' motivation to study during the pandemic and in the future. E-modules with numeric content can also improve students' numeracy skills needed in the 21st century.

CONCLUSION AND SUGGESTION

The e-module FLIP-STIK has fulled the valid criteria, ease of use, and is also effective in developing students' numeracy skills. FLIP-STIK was declared valid in terms of material with a percentage of 77.76% and in terms of media with a percentage of 65% to be used in learning statistics on 8-grade material. FLIP-STIK is easy to use based on student responses that are easy to operate FLIP-STIK. FLIP-STIK is also effective in developing students' numeracy skills based on the results. student work. FLIP-STIK received a positive response from students of 85.5% so that it can be used as a learning medium during a pandemic and can develop numeracy skills needed in the 21st century. It is hoped that in the future there will be studies on the development of learning media to improve numeracy skills with other technologies.

REFERENCES

A, M. A., Suryani, N., & Ardianto, D. T. (2020). Digital Flipbook empowerment as a development means for history learning media. *JPI (Jurnal Pendidikan Indonesia)*, *8*(2), 266. https://doi.org/10.23887/jpi-undiksha.v8i2.24122

Agustiva, W. O., Ndia, L., & Ikman. (2016). Analisis kesalahan siswa dalam menyelesaikan soal statistika (studi kualitatif pada siswa kelas VII SMP Negeri 4 Kendari). *Jurnal Penelitian Pendidikan Matematika*, *4*(1), 155–168.

Ambarwati, D., & Kurniasih, M. D. (2021). Pengaruh Problem Based Learning berbantuan media Youtube terhadap kemampuan literasi numerasi siswa. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(3), 2857–2868. https://www.j-cup.org/index.php/cendekia/article/view/829

Andini, S., Fitriana, L., & Budiyono, B. (2018). Geometry in Flipbook multimedia, a role of technology to improve mathematics learning quality: The case in Madiun, East Java. *Journal of Physics: Conference Series*, *1008*(1). https://doi.org/10.1088/1742-6596/1008/1/012077

Baroroh, U., & Fitriana, L. (2022). *E-module ethnomathematics on mathematical representation ability of class XI High School students*. 10–18.

Basal, A. (2015). The implementation of a Flipped Classroom in foreign language teaching. *Turkish Online Journal of Distance Education*, *October*, 28–37. https://files.eric.ed.gov/fulltext/EJ1092800.pdf

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every eay*. International Society for Technology in Education.

Daryanto. (2013). *Penyusunan Modul*. Gava Media.

Diantari, L. P. E., Damayanthi, L. P. E.,

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

Sugihartini, N. S., & Wirawan, I. M. A. (2018). Pengembangan e-modul berbasis Mastery Learning untuk mata pelajaran KKPI kelas XI. *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI)*, *7*(1), 33. https://doi.org/10.23887/janapati.v7i1.12166

Drijvers, P., Boon, P., & Reeuwijk, M. Van. (2011). *Algebra and technology in secondary algebra education*. Brill Sense.

Fahmi, S., Priwantoro, S. W., Cahdriyana, R. A., Hendroanto, A., Rohmah, S. N., & Nisa, L. C. (2019). Interactive learning media Using Kvisoft Flipbook Maker for mathematics learning. *Journal of Physics: Conference Series*, *1188*(1). https://doi.org/10.1088/1742-6596/1188/1/012075

Fitrianawati, M., & Setiyawati, T. (2021). Development of an ethnomathematics-based digital Flipbook module for least common multiple and greatest common divisor in the fourth grade of Elementary School. *Ethnomathematics Journal*, *2*(2), 67–79.

Fonda, A., & Sumargiyani, S. (2018). The developing math electronic module with scientific approach using Kvisoft Flipbook Maker Pro for XI grade of senior high school students. *Infinity Journal*, *7*(2), 109. https://doi.org/10.22460/infinity.v7i2.p109-122

Fulton, K. (2012). The Flipped Classroom: Transforming education at Byron High School: A Minnesota High School with severe budget constraints enlisted YouTube in its successful effort to boost math competency scores. *T.H.E. Journal Technological Horizons in Education*, *39*, 18.

Han, W., Susanto, D., Dewayani, S., Pandora, P., Hanifah, N., Miftahussururi, Nent, M. N., & Akbari, Q. S. (2017). *Materi pendukung literasi numerasi*. Kementerian Pendidikan dan Kebudayaan.

Haryanti, F., & Saputro, B. A. (2016). Pengembangan modul matematika berbasis Discovery Learning berbantuan Flipbook Maker untuk meningkatkan kemampuan pemahaman konsep siswa pada materi segitiga. *KALAMATIKA Jurnal Pendidikan Matematika*, *1*(2), 147. https://doi.org/10.22236/kalamatika.vol1no2.2016pp147-161

Herawati, N. S., & Muhtadi, A. (2018). Pengembangan modul elektronik (e-modul) interaktif pada mata pelajaran kimia kelas XI SMA. *Jurnal Inovasi Teknologi Pendidikan*, *5*(2), 180–191. https://doi.org/10.21831/jitp.v5i2.15424

Imansari, N., & Sunaryantiningsih, I. (2017). Pengaruh penggunaan e-modul interaktif terhadap hasil belajar mahasiswa pada materi kesehatan dan keselamatan kerja. *VOLT : Jurnal Ilmiah Pendidikan Teknik Elektro*, *2*(1), 11. https://doi.org/10.30870/volt.v2i1.1478

Kristanto, Y. D. (2021). Desain

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

aktivitas pembelajaran matematika digital dengan menggunakan Desmos. *Jurnal Pengabdian Kepada Masyarakat*, *27*(3), 192–199.

Kurniasih, M. D., Ermawati, I. R., Astuti, S., Fitriana, O., & Achmad, W. F. W. (2021). The effect of character-based teaching Flipbook media on the results of calculus learning. *International Conference on Computer & Information Sciences (ICCOINS)*, 65–67. https://doi.org/10.1109/ICCOINS49721.2021.9497228

Maryani, N., & Widjajanti, D. B. (2020). Mathematical literacy: How to improve it using contextual teaching and learning method? *Journal of Physics: Conference Series*, *1581*(1). https://doi.org/10.1088/1742-6596/1581/1/012044

Mulwanti, E., Misdalina, & Ningsih, Y. L. (2022). Pengembangan e-modul menggunakan Flipbook Maker pada materi matriks untuk siswa SMA. *Research & Learning in Primary Education*, *4*(1), 86–95.

Mulyati, S., & Evendi, H. (2020). Pembelajaran matematika melalui media game Quizizz untuk meningkatkan hasil belajar matematika SMP. *GAUSS: Jurnal Pendidikan Matematika*, *3*(1), 64–73. https://doi.org/10.30656/gauss.v3i1.2127

Novita, L., Sukmanasa, E., & Yudistira Pratama, M. (2019). Penggunaan media pembelajaran video terhadap hasil belajar siswa SD. *Indonesian Journal of Primary Education*, *3*(2), 64–72. https://repository.unpak.ac.id/tukangna/repo/file/files-20200110015955.pdf

Pawicara, R., & Conilie, M. (2020). Analisis pembelajaran daring terhadap kejenuhan belajar mahasiswa Tadris Biologi IAIN Jember di tengah Pandemi Covid-19. *ALVEOLI: Jurnal Pendidikan Biologi*, *1*(1), 29–38. https://doi.org/10.35719/alveoli.v1i1.7

Pierce, R., & Fox, J. (2012). Vodcasts and active-learning exercises in a "flipped classroom" model of a renal pharmacotherapy module. *American Journal of Pharmaceutical Education*, *76*(10). https://doi.org/10.5688/ajpe7610196

Pramana, M. W. A., Jampel, I. N., & Pudjawan, K. (2020). Meningkatkan hasil belajar biologi melalui e-modul berbasis Problem Based Learning. *Jurnal Edutech Undiksha*, *8*(2), 17. https://doi.org/10.23887/jeu.v8i2.28921

Prasetyono, R. N., & Hariyono, R. C. S. (2020). Development of Flipbook using web learning to improve logical thinking ability in logic gate. *International Journal of Advanced Computer Science and Applications*, *11*(1), 342–348. https://doi.org/10.14569/ijacsa.2020.0110143

Riduwan. (2012). *Skala pengukuran variabel-variabel penelitian*. Alfabeta.

Roehl, A., Reddy, S. L., & Shannon, G.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

J. (2013). The Flipped Classroom: An opportunity to engage millennial students through active learning strategies. *Journal of Family & Consumer Sciences*, *105*(2), 44–49. https://doi.org/10.14307/jfcs105.2.12

Sari, R. A., Misdalina, & Kesumawati, N. (2021). PMRI-based e-module development on sequences and series materials. *Desimal: Jurnal Matematika*, *4*(3), 325–338. https://doi.org/10.24042/djm

Selvia, Suratman, D., & Hartoyo, A. (2016). Pengembangan media pembelajaran matematika menggunakan Flipbook dikaitkan dengan kemampuan komunikasi matematis siswa SMA. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *7*(1). http://www.intelektual.org/index.php/AdMathEdu/article/view/12350

Serevina, V., Sunaryo, Raihanati, Astra, I. M., & Sari, I. J. (2018). Development of e-module based on Problem Based Learning (PBL) on heat and temperature to improve student's science process skill. *TOJET: The Turkish Online Journal of Educational Technology –*, *17*(3), 26–36.

Seruni, R., Munawaroh, S., Kurniadewi, F., & Nurjayadi, M. (2020). Implementation of e-module flip PDF professional to improve students' critical thinking skills through problem based learning. *Journal of Physics: Conference Series*, *1521*(4). https://doi.org/10.1088/1742-6596/1521/4/042085

Sriyanti, I., Almafie, M. R., Marlina, L., & Jauhari, J. (2021). The effect of using Flipbook-based e-modules on student learning outcomes. *Kasuari: Physics Education Journal (KPEJ)*, *3*(2), 69–75. https://doi.org/10.37891/kpej.v3i2.156

Sudarma, & et al. (2015). *Desain pesan kajian analitis desain visual teks dan image*. Graha Ilmu.

Sugiyono. (2010). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif, dan R&D*. Alfabeta.

Tessmer, M. (2013). *Planning and conducting formative evaluations*. Routledge.

Turmuzi, M., Arjudin, A., & Suryadi, R. (2021). Pemanfaatan Software Geogebra untuk meningkatkan pemahaman konsep matematika guru Sekolah Dasar di Kecamatan Narmada. *JMM: Jurnal Masyarakat Mandiri*, *5*(3), 949–963.

Waluya, S. B., Sukestiyarno, Y. L., & Cahyono, A. N. (2022). E-module design using Kvisoft Flipbook application based on mathematics creative thinking ability for Junior High Schools. *International Journal of Interactive Mobile Technologies*, *16*(4).

Wei, X., Cheng, I.-L., Chen, N.-S., Yang, X., Liu, Y., Dong, Y., Zhai, X., & Kinshuk. (2020). Effect of the Flipped Classroom on the mathematics performance of middle school students. *Educational Technology Research and Development*, *68*(3), 1461–1484.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v11i1.4428

https://doi.org/https://doi.org/10.1007/s11423-020-09752-x

Yanuarto, W. N. (2018). Flipped Classroom Learning Model untuk menumbuhkan kemandirian belajar matematika dan memaksimalkan peran teknologi pada pendidikan. *De Fermat : Jurnal Pendidikan Matematika*, *1*(1), 13–19. https://doi.org/10.36277/defermat.v1i1.10