JPPIPA 9(9) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Effect of Using Interactive Electronic Module with Contextual Approach on Students Learning Motivation on Conductor and Insulator Materials

Fitria Lafifa[1*], Dadan Rosana[1], Jumadi[1], Suyanta[2], S Nurohman[1], Sri Rejeki Dwi Astuti[2]

[1] Department of Science Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.
[2] Department of Chemistry Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.

Received: March 5, 2023
Revised: August 29, 2023
Accepted: September 25, 2023
Published: September 30, 2023

Corresponding Author:
Fitria Lafifa
fitrialafifa.2021@student.uny.ac.id

DOI: 10.29303/jppipa.v9i9.3354

Abstract: This study aims to develop an interactive electronic module product with a contextual approach and determine the effect of its use on students' learning motivation on conductor and insulator material. This study uses the R&D method with a 4D model. The research instrument is a questionnaire. The product was tested for feasibility, material validity, readability test, and measurement of student's learning motivation. The research subjects were seventh-grade students of MTsN 8 Banyuwangi and 5 validators. Data were analyzed qualitatively. The results of the study are the average product score is 3.9 with very good criteria and the percentage of 98% is very feasible, the validity of the material with a score of 3.8 with very good criteria and the percentage of 95% is very valid, the readability test obtained a score of 3 with very good criteria and percentage of 75% and learning motivation of students obtained a score of 3 and a percentage of 100% with high criteria. It can be concluded that the contextual approach interactive electronic module affects students' learning motivation on conductor and insulator material.

Keywords: Contextual Approach; Electronic Module; Learning Motivation

Introduction

Science education is learning related to everyday life. Science learning can also be said as a scientific-related process, where so that learning is effective and meaningful it can be linked between the concepts of the material understood and everyday life (Khusniati, 2012). The knowledge or material possessed by students is always related to the facts that exist in life so that students can apply the concepts they have to solve problems in everyday life (Marlina et al., 2011). In science learning, so that students can easily understand the existing concepts, the learning can be done with interesting activities (Wright, 2001).

One of the materials in science learning is conductor and insulator material. This material is still abstract. Conductors are objects that can conduct heat well. This object, if exposed to fire, hot water, or sunlight, in one part, can transmit heat in another. Heat insulating objects are objects that do not conduct heat well. This object when exposed to fire, hot water, or sunlight, in one part, cannot or slowly transfer heat to other parts (Rosma, 2016). The lack of learning activities in the process of learning science activities, the subject matter of conductors and insulators, has a low impact on student learning outcomes when teachers are still using the lecture method (conventional) (Silvia & Fasha, 2019). Learning is teacher-centered so that the involvement of students in learning is less so that students become passive and student learning outcomes are low (Susanti, 2021).

Motivation is the urge to do something so that the goal can be achieved (Badaruddin, 2015). Motivation can affect student learning success (Li & Baker, 2018). The motivation of junior high school students at the time of learning is still low. This can be seen in Ani Widyawati's research on junior high school students which shows that science learning motivation is low with

How to Cite:
Lafifa, F., Rosana, D., Jumadi, J., Suyanta, S., Nurohman, S., & Astuti, S.R.D. (2023). The Effect of Using Interactive Electronic Module with Contextual Approach on Students Learning Motivation on Conductor and Insulator Materials. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 6734–6741. https://doi.org/10.29303/jppipa.v9i9.3354

questionnaire data 53% of students feel bored with science lessons. To overcome the problem of low student motivation, several studies on teaching strategies have been carried out to motivate student involvement (Cheng et al., 2021). Active learning can affect students' learning motivation (Lan & Hew, 2020). There needs to be a stimulus for students to be active in learning so that students' learning motivation increases (de Barba et al., 2016).

Research that has been done to overcome the problem of low motivation in conductors and insulators is the development of guided inquiry learning tools (Suwatra, 2018). The use of audio-visual media in science learning with a cooperative learning model of the NHT type (Ahaya, 2020) and the use of experimental methods (Supardi, 2015). From several studies that have been developed, there are weaknesses, namely, to overcome the low learning motivation of students on conductors and insulators, which are still limited to devices, methods, models, and media. For this reason, a solution is given, namely the development of an interactive based electronic modul with a contextual approach so that participants' learning motivation can increase.

Electronic modules are packaged in the form of material containing videos, audio, and animations that are structured in a structured manner so that students can learn independently (Perdana et al., 2017). Videos and animations on electronic modules can contain material that is represented concretely (Adriani et al., 2021). Electronic modules can increase students' learning motivation (Syahrial et al., 2020). Electronic modules can make the learning atmosphere more effective because students can understand the material being studied so that quality learning will be produced (Daryanto, 2013; Linda et al., 2020; Wena, 2012).

The electronic module developed must be by the times, namely digital-based which can be created with the Flip PDF Professional application and packaged in android form. The Flip PDF application is an application that has various features such as images, videos, animations, youtube, hyperlinks, and combining files that can be used to create electronic modules (Himmah, 2019). E-modules developed using Flip PDF Professional can make students learn independently, make it easier for students to understand, and are flexible because they are based on Android so that they are not limited by space and time (Lestari et al., 2022).

A contextual approach is an approach that connects material with facts that has 7 steps, namely, constructivism, finding, asking questions, learning communities, modeling, reflection, and actual assessment (Sutejo, 2009). The seven components in contextual learning are constructivism, which is pre-existing knowledge, an inquiry is the knowledge and skills acquired by students, questioning is the activity of asking questions during learning, learning community is collaboration, modeling is a model that is imitated, reflection is a way of thinking that is past and present, authentic assessment is data collection to see the development of learning outcomes (Hamidah et al., 2017). The contextual approach means that students have connected the concept with circumstances in everyday life to solve the problems they have (Harwell, 1999). Learning with a contextual approach can encourage students to be more positive (Suryawati & Osman, 2018). Learning using a contextual approach can increase students' learning motivation (Ekowati et al., 2015; Setiawan & Harta, 2014).

Based on the problems that have been described, a solution is given, namely, to develop an interactive electronic module with a contextual approach to measure students' learning motivation on the topic of conductors and insulators and determine the effect of their use on students' learning motivation on conductors and insulators.

Method

The method used in this research is Research and Development which aims to produce a product and test the feasibility and readability of the product (Sugiyono, 2018). The product developed is an electronic module with a contextual approach that is packaged into an android and laptop application with conductor and insulator material as an opportunity to increase students' learning motivation on conductor and insulator material.

Table 1. Table of Details of Research Stages

Stages	Results
Define	Literature study, guide in making electronic modules and flipbooks
Design	Product drafts, student learning motivation instruments, and assessment instruments for material validation questionnaires, media, and readability tests
Develop	Electronic module application, material and media validation results, test results and learning motivation, and revision results
Dissemination	Product articles and product distribution

This study uses a 4D model, namely define, design, develop, and dissemination. The stages of the research with the results obtained can be seen in Table 1. To make the research flow clearer, see Figure 1.

The results of the data obtained are quantitative data in the form of data from material validation questionnaires, products, readability, and students' learning motivation. Meanwhile, qualitative data are in

the form of comments and suggestions from validators, teachers, and students. Data were obtained from the results of material and media validation questionnaires filled out by 5 validators as well as readability and learning motivation questionnaires by students of MTsN 8 Banyuwangi. Readability, motivation, material, and media questionnaires used a 4-level Likert scale, namely strongly agree, agree, disagree, and disagree (Likert, 1932). The data obtained were then analyzed using the average value analysis technique. So, the calculation of the average value can be formulated as follows (Formula 1).

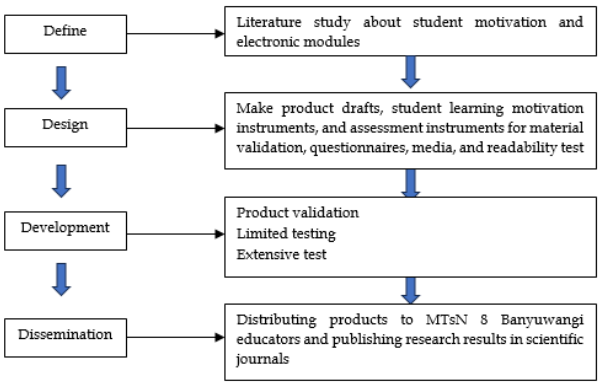

Figure 1. Research Flow

$$P = \frac{\sum R}{N} \times 100\% \quad (1)$$

Information:
P = Percentage score
R = Total score of answers given by each respondent
N = Total ideal score

Table 2. Table of Eligibility Criteria for Questionnaire Data with a Scale of 4

Quantitative Score Range	Category
X ≥ 3.00	Very good
2.50 X < X + 0.50	Well
2.00 X < 2.50	Not good
X < 2.00	Very Not Good

Then interpret and conclude the data using the percentage of product feasibility. The feasibility product is determined based on the criteria shown in Table 2 while the level of student learning motivation is in Table 3.

Table 3. Table of Learning Motivation Criteria

Score	Criteria
X ≥ $\bar{x}$ + SD	High
$\bar{x}$ - SD ≤ X < $\bar{x}$ + SD	Currently
X < $\bar{x}$ - SD	Low

Qualitative descriptive analysis of product feasibility and readability data from validators and students is taken into consideration in product development and improvement.

Result and Discussion

The product developed is an interactive electronic module which is packaged in the form of an android and laptop application with the help of the Flip PDF Professional application with a contextual approach to conductor and insulator material to increase students' learning motivation. The development of electronic modules is one solution to make learning more effective and make students able to understand the material being studied so that quality learning will be produced (Daryanto, 2013; Linda et al., 2020; Wena, 2012). Electronic module is a means to facilitate students to learn independently (Perdana et al., 2017). One of the innovative teaching materials that can support learning activities, especially digital-based ones, is electronic modules which are not yet widely used by educators (Prabasari et al., 2021). Electronic modules are developed in a structured manner starting from the title of the E-Modul, the identity of the electronic module, concept maps, and material topics that contain several activities. The results of the electronic module can be seen in Figures 2a and 2b.

Figure 2a. Home Electronic Module **Figure 2b.** Contents Page of Electronic Module

The topics presented contain several sub-topics ranging from Learning Activities 1 Heat and Specific Heat, Learning Activities 2 Heat Transfer, Learning Activities 3 Conductors and Insulators, Learning Activities 4 Examples of Physics in the Touch Sensing System (Skin) which includes the sense of touch in humans along with function, and skin disorders.

Examples of problems in everyday life are presented in the form of learning videos that can be accessed directly by students by pressing the play button on the video. Through video, it is hoped that learning will be more meaningful and can be represented concretely (Adriani et al., 2021).

Figure 3. Student Learning Activities

Learning activities are carried out by providing stimulus to students related to the material, namely the teacher asks about events when students accidentally hold a pot on the stove, what they feel. Then divide students into several groups and then are given electronic modules that can be opened on laptops and androids. Learning is carried out with the help of the electronic module. Then, students carry out experiments contained in the electronic module. Prepare several blocks A, B, C with the same size from different materials, then students heat the blocks and feel the heat. Then students compare which one can spread heat faster as an indicator of conductors and insulators. The application of the contextual approach to electronic modules can be seen when conducting practical identification of conductors and insulators. Students are given instructions to light a candle then heat some objects then let them sit for a while and then touch it to feel the heat with a cloth.

At the constructivism stage, students already know conductors and insulators in the previous material and from everyday life. Then at the inquiry stage, students light a candle and heat several blocks A, B, C with the same size with different materials then the students touch the object to see and compare which block heats up faster as an indicator in determining insulator and conductor objects then students write their results on the table. In the questioning stage, students answer the questions that have been prepared in the electronic module. In the Learning community stage, students in groups carry out practical activities. In the modeling stage, students try to draw parts of the skin as receptors. In the reflection stage, students reconnect the results obtained with the previous material. In the authentic assessment stage, students collect the results of the practicum and the results of the learning evaluation at the end of the electronic module. The application of the contextual approach in this electronic module is following that of the Ministry of National Education (Depdiknas, 2003), namely, there are 7 components in contextual learning, namely constructivism which is pre-existing knowledge, an inquiry is knowledge and skills acquired by students, questioning is the activity of asking questions at the time of writing. learning, learning community, namely collaboration, modeling, namely there is a model that is imitated, reflection is the way of thinking past, and present, authentic assessment is collecting data to see the development of learning outcomes (Hamidah et al., 2017).

The existence of active and interesting learning in learning helps participants to increase students learning motivation (Syahrial et al., 2020). The electronic module interactive flipbook with a contextual approach can be used as an opportunity to increase students' learning motivation. The product feasibility test was assessed by 5 validators, namely 4 students of Master of Science Education, Universitas Negeri Yogyakarta, and one science teacher at MTsN 8 Banyuwangi. The summary of the results of the average product assessment is presented in Figure 5.

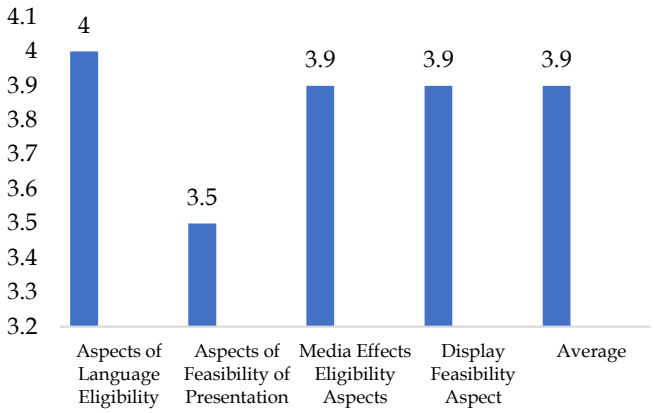

Figure 5. Product Feasibility Average

The results of the product feasibility test have an average feasibility score of 3.9 with very good criteria and a percentage of 98% with very feasible criteria. The summary of the average results of the material assessment is presented in Figure 6.

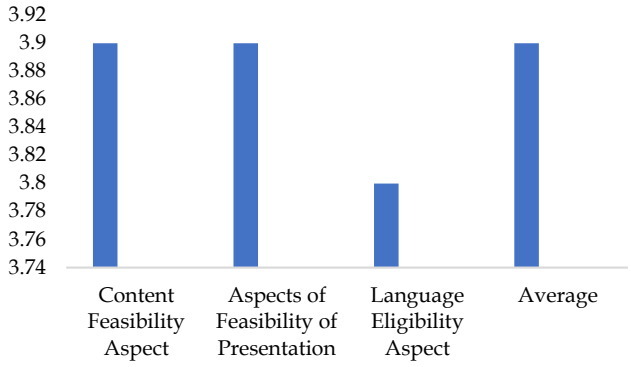

Figure 6. Material Validity Average

The results of the material validity test resulted in a score of 3.8 with very good criteria and an average percentage of 95%. with very valid criteria. Thus, the development of an interactive electronic module Flip Book with a contextual approach to conductor and insulator material can be used as learning material that supports increasing students' learning motivation.

The electronic module readability test that has been carried out produces quantitative and qualitative data obtained from 20 grade VII students of MTsN 8 Banyuwangi. Quantitative data were obtained from the readability questionnaire scores and students' learning motivation. From the results of the readability test, a score of 3 was obtained with very good criteria and the percentage of feasibility was 75% with very feasible criteria. The results of the students' learning motivation test obtained a score of 3 and a percentage of 100% with high criteria.

From the results of the data obtained, it shows that the electronic module can affect students' learning motivation on conductors and insulators and is feasible to function as an opportunity to increase students' learning motivation. The results of these data can be proven at the time of learning where students are more active and eager to learn by using teaching materials that contain videos and animations. Students are also more interested and motivated when conducting experiments on testing conductors and insulators using candles and blocks. The results of the validity data also show that this electronic module is feasible for learning as indicated by the total value of validators who are experts in their fields.

This follows the research that has been researched that interactive electronic modules can increase students' learning motivation (Syahrial et al., 2020). In addition, the electronic module has an attractive design that can increase student learning motivation (Ratnawati & Khaharsyah, 2022). Motivation is very important when students study in the classroom, because motivation will influence students' skills and learning outcomes (Hidayati et al., 2022; Syamsinar et al., 2023). Videos and animations on electronic modules can contain material that is represented concretely (Adriani et al., 2021). Animation can show the visualization of abstract concepts into concrete concepts (Castro-Alonso et al., 2019). Research shows that the use of animation can increase students' knowledge and understanding of science concepts (Dalacosta et al., 2009). The presence of animated videos in electronic modules can improve students' learning in studying science (Hanif, 2020; Hapsari et al., 2019; Ploetzner et al., 2020). The existence of animation can also increase students' understanding of science material (Hobban & Nielsen, 2013).

The advantage of using the module is that students can find out the extent of their ability to absorb the material (Arviyanto Himawan et al., 2020; Liana et al., 2022). Learning can run effectively if the learning process uses electronic modules so that learning objectives can be achieved (Rasmi et al., 2023). This research is supported by research which shows that currently students prefer learning using smartphones with electronic module (Arviyanto Himawan et al., 2020). The results of this research are in line with Ndoa & Jumadi, (2022) those who suggest that the use of electronic modules can increase students' learning motivation.

Learning with a contextual approach can encourage students to be more positive (Suryawati & Osman, 2018). Learning using a contextual approach can increase students' learning motivation (Ekowati et al., 2015; Setiawan & Harta, 2014). Learning using contextual can motivate students to learn (Rahmatullah et al., 2023). Contextual model learning can provide new experiences that stimulate the brain to make connections between experiences, thereby helping students to find new meaning (Ningrum & Murti, 2023). Contextual is done to find answers to unanswered questions or to understand something better (Milanto et al., 2023).

Conclusion

Based on the results obtained, it can be concluded that the interactive electronic module contextual approach can increase students' learning motivation. Recommendations for future research can be developed again and can use as a supporting medium in learning.

Acknowledgments
I would like to thank the lecturers, validators, teachers and students of MTsN 8 Banyuwangi who have participated in this research.

Author Contribution
The authors provide equal contribution to this work.

Funding
This research uses independent costs.

Conflicts of interest
No conflict of ineterest.

References

Adriani, D., Azhar, M., Dj, L., Putra, A., & Yerimadesi. (2021). Validity and Practicality Level of Acid-Base Electronic Module Based on Structured Inquiry Containing Three Levels of Chemical Representation for Senior High School Student. *Journal of Physics: Conference Series*, *1788*(1). https://doi.org/10.1088/1742-6596/1788/1/012038

Ahaya, A. (2020). Penggunaan Media Audio Visual dalam Pembelajaran IPA Dengan Model Cooperative Learning Tipe NHT Pada Materi Konduktor dan Isolator Panas Di Kelas VI Dikelas VI SDN No. 84 Kota Tengah. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, *4*(3), 225. https://doi.org/10.37905/aksara.4.3.225-232.2018

Arviyanto Himawan, N., Luliyarti, D. S., Jumadi, & Astuti, D. P. (2020). Physics Learning E-Module Integrated with Practicing Pancasila Values on Momentum and Impulse: Is it Effective to Improve Students" Critical Thinking Skill and Hard Work Character? *JIPF (Jurnal Ilmu Pendidikan Fisika)*, *8*(1), 30–41. Retrieved from https://journal.stkipsingkawang.ac.id/index.php/JIPF/article/view/3128

Badaruddin, A. (2015). *Peningkatan Motivasi Belajar Siswa Melalui Konseling Klasikal*. Abe Kreatifindo.

Castro-Alonso, J. C., Wong, M., Adesope, O. O., Ayres, P., & Paas, F. (2019). Gender Imbalance in Instructional Dynamic Versus Static Visualizations: a Meta-analysis. *Educational Psychology Review*, *31*(2), 361–387. https://doi.org/10.1007/s10648-019-09469-1

Cheng, L., Abraham, J., Trenberth, K. E., Fasullo, J., Boyer, T., Locarnini, R., Zhang, B., Yu, F., Wan, L., Chen, X., Song, X., Liu, Y., Mann, M. E., Reseghetti, F., Simoncelli, S., Gouretski, V., Chen, G., Mishonov, A., Reagan, J., & Zhu, J. (2021). Upper Ocean Temperatures Hit Record High in 2020. *Advances in Atmospheric Sciences*, *38*(4), 523–530. https://doi.org/10.1007/s00376-021-0447-x

Dalacosta, K., Kamariotaki-Paparrigopoulou, M., Palyvos, J. A., & Spyrellis, N. (2009). Multimedia application with animated cartoons for teaching science in elementary education. *Computers & Education*, *52*(4), 741–748. https://doi.org/10.1016/j.compedu.2008.11.018

Daryanto. (2013). *Menyusun Modul Bahan Ajar untuk Persiapan Guru dalam Mengajar*. Gava Media.

de Barba, P. G., Kennedy, G. E., & Ainley, M. D. (2016). The role of students' motivation and participation in predicting performance in a MOOC. *Journal of Computer Assisted Learning*, *32*(3), 218–231. https://doi.org/10.1111/jcal.12130

Depdiknas. (2003). *Kumpulan Pedoman Kurikulum 2004*. Depdiknas.

Ekowati, C. K., Darwis, M., Upa, H. M. D. P., & Tahmir, S. (2015). The Application of Contextual Approach in Learning Mathematics to Improve Students Motivation At SMPN 1 Kupang. *International Education Studies*, *8*(8), 81–86. https://doi.org/10.5539/ies.v8n8p81

Hamidah, H., Noer, S. H., & Caswita. (2017). Pengembangan LKPD Berbasis Kontekstual dalam Meningkatkan Pemahaman Konsep dan Disposisi Matematis. *Jurnal Pendidikan Matematika Universitas Lampung*, *5*(10), 1–10. Retrieved from http://jurnal.fkip.unila.ac.id/index.php/MTK/article/view/14341

Hanif, M. (2020). The development and effectiveness of motion graphic animation videos to improve primary school students' sciences learning outcomes. *International Journal of Instruction*, *13*(4), 247–266. https://doi.org/10.29333/iji.2020.13416a

Hapsari, A. S., Hanif, M., Gunarhadi, & Roemintoyo. (2019). Motion graphic animation videos to improve the learning outcomes of elementary school students. *European Journal of Educational Research*, *8*(4), 1245–1255. https://doi.org/10.12973/eu-jer.8.4.1245

Harwell. (1999). *Why do I have to learn this? Workbook*. CORD.

Hidayati, L. N., Utami, R., Wiyarsi, A., & Ikhsan, J. (2022). Analysis Students' Learning Motivation on the Implementation of Direct Instruction Learning Model. *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2417–2422. https://doi.org/10.29303/jppipa.v8i5.2090

Himmah, E. F. (2019). *Pengembangan E-modul menggunakan Flip PDF Professional pada Materi Suhu dan Kalor*. Doctoral dissertation, UIN Raden Intan Lampung.

Hobban, G., & Nielsen, W. (2013). Learning Science through Creating a 'Slowmation': A case study of preservice primary teachers. *International Journal of Science Education*, *35*(1), 119–146. https://doi.org/10.1080/09500693.2012.670286

Khusniati, M. (2012). Pendidikan karakter melalui pembelajaran IPA. *Jurnal Pendidikan IPA Indonesia*, *1*(2), 204–210. Retrieved from https://journal.unnes.ac.id/nju/index.php/jpii/article/view/2140

Lan, M., & Hew, K. F. (2020). Examining learning engagement in MOOCs: a self-determination

theoretical perspective using mixed method. *International Journal of Educational Technology in Higher Education*, *17*(1). https://doi.org/10.1186/s41239-020-0179-5

Lestari, E., Nulhakim, L., & Indah Suryani, D. (2022). Pengembangan E-modul Berbasis Flip Pdf Professional Tema Global Warming Sebagai Sumber Belajar Mandiri Siswa Kelas VII. *PENDIPA Journal of Science Education*, *2022*(6), 338–345. https://doi.org/10.33369/pendipa.6.2.338-345

Li, Q., & Baker, R. (2018). The different relationships between engagement and outcomes across participant subgroups in Massive Open Online Courses. *Computers and Education*, *127*, 41–65. https://doi.org/10.1016/j.compedu.2018.08.005

Liana, D. E., Muzzazinah, M., & Indrowati, M. (2022). Development of Science E-Modules Based of Guided Inquiry to Improve Students' Critical Thinking Ability. *Jurnal Penelitian Pendidikan IPA*, *8*(3), 1368–1375. https://doi.org/10.29303/jppipa.v8i3.1668

Likert, R. (1932). *A Technique for the Measurement of Attitudes,. In Woodworth (Ed.)*, Encyclopedia of Research Design, Archieves Of Psychology. https://doi.org/10.4135/9781412961288.n454

Linda, R., Nufus, H., & Susilawati. (2020). The implementation of chemistry interactive e-module based on Kvisoft Flipbook Maker to improve student' self-learning. *AIP Conference Proceedings*, *2243*. https://doi.org/10.1063/5.0002309

Marlina, Pipin, T. ., & Suciati. (2011). Dasar Rias (Tata Kecantikan Wajah Dan Rambut) Untuk Meningkatkan Kreativitas Mahasiswa. *Jurnal Penelitian Pendidikan*, *12*(1), 11–21. Retrieved from http://jurnal.upi.edu/penelitian-pendidikan/view/1818/DASAR%20RIAS%20(TATA%20KECANTIKAN%20WAJAH%20DAN%20RAMBUT)%20UNTUK%20MENINGKATKAN%20KREATIVITAS%20MAHASISWA

Milanto, S., Suprapto, N., & Budiyanto, M. (2023). Effectiveness of Contextual Learning Using the Guided Inquiry Approach to Improve Students' Scientific Literacy Ability. *Jurnal Penelitian Pendidikan IPA*, *9*(1), 444–448. https://doi.org/10.29303/jppipa.v9i1.2785

Ndoa, Y. A. A., & Jumadi, J. (2022). Increasing Learning Motivation Through the Application of Physics E-Module Based on Flipped Learning. *Jurnal Penelitian Pendidikan IPA*, *8*(3), 1223–1230. https://doi.org/10.29303/jppipa.v8i3.1556

Ningrum, A. W., & Murti, R. C. (2023). Contextual Learning Models in Improving Elementary School Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 48–53. https://doi.org/10.29303/jppipa.v9i5.2360

Perdana, F. A., Sarwanto, S., Sukarmin, S., & Sujadi, I. (2017). Development of e-module combining science process skills and dynamics motion material to increasing critical thinking skills and improve student learning motivation senior high school. *International Journal of Science and Applied Science: Conference Series*, *1*(1), 45. https://doi.org/10.20961/ijsascs.v1i1.5112

Ploetzner, R., Berney, S., & Bétrancourt, M. (2020). A review of learning demands in instructional animations: The educational effectiveness of animations unfolds if the features of change need to be learned. *Journal of Computer Assisted Learning*, *36*(6), 838–860. https://doi.org/10.1111/jcal.12476

Prabasari, J. S. M., & Wahyuningsih, D. (2021). Pengembangan Elektronik Modul Berbasis Problem Based Learning Pada Materi Zat Aditif Dan Zat Adiktif Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Jurnal Penelitian Pendidikan IPA*, *7*(SpecialIssue), 312–319. https://doi.org/10.29303/jppipa.v7ispecialissue.1233

Rahmatullah, R., Bahtiar, B., & Maimun, M. (2023). Development of Contextual Physics Teaching Materials Assisted by Virtual Lab Based-Android as Alternative Learning in Covid-19 Pandemic. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 4015–4021. https://doi.org/10.29303/jppipa.v9i5.2468

Rasmi, D. P., Hendri, M., & Azriyanti, R. (2023). Analysis of the Need for Development of Teaching Materials in the Form of STEM-Based Electronic Modules. *Jurnal Penelitian Pendidikan IPA*, *9*(6), 4135–4141. https://doi.org/10.29303/jppipa.v9i6.2683

Ratnawati, D., & Khaharsyah, A. (2022). Pengembangan E-modul Sistem Pendingin Berbasis Website Google Sites Untuk Siswa Sekolah Menengah Kejuruan. *Jurnal Dinamika Vokasional Teknik Mesin*, *7*(1), 29-34. http://dx.doi.org/10.21831/dinamika.v7i1.48726

Rosma. (2016). Penerapan Metode Pembelajaran Eksperimen Untuk Meningkatkan Hasil Belajar Siswa Pada Pokok Bahasan Konduktor Dan Isolator Di Kelas VI SDN Percontohan. *Jurnal Kreatif Tadulako Online*, *4*(3), 228–241. Retrieved from http://jurnal.untad.ac.id/jurnal/index.php/JKTO/article/view/5489

Setiawan, R. H., & Harta, I. (2014). Pengaruh Pendekatan Open-Ended Dan Pendekatan Kontekstual Terhadap Kemampuan Pemecahan Masalah Dan Sikap Siswa Terhadap Matematika. *Jurnal Riset Pendidikan Matematika*, *1*(2), 241. https://doi.org/10.21831/jrpm.v1i2.2679

Silvia, S., & Fasha, E. F. (2018). Pembelajaran Matematika Materi Bangun Ruang Berbasis Soal Cerita. *DIALEKTIKA Jurnal Pemikiran dan Penelitian*

Pendidikan Dasar, 8(1), 1-7. Retrieved from https://journal.peradaban.ac.id/index.php/jdpgsd/article/view/228

Sugiyono. (2018). *Metode Penelitian Pendidikan*. In Alfabeta.

Supardi. (2015). Meningkatkan Prestasi Belajar Siswa Kelas VI SDN 2 Watulimo Trenggalek pada Bidang Studi IPA Materi Konduktor dan Isolator Panas Melalui Metode Eksperimen. *JUPEDASMEN*, *1*(3), 130–137. Retrieved from https://docplayer.info/38247051-Oleh-supardi-sdn-2-watulimo-trenggalek.html

Suryawati, E., & Osman, K. (2018). Contextual learning: Innovative approach towards the development of students' scientific attitude and natural science performance. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(1), 61–76. https://doi.org/10.12973/ejmste/79329

Susanti, I. (2021). Penerapan Model Pembelajara Kooperatif Tipe TAI (Team Assisted Individualization) Untuk Meningkatkan Prestasi Belajar Siswa Materi Konduktordan Isolator Panas IPA Kelas VI-B. *Suluh: Jurnal Bimbingan dan Konseling, 7*(1), 41-47. https://doi.org/10.33084/suluh.v7i1.2739

Sutejo, B. (2009). *Panduan Pengembangan Pembelajaran IPA Terpadu*. Balitbang Depdiknas.

Suwatra, W. (2018). *Pengembangan Bahan Ajar Elektronik Pemanasan Global Untuk Menumbuhkan Keterampilan Berpikir Kritis Siswa SMA.* Tesis, Universitas Lampung.

Syahrial, Asrial, Melinda, L. G., Rizky Fajar, M., Jannah, N., Puspitasari, T. O., & Putri, Y. E. (2020). Impact E-modul ethnoconstructivism: Attitude & motivation. *International Journal of Scientific and Technology Research*, *9*(4), 3752–3757. Retrieved from https://www.ijstr.org/final-print/apr2020/Impact-E-modul-Ethnoconstructivism-Attitude-Motivation.pdf

Syamsinar, S., Ali, S., & Arsyad, M. (2023). Pengaruh Keterampilan Berpikir Kritis dan Motivasi Berprestasi Terhadap Hasil Belajar Fisika Peserta Didik di SMA Negeri 2 Gowa. *Jurnal Penelitian Pendidikan IPA*, *9*(1), 322–331. https://doi.org/10.29303/jppipa.v9i1.2327

Wena, M. (2012). *Strategi Pembelajaran Inovatif Kontemporer*. Bumi Aksara.

Wright, T. (2001). Karen in motion the role of physical enactment in developing an understanding of distance, time, and speed. *Journal of Mathematical Behavior*, *20*(2), 145–162. https://doi.org/10.1016/S0732-3123(01)00072-4