



## Training On Introduction To Physics Software For Interactive Learning To Boost Students's Interest In Electromagnetism At SMK Gajah Mada In Lampung

Apriana<sup>(1\*)</sup>, Novalia Nurbaiti<sup>(2)</sup>, Ridho Hanan Asrowi<sup>(3)</sup>, Ainol Yaqin<sup>(4)</sup>, Tisar Dewi Pratiwi<sup>(5)</sup>, Mega Aulia Putri<sup>(6)</sup>, Laras Wati<sup>(7)</sup>

<sup>1</sup>Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

<sup>2</sup> Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

<sup>3</sup> Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

<sup>4</sup> Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

<sup>5</sup> Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

<sup>6</sup> Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

<sup>7</sup> Falkultas Sains, Institut Teknologi dan Sains Nahdlatul UlamaLampung, Indonesia

\*Corresponding Author. E-mail: [apriana@itsnulampung.ac.id](mailto:apriana@itsnulampung.ac.id)

### ARTICLE INFO

#### Article History:

Received: 29-May. 2026

Revised: 08-Jun. 2026

Accepted: 25-Jun. 2026

#### Keywords:

Electromagnetism,  
PhET Interactive  
Simulations,  
Simulations, Training,  
and Vocational High  
School.

### ABSTRACT

Pelatihan pengenalan software fisika merupakan salah satu strategi pembelajaran yang efektif untuk membantu siswa Sekolah Menengah Kejuruan dalam memahami konsep-konsep fisika yang bersifat abstrak. Kegiatan pengabdian kepada masyarakat ini bertujuan untuk meningkatkan minat belajar siswa SMK Gajah Mada Bandar Lampung terhadap mata pelajaran fisika, khususnya pada materi listrik-magnet. Pelatihan ini menggunakan media *PhET Interactive Simulations* yang memungkinkan siswa memvisualisasikan fenomena seperti muatan listrik, interaksi antar muatan, garis medan listrik, serta konsep medan magnet secara interaktif. Metode pelaksanaan meliputi penyampaian materi, pengenalan software, serta praktik simulasi secara langsung. Hasil kegiatan menunjukkan bahwa siswa lebih aktif, antusias, dan terlibat dalam proses pembelajaran. Berdasarkan data angket minat siswa di peroleh hasil 11,11 % siswa memiliki minat belajar dengan kriteria sangat tinggi dan 88,89 % siswa memiliki minat belajar dengan kriteria tinggi. Sehingga, rata-rata nilai minat belajar siswa sebesar 76,67 dengan kriteria tinggi. Hal ini mengindikasikan bahwa penggunaan simulasi interaktif efektif dalam meningkatkan minat belajar siswa. Temuan ini sejalan dengan penelitian yang menunjukkan bahwa penggunaan simulasi berbasis teknologi dapat meningkatkan keterlibatan dan pemahaman konsep siswa secara signifikan.

Training in the use of physics software is an effective teaching strategy to help vocational high school students understand abstract physics concepts. This community service activity aims to increase the interest of students at SMK Gajah Mada Bandar Lampung in learning physics, particularly in the subject of electromagnetism. This training uses PhET Interactive Simulations, which allow students to visualize phenomena such as electric charge, interactions between charges, electric field lines, and magnetic field concepts interactively. The implementation methods included material delivery, software introduction, and hands-on simulation practice. The results of the activity showed that students



were more active, enthusiastic, and engaged in the learning process. Based on the data from the student learning interest questionnaire, the result show that 11,11 % of student have a very high level of learning interest and 88,89 % have a high level of learning interest. Thus, the average score for student learning interest is 76,67, which falls into the high category. This indicates that the use of interactive simulations is effective in increasing students' interest in learning. These findings are consistent with research showing that the use of technology-based simulations can significantly improve student engagement and conceptual understanding.

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#### How to Cite:

Apriana, at al. (2026). Training On Introduction To Physics Software For Interactive Learning To Boost Students's Interest In Electromagnetism At SMK Gajah Mada In Lampung. *Journal of Research Applications in Community Services*, 5(2), 95-108. <https://doi.org/10.32665/JaRCOMS.v5i2.6659>

## INTRODUCTION

Evidence from the field show that most student do not like physics. This finding emerged when the Community Service Team from the Physics Program at the ITS NU Lampung conducted fieldwork. Through interviews 10th-grade students in the Computer and Network Engineering Program at Gajah Mada Vocational High School in Bandar Lampung, it was found that most of students do not like physics class. Of the 27 respondents, 2 said they liked physics class and 25 said they did not liked physics class. The reasons given by those who did not like physics class varied. Based on data collected from 27 respondents, 25 respondents stated that they did not like physics for various reason: 8 respondents said that physics difficult to learn, 4 respondents said that physics concepts were difficult, 4 respondents said that studying physics is abstract, 6 respondents said that physics involve a lot of calculations, and 3 respondents said that physics is confusing and make their heads spin.

If physics is taught solely through lecturer or formulas, concepts such as parabolic motion, Newton's Law, and electromagnetism can feel abstract and difficult to visualize. Many students simply memorize the material without truly observing and understanding the phenomena. When physics is taught through hands-on experiments in the laboratory, it is often hindered by limited and expensive equipment, and not all phenomena can be observed directly (for example, phenomena on the atomic scale). Based on the reasons above, simulations offer a solution for making physics instruction more engaging and enjoyable, thereby increasing student's interest the subject. One simulation tool that can be used is PhET Interactive Simulations. PhET Simulation tools have a strong positive impact on improving learning outcomes in science, specifically regarding the topic is waves, and are recommended for integration as an innovative solution to address difficulties in learning abstract concepts (Simamora et al., 2025). Science teachers have successfully utilize PhET Interactive Simulations as a practical tool in online science instruction. This is evident in their increased knowledge of the basics of PhET, their ability to download and install PhET, operate PhET, and create worksheet to apply PhET. The training outcomes are expected to help teachers improve the quality of science instruction in the era of distance learning (Negeri et al., 2023). By using PhET Interactive Simulations, students can visually observe phenomena that were previously abstract.

They can also adjust specific variables to see the immediate effects visually and interactively. PhET Simulations are an effective interactive learning tool that supports understanding of the subject matter and the development of critical thinking skills. Integrating PhET as a digital learning tool can serve as an innovation to improve the quality of science education in the digital age (Nugroho et al., 2025). Some of the advantages of PhET over other applications include the fact that it is known for being interactive, user-friendly, and flexible; it features an attractive interface; it can demonstrate phenomena that are difficult to observe directly; and it is free to access and can be downloaded for offline use (Barat, 2023).

This Community Service activity focused on training participants in the use of the physics software PhET Interactive Simulations. The activity began with an introduction to PhET Interactive Simulations software and its components (it includes five main subjects, each of which contains numerous simulations). For the physics course, there are approximately 66 simulations available. The instructor guides students through the software introduction and the simulation activities, allowing them to follow along from start to finish. PhET Interactive Simulations are said to be quite easy to use and accessible to anyone, anywhere. This community service activity focuses on electromagnetism. The use of PhET Simulations was found to be effective in increasing student engagement and understanding; although challenges such as limited equipment and access to technology remain, this training has proven to have a positive impact on teachers' readiness to utilize digital media. PhET simulations offer an alternative solution to address laboratory limitations and improve the quality of science education (Mutiarra et al., 2025). During the PhET Interactive Simulations lab session, students at SMPIT Daruttaqwa were seen to be happy, enthusiastic, and motivated to use the virtual lab during classroom instruction (Purwanti & Mayanti, 2023).

Given the difficulty of physics in school, this community service activity aims to increase the interest and engagement of students at SMK Gajah Mada in Bandar Lampung in the subject of physics through training in the use of physics software, specifically PhET Interactive Simulations, covering the topic of electricity and magnetism, specifically visualizing electric charges, interactions between electric charges, electric field lines, magnets, magnetic field lines, and the relationship between magnetic and electric fields. The novelty of the activity lies in the introduction of a virtual laboratory that can be accessed both online and offline; it is accessible to anyone, and the method of access is simple and cost-effective, designed to support the physics learning process in settings with limited laboratory resources. Additionally, learning with PhET Simulations can increase students' interest in physics topics because the learning experience is more interactive and visually engaging through the virtual laboratory. PhET Simulations are effectively used to help teachers and students learn physics concepts; they work particularly well when combined with inquiry-based learning models; and they have the advantage of being effective in explaining abstract physics concepts, while their disadvantage is that their implementation in schools is highly dependent on the availability of computer units (Rizaldi & Jufri, 2020).

It is hoped that this simulation-based physics software training on the topic of electromagnetism at SMK Gajah Mada in Bandar Lampung will have a significant impact on increasing students' interest and motivation to learn. Through this activity, students can independently use PhET Interactive Simulations anytime and anywhere, choose the topics or

themes they wish to explore, adjust the desired variables, and understand the relationship between those variables. This training activity not only increases students' interest and engagement in physics but also allows them to visually observe phenomena that are not visible to the naked eye.

The use of simulations in physics education has been shown to help students understand abstract concepts through more concrete visualizations. Simulation-based media also allow students to explore concepts independently and interactively, thereby increasing their engagement in the learning process. Furthermore, the use of PhET Interactive Simulations has been shown to significantly improve students' conceptual understanding and learning outcomes.

Physics instruction is most effective when conducted in a laboratory; however, there are limitations regarding the availability of laboratory equipment, and the high cost of purchasing such equipment is another obstacle to its provision. This situation is also evident at SMK Gajah Mada in Bandar Lampung, thereby hindering a learning process that should be engaging and interactive.

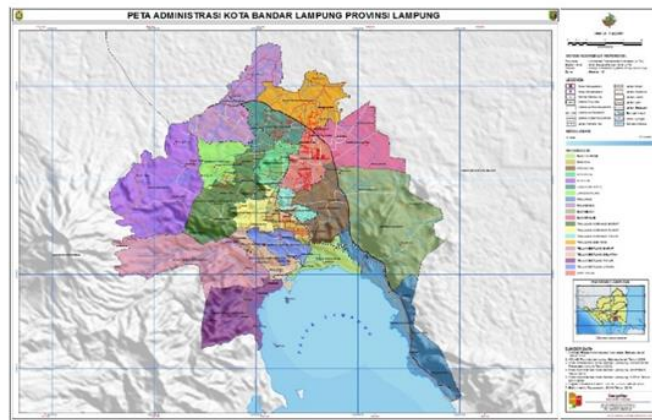
Therefore, strategic measures are needed to address this issue. This simulation-based physics software training is expected to be one solution to the problem described above. Through this community service activity, we hope to increase students' interest and enthusiasm for learning physics. The use of PhET application as a digital tool serves as an additional learning resource; utilizing the PhET application can increase student engagement during the learning process because it is easy to use and provides quick and accurate solutions; furthermore, using the PhET application can boost student motivation since it can be accessed anywhere, enabling self-directed learning (Ashadi et al., 2025). The evaluation results show that 85-90% of participants demonstrated improved understanding of physics concepts and increased interest in visual and exploratory learning methods. These findings suggest that the integration of Deep Learning and PhET can enrich physics education, making it more contextual, engaging, and aligned with 21<sup>st</sup>-century competencies. This program serves as a first step toward sustainable educational transformation, with teachers as the drivers of innovation (Bunyi, 2025).



(a)



(b)



(c)

Picture 1. (a) Location of the SMK Gajah Mada PKM activity, (b) Inside the school, (c) Location of the SMK Gajah Mada Bandar Lampung PKM activity, Administrative Map Kota of Bandar Lampung City

## METHOD

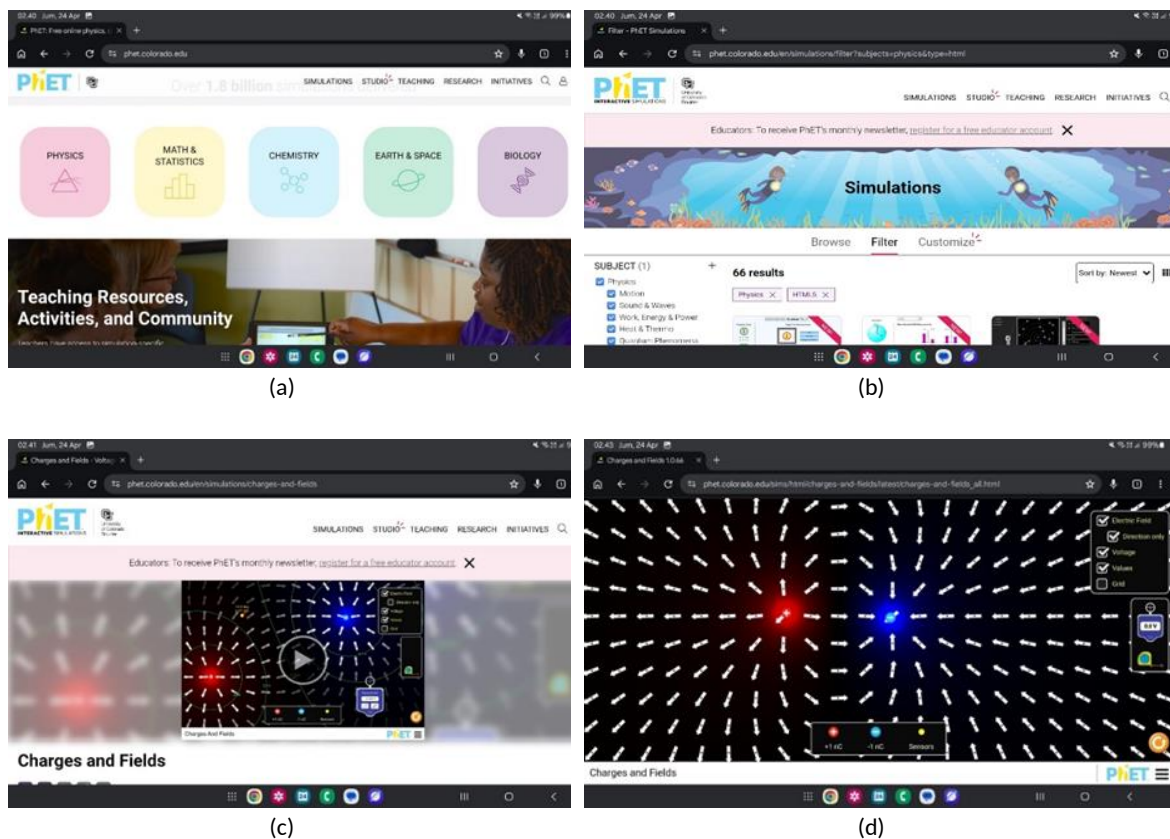
The implementation method for this community service activity consists of a preparation phase, a training phase, a mentoring phase, an evaluation phase, and success indicators. During the preparation phase, we prepare all the research equipment, tools, and materials needed for the activity. This includes preparing initial interview sheets, student learning interest questionnaires, laptops, projectors, terminals, and internet data plans. The training session was conducted by the presenter, beginning with an introduction to PhET Interactive Simulations and continuing with a demonstration of one of the simulations using a laptop connected to a projector so that the students could observe it. PhET Interactive Simulations is web-based application that features simulations of various physics concepts. With PhET Simulations, students can conduct various experiments that cannot be performed in real life. PhET Simulations resources are available for free at [website https://phet.colorado.edu/](https://phet.colorado.edu/) to both educators and students. PhET can be accessed on a computer or via an android browser, and can even be integrated into other applications such as Power Point, Android apps, Nearpod, and more. This is because PhET Simulations are HTML-based (Verdian et al., 2020).

The use of PhET in physics education can enhance students' understanding of physics concepts and motivated them to study physics. Strategies for using PhET in physics education include using it as a tool to explain physics concepts, having students conduct virtual experiments, and having them write reports on those virtual experiments (Liswar et al., 2023). The use of digital technology can enhance conceptual understanding, increase participation, and provide safe, reproducible experimental experiences. However, limited infrastructure, unequal access, technical issues, and inadequate teacher preparation remain significant barriers (Pardayeva, 2027).

The use of PhET Simulations combined with a guided inquiry learning model can improve student learning outcomes, science process skills, and interest in learning. This is because guided inquiry helps students understand their hands-on experiences when using PhET Simulations. In addition, the interactive and engaging nature of the simulations also helps increase students' interest in learning (Azizaturedha & Fatmawati, 2019). The use of STEM-Based virtual laboratories

can improve students' problem-solving skills. These skills are evident in students' ability to find solutions through the process of gathering and organizing information with the help of virtual laboratories such as PhET Simulations (Laila, 2020). The use of the PhET virtual learning environment in distance learning via zoom can moderately improve high school students' higher-order thinking skills (Aprilia et al., 2020).

To get started with PhET Interactive Simulations, open a web browser on your laptop, such as google chrome. Once google chrome is open, go to the Google.com search engine. Type "PhET Interactive Simulations" into the search bar. When the results appear, simply click on the link, and a window will open displaying five subject areas, each containing a wide variety of simulations. Since the focus here is on the subject of physics, simply click on the physics subject. There are many different simulations available. This activity focuses on electromagnetism, so we will select simulations related to that topic. The topics include charges and fields, Coulomb's Law, Generators, Faraday's Law, Magnets and compasses, Magnets and electromagnets, etc. To run a simulation, simply click on the desired topic; you can then adjust the variables as needed, observe the effects of these changes, and draw conclusions about the relationships between variables.



Picture 2. Simulation view using PhET (a) link to phet.colorado.edu, (b) PhET home screen, (c) When the "Charges and Fields" theme is clicked (d) Simulation in progress

The training process begins with an introduction to the PhET Interactive Simulations Software, its components, and how to run the simulations. Follow the same steps to open other simulations in PhET Interactive Simulations. A simulation-based approach was chosen because it has proven effective in enhancing students' conceptual understanding and engagement in science learning. The use of interactive digital media allows students to observe phenomena that are difficult to observe directly and to understand the relationships between variables in a more systematic way.

The mentoring phase was conducted by five instructors, who guided students as they used or practiced simulations in the virtual laboratory (PhET) via their own smartphones. This allowed students to gain hands-on experience using the virtual laboratory. The next phase involved an evaluation. The evaluation took the form of a question- and-answer session led by the resource person with the students or training participants regarding the training process, the use of simulations, and the concepts that had been taught. Finally, regarding success indicators, to determine whether this training was successful or not, a questionnaire was provided to assess students' interest in learning physics using PhET simulations.

## RESULTS

### Date and Time

The PKM event was held on Friday, April 24, 2026, at SMK Gajah Mada in Bandar Lampung. SMK Gajah Mada was chosen as the venue for the event because it supports technology- based learning for students, particularly those in the computer and network engineering program.

### Implementation Results

A training session on physics software for interactive learning was held at SMK Gajah Mada in Bandar Lampung. The training, which involved 10<sup>th</sup>-grade student majoring in Computer and Network Engineering, proceeded smoothly and according to plan. The PKM activity began with an introduction to the physics software, PhET Interactive Simulations, by the supervising lecturer. This was followed by an explanation of the various components of the simulation. Once the participants had grasped the concepts, the presenter proceeded to open the simulation, starting with "charges and fields" followed by "Generator".

While running the simulation, the instructor provided examples of how to change the variables within the simulation, while the students observed the effects of each change. As the instructor explained and ran the simulation, the students appeared to be paying close attention to the lesson. This is evident in the following image.



(a)



(b)

Picture 3. Activities during the PKM (a) Introduction to the simulation , (b) Simulation led by the presenter

There is difference students' conceptual understanding before and after learning using a scaffolding approach supported by PhET Simulations. However, this difference does not have a significant effect on students' conceptual understanding. Learning using a scaffolding approach supported by PhET Simulations has an effect on students' learning independence. Students' independence is rated as fairly good and good. Activity levels increased during the learning process. Students became more active in seeking knowledge, and peer interactions increased. This facilitated communication and collaboration (Buar & Obiedo, n.d.). The research findings indicate that the activity proceeded smoothly, received positive feedback, and generated high levels of enthusiasm among the students. The students actively participated in discussions, explored various features, and the initiative to try different experiments. PhET Simulation has proven to be highly effective in boosting learning motivation and encouraging in-depth exploration, making it an effective and contextually relevant solution when real laboratory equipment is not available (Motivasi et al., 2025).

The training took place over one day, from 7:30 a.m. to 9:30 a.m. During the training, the students appeared enthusiastic and focused as they listened to the speaker. The students were also actively asking questions, which indicates that they were interested in the lesson and eager to understand the material being presented. Not only that, but the students also tried to answer every question posed by the speaker. The students appeared enthusiastic about answering the speaker's questions. They began to feel confident expressing their opinions based on their understanding of the subject. This indicates that the students' interest in physics has increased as a result of this simulation-based training. The training concluded with a group photo session, as shown in the image below.



Picture 4. Group photo with the students and instructors

As part of this activity, not only did several instructors observe the students during the session, but the students also completed a questionnaire on their interest in learning physics using PhET Interactive Simulations, which served as feedback and an indicator of the activity's success.

Below are the results of a survey on students’ interest in learning physics using PhET Interactive Simulations. The survey consisted of 10 questions, with responses measured on a likert scale. The respon options were “ strongly disagree”, “disagree”, “agree”, and “strongly agree”. Strongly disagree was scored as 1, disagree as 2, agree as 3, and strongly agree as 4.

**Table 1.** Survey Data On Students’ Interest In Learning Physics Using PhET

Number	Respondent	Total Score (10 questions)	Final Grade	Criteria
1	Respondent 1	30	75	High
2	Respondent 2	32	80	High
3	Respondent 3	29	72,5	High
4	Respondent 4	30	75	High
5	Respondent 5	30	75	High
6	Respondent 6	29	72,5	High
7	Respondent 7	30	75	High
8	Respondent 8	30	75	High
9	Respondent 9	30	75	High
10	Respondent 10	30	75	High
11	Respondent 11	32	80	High
12	Respondent 12	30	75	High
13	Respondent 13	32	80	High
14	Respondent 14	40	100	Very High
15	Respondent 15	30	75	High
16	Respondent 16	35	87,5	Very High
17	Respondent 17	30	75	High
18	Respondent 18	31	77,5	High
19	Respondent 19	33	82,5	Very High
20	Respondent 20	30	75	High
21	Respondent 21	30	75	High
22	Respondent 22	30	75	High
23	Respondent 23	27	67,5	High
24	Respondent 24	30	75	High
25	Respondent 25	31	77,5	High
26	Respondent 26	28	70	High
27	Respondent 27	29	72,5	High

The final value is obtained from the formula below,

$$FG = \frac{Total\ Score}{Ideal\ Score} \times 100\ %$$

With the following criteria:

81-100 = Very High

61-80 = High

41-60 = Low

0-40 = Very Low

Based on Table 1 above, it can be seen that 11,11 % of students have very high interest in learning, and 88,89 % have a high interest in learning. Therefore, it can be concluded that the average level of student interest in learning is 76,67, which falls within the "High" category. Based on the calculations, students' interest in learning using PhET Interactive Simulations has increased.

The positive impact of using PhET Simulations on improving students' understanding and effectiveness of the learning process (*EFFECTIVENESS OF DEEP PHET INTERACTIVE SIMULATION*, 2023). PhET Simulations significantly improved student learning outcomes, enhance conceptual understanding, and boost motivation compared to conventional teaching methods. Therefore, PhET Simulations are an effective tool and are highly recommended for use by educators, especially when combined with structured materials such as worksheet, to visualize complex science concepts and increase student engagement (Romadoni, 2025). PhET simulations effectively enhance students' understanding electrical circuit concepts while increasing their engagement through interactive learning. PhET Simulations also offer flexibility in conducting virtual experiments, making them a solution to the limitations of physical laboratories (Juli et al., 2025).

## DISCUSSION

### Limiting Factors

The implementation of Community Service (PKM) Program at SMK Gajah Mada Lampung went smoothly, though there were some limitations during the program. One of the limitations encountered was the internet connection used for the interactive simulation. This situation meant that some student had to use their own internet data plans.

In addition, difference in students' proficiency levels in using technology and educational software also posed a challenge during the training process. Some participants still required further guidance in understanding the features of the simulations used. Time constraints also prevented the material from being covered in greater depth, particularly regarding the application of simulations for analyzing more complex electromagnetic

### The effectiveness of training and mentoring

The training and guidance provided have proven effective in improving students' understanding of electromagnetism. The use of interactive simulation software helps students visualize abstract concepts, making the learning process easier to understand. Hands-on guidance during practical sessions also helps participants operate the software and better understand the steps involved in virtual experiments.

The effectiveness of the activity was evident in the increased active participation of students throughout the training process. Students showed enthusiasm in conducting simulations, observing the results of virtual experiments, and discussing the physics concepts they were learning. As a result, this training was deemed effective in boosting students' interest in learning, improving their skills in using educational technology, and enhancing their understanding of physics concepts in a more interactive and innovative way.

Based on the data above, it can be explained that 11,11 % of students have very high interest in learning, and 88,89 % have a high interest in learning. Therefore, it can be concluded that the average level of student interest in learning is 76,67, which falls within the "High" category. Based on the calculations, students' interest in learning using PhET Interactive Simulations has increased. To ensure the sustainability of this initiative, training on the creation of interactive student modules and worksheets could be conducted, or advanced training on writing learning guides using inquiry-based learning methods could be provided, as this approach naturally stimulates students' curiosity. One of the challenges when learning using PhET Interactive Simulations software is internet connectivity; therefore, schools need to provide or install the offline version of PhET Interactive Simulations so that students can access it at any time without being hindered by internet connectivity issues.

The implementation of PhET Simulations in the thematic mathematics curriculum on fraction in Class 3A at MI Ma'arif Giriloyo 1 increased student engagement by 84,85%. The use of PhET Simulations in Class 3A at MI Ma'arif Giriloyo 1 also improved student learning outcomes by 72,73 % (Ilmiah & Madrasah, 2022). The results of study show that the experimental class, which used PhET Simulations in its instruction, demonstrated higher levels of student engagement and better learning outcomes than the control class, which used conventional teaching methods (Fitria et al., n.d.). The results of the data analysis indicate that digital skills have improved, with an N-Gain of 0,70, which falls into the high category. It can be concluded that the use of PhET Simulations in science education effectively enhances students' digital skills, particularly in the use of ICT devices, the utilization of digital learning media, and their ability to explore and analyze scientific concepts through interactive simulations (Zikriana & Hanum, 2026). The use of PhET Colorado software can improve student learning outcomes. This is evidenced by the fact using this software resulted in improved student learning outcomes. The percentage of students who met the minimum competency standart (KKM) increased from 42,1 % in the pre-cycle to 73,7 %. In the second cycle, 84,2 % of students met the minimum competency standart, with an average score of 81. Thus, the use of the PhET Colorado media can help improve student learning outcomes (Kurniawan et al., 2024). The results of the training show that 70 % of participants have a good understanding of how to use PhET in science and mathematics instruction. It is hoped that this training will help teachers implement PhET in creative and innovative teaching practices (Yamin et al., 2023). The teachers have become familiar with and are able to analyze PhET learning models and simulations. These models and simulations can that be used in the classroom. The average evaluation score was 83,07. Additionally, participants were satisfied with this training activity, with an average satisfaction score 4,16, falling into the "good" category. Thus, the activity successfully enabled teachers to become familiar with and analyze innovative learning models and PhET Simulations (Fitriah et al., 2023).

## CONCLUSION

A community service activity at SMK Gajah Mada in Bandar Lampung demonstrated that training in the physics software PhET Interactive Simulations, designed for interactive learning in the field of electromagnetism, is effective increasing students' interest and engagement in learning. This was evident from the students' active participation during the activity. Many students asked questions and enthusiastically answered every question posed by the presenter. Based on the results of the survey on students' interest in learning physics using PhET Interactive Simulation, It can be conclude that that 11,11 % of students have very high interest in learning, and 88,89 % have a high interest in learning. Therefore, it can be concluded that the average level of student interest in learning is 76,67, which falls within the "High" category. Thus, the use of simulation-based learning materilas not only increases students' interest in learning but also has the potential to enhance their conceptual understanding of physics concepts.

## ACKNOWLEDMENT

We would like to express our gratitude to everyone who contributed to the success of this community service activity. We would also like to thank the entire administration of SMK Gajah Mada Bandar Lampung, as well as the students, for their cooperation and coordination, which ensured that this activity ran smoothly and according to plan. Without the support of all these parties, this success would not have been possible.

## AI ACKNOWLEDMENT

The authors state that AI technology was used solely as a tool to assist with language editing, grammar, and structural improvement during the writing process; however, all data, content, analysis, and discussion in this article are entirely the result of work conducted by the writing team. Therefore, the entire writing team takes full responsibility for the content of this article.

## INFORMED CONSENT

The authors have obtained approval from the entire community service team (PKM).

## CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest in the writing or publication of this article.

## REFERENCE

- Aprilia, R., Rustana, C. E., & Budi, E. (2020). *Pengaruh Pemanfaatan Media Phet Dalam Pembelajaran Jarak Jauh Menggunakan Webinar Zoom Terhadap Peningkatan High Order Thinking Skills (Hots) Siswa Fisika Sma. IX*, 177-182. <https://doi.org/10.21009/03.snf2020.02.pf.26>
- Ashadi, N. R., Tri, A., Suwahyu, I., & Dewi, S. S. (2025). *Pelatihan Pemanfaatan Aplikasi Phet Sebagai Media Pembelajaran Interaktif untuk Meningkatkan Keaktifan dan Motivasi Siswa*. 3(1), 110-118.

- Azizaturedha, M., & Fatmawati, S. (2019). *Info Artikel Abstrak : f i : e n d i d i k a n E d u f i s i k a : J u r n a l P e n d i d i k a n F i s i k a V o l u m e 4 N o m o r 1 , J u n i 2 0 1 9 . 4 , 1 - 5 .*
- Barat, L. (2023). *PELATIHAN PENGGUNAAN APLIKASI PHET PADA SISWA SMAN 1 GUNUNGSARI LOMBOK BARAT Muhammad Taufik\*, Susilawati, Jannatin 'Ardhuha, Ni Nyoman Sri Putu Verawati, Hikmawati. 6(4), 323-327.*
- Buar, C. L., & Obiedo, R. V. (n.d.). *The Effect of Scaffolding Approach Assisted by PhET Simulation on Students ' Conceptual Understanding and Students ' Learning Independence in Physics The Effect of Scaffolding Approach Assisted by PhET Simulation on Students ' Conceptual Understanding and. <https://doi.org/10.1088/1742-6596/1233/1/012036>*
- Bunyi, D. A. N. (2025). *Jurnal Pengabdian Pendidikan Masyarakat ( JPPM ). 6(2), 368-374.*
- EFFECTIVENESS OF DEEP PHET INTERACTIVE SIMULATION. (2023). 7(2), 92-102.
- Fitria, N., Hardoyo, T., Supriadi, B., Jember, U., Islam, F. A., Malang, U. I., Simulation, P., & Belajar, H. (n.d.). *PENGGUNAAN PhET SIMULATION UNTUK MENINGKATKAN. 7(2), 428-438.*
- Fitriah, L., Mahtari, S., Ilahi, A. W., & Arif, M. A. (2023). *Pelatihan Inovasi Pembelajaran tentang Model Pembelajaran dan Simulasi PhET. 5(1), 1-13.*
- Ilmiah, A. J., & Madrasah, P. (2022). *PEMBELAJARAN DARING MENGGUNAKAN PHET SIMULATIONS UNTUK IBTIDAIYAH. 6(4), 1041-1052. <https://doi.org/10.35931/am.v6i4.1120>*
- Juli, V. N., Bani, D., Habibillah, D., & Muskhir, M. (2025). *Pengaruh Media Pembelajaran Berbasis PhET Simulation terhadap Hasil Belajar Mahasiswa Teknik Elektro pada Mata Kuliah Rangkaian Listrik Universitas Negeri Padang.*
- Kurniawan, A., Pendidikan, I., & Terbuka, U. (2024). *Pemanfaatan PhET colorado untuk meningkatkan hasil belajar siswa pada materi rangkaian listrik. 1(2), 43-51.*
- Laila. (2020). *Keefektifan penerapan laboratorium virtual ( PhET ) Berbasis STEM dan keterampilan penyelesaian masalah. 97-103.*
- Liswar, F., Hidayati, A., & Yeni, F. (2023). *The Use of Phet Interactive Simulation Software in Physics Learning. 9, 135-142. <https://doi.org/10.29303/jppipa.v9iSpecialIssue.5982>*
- Motivasi, D. A. N., Fisika, B., & Sman, D. I. (2025). *No Title. 5(2), 75-80.*
- Mutiara, H., Nita, G., Rohmawati, I., & Sari, I. J. (2025). *PHET VIRTUAL SIMULATION TRAINING TO IMPROVE TEACHER COMPETENCE AT SMPN 1 PLERED PELATIHAN SIMULASI VIRTUAL PHET UNTUK MENINGKATKAN KOMPETENSI GURU DI SMPN 1 PLERED. 8(1).*
- Negeri, U., Ji, Y., & No, C. (2023). *PELATIHAN PEMANFAATAN PHET INTERACTIVE SIMULATIONS SEBAGAI SARANA PRAKTIKUM DALAM PEMBELAJARAN PADA MASA PANDEMI COVID-19 BAGI sebenarnya sarana vid*
- .0., .eo conferencing seperti Google Meet atau Zoom juga dapat. 20(2), 142-152.
- Nugroho, M. S., Murtiyasa, B., Pendidikan, M. A., & Surakarta, U. M. (2025). *Efektivitas Simulasi PhET Pada Pembelajaran IPA SMP Materi Konsep Listrik 1,2,3. 6(1), 125-132.*
- Pardayeva, K. Z. (2027). *ASEAN Journal for. 6(1), 1-6.*
- Purwanti, P., & Mayanty, S. (2023). *PKM Praktikum Virtual Phet Interactive Simulation untuk Siswa SMPIT Daaruttauqa. 2(2), 232-241.*
- Rizaldi, D. R., & Jufri, A. W. (2020). *PhET : SIMULASI INTERAKTIF DALAM PROSES PEMBELAJARAN FISIKA. <https://doi.org/10.29303/jipp.v5i1.103>*
- Romadoni, R. B. (2025). *Pengaruh Penggunaan Media Virtual Lab PhET Simulation pada Materi Gerak dan Gaya terhadap Peningkatan Hasil Belajar Siswa SMP. 3(1), 214-223.*
- Simamora, A. P., Priska, N., Fadilla, R., Kalsum, U., Pardosi, S. M., Medan, U. N., Baru, K., & Serdang, D. (2025). *STUDY LITERATURE ANALISIS PENGARUH PENGGUNAAN MEDIA PHET SIMULATIONS TERHADAP HASIL BELAJAR. 3(12).*
- Verdian, F., Jadid, M. A., Rahmani, M. N., & Simmulation, P. (2020). *STUDI PENGGUNAAN MEDIA*

*SIMULASI PhET DALAM.* 39-44.

- Yamin, A., Parwatiningtyas, D., Dewi, D. R., & Zuhnir, M. (2023). *Pelatihan Pemanfaatan Perangkat Lunak PhET bagi Guru IPA Dan Matematika di SDIT Nuur A ' laa Nuur Tambun Bekasi dalam Membentuk Pembelajaran yang Kreatif dan Inovatif Pendahuluan.* 1(1), 7-14.
- Zikriana, L., & Hanum, E. (2026). *Optimalisasi Simulasi PhET dalam Pembelajaran IPA sebagai Upaya Peningkatan Keterampilan Digital Siswa di SMP Negeri 3 Peusangan.* 4(3), 20192-20197.