JPPIPA 10(11) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

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

Developing Website as Media in Wordpress Assisted in Learning Momentum, Impulse, and Collision to Improve Students' Creative Thinking Skills

Mansur Solaiman[1*], Heru Kuswanto[1], Insih Wilujeng[1]

[1]Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negri Yogyakarta, Yogyakarta, Indonesia.

Received: December 18, 2023
Revised: August 11, 2024
Accepted: November 25, 2024
Published: November 30, 2024

Corresponding Author:
Mansur Solaiman
mansursolaiman.2022@student.uny.ac.id

DOI: 10.29303/jppipa.v10i11.6638

Abstract: Teachers are expected to have several competences; master teaching materials and have Indonesian character and personality, inspire and be a role model, have a charming appearance, be authoritative, firm, sincere, and disciplined who are able to educate, learn, guide, direct, train, assess, and evaluate students in accordance with the demands of current and future developments in information and communication technology. The purpose of this research is to develop a word press-based website to improve students' creative thinking skills in the physics concept of impulse and impact momentum. The method used in this research is development research or Research and Development (R&D) with the ADDIE model including five stages, namely the Analyze, Design, Development, Implementation, and Evaluate stages. The results showed that the wordpress-based website media developed was feasible to use for learning momentum, impuils and collisions on MA Ali Maksum students in class X physics subjects with a value of 86.3% media attractiveness aspect, 87.0% material adequacy and 83.7% language use and media validity declared feasible, and wordpres-based website learning media can also improve students' creative thinking skills on the concept of momentum, impulse and collision.

Keywords: Creative thinking skills; Media website wordpress; Momentum impulse and collision

Introduction

Innovation in the development of learning media during the advancement of information and communication technology has significantly encouraged the birth of ICT-oriented learning concepts and mechanisms. It's good to realize that or not, essentially every human being requires knowledge and following technological developments in order to be able to carry out. This life continues to change technology. Where is the technological development? Of course, this is an implication of physics has been studied by experts who are experts in the field. Discovered or created: Bluetooth, Search Engine Google, Google Translate, YouTube, Facebook, Email, HoloLens, Virtual Reality, God Particle, Neutrino, Application open Access Website WordPress and so on, causing problems in all aspects of human life, including in the world of education, especially physics learning problems (Jatmiko, 2017). Further, according to Jang (2016) and Bilad et al. (2022) creative places critical thinking as an essential skill needed in the modern world of education. One alternative solution to these problems and findings is by equipping students with thinking skills that can think complexly; and can

How to Cite:
Solaiman, M., Kuswanto, H., & Wilujeng, I. (2024). Developing Website as Media in Wordpress Assisted in Learning Momentum, Impulse, and Collision to Improve Students' Creative Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, *10*(11), 9120–9128. https://doi.org/10.29303/jppipa.v10i11.6638

integrate various problems and findings in a comprehensive and holistic manner.

Physics is a field of study that is usually considered difficult, but the sources of difficulty in studying physics have not been studied further. It is often said that physics is difficult because of the use of mathematics, or because students cannot calculate, or that physics is not interesting. Physics is a science that is very closely related to human life. Due to the use of mathematics in it, it requires creative thinking skills. Developing creative thinking abilities and how to measure them is one of the focuses of mathematics learning. One way to measure creative thinking abilities is with open questions, namely questions that have various solutions or completion strategies (Umar & Abdullah, 2020). In the mathematics learning process, a high level of curiosity is needed to support successful learning. Apart from that, creative thinking skills are also needed in solving problems (Cahyani et al., 2022). Physics is considered difficult because the solution involves the use of mathematics in it.

Physics will be useful for humans if it is realized in the form of technological results. With physics, all work becomes easier because of the application of physics which is implied in sophisticated technology. Several physics concepts can be combined in one form of equipment as a technological result. Physics will underlie the development of equipment used by humans.

The development of science and technology encourages renewal efforts in the use of technological results in the teaching and learning process. The use of media in the physics learning process can bridge abstract material into concrete. One of the benefits of using computer-based media is that it can help the teacher's role in providing lesson material, for example with a virtual laboratory (Bahtiar & Azmar, 2022; Sari et al., 2020) which can be embedded in an open access website, for example with CMS WordPress. By displaying lesson material with the help of application software programs in the teaching and learning process, teachers can present lesson material in a more interesting, effective and efficient manner. Physics is a science that studies the nature, laws of nature and their application in everyday life, has concrete and abstract concepts (Amanda et al., 2022; Irfansyah et al., 2023). Abstract physics concepts are difficult to visualize, making it difficult for students to understand them. Research on learning shows that there are various causes of student achievement, including students' inability to connect what they have learned with what they just learned and misinterpreting new concepts with their prior knowledge (Makhrus et al., 2023).

To reduce these causes, teachers need to prepare devices that can visualize abstract concepts to more real concepts in learning. One of the physical materials that has an abstract character is momentum, impulse and collision, because they occur in a very short time and quickly (Zaini et al., 2015). In physics, the word momentum has a different meaning from the meaning in everyday life. In everyday life, momentum is defined as an event that occurs in the history of human life. Momentum is a quantity possessed by a moving object. Momentum is the tendency of an object to keep the object moving (Limba et al., 2023). The momentum of a moving object is defined as the product of its mass and its speed formulated $\vec{p} = m\,\vec{v}$. The result of the force multiplication $\vec{F}$. With time lapse Δt disebut sebagai impuls dirumuskan $\vec{F}\Delta t = \vec{I}$. While impulse is a measure of how much influence an external force has to change the momentum of an object, or impulse is a change in the momentum of an object (Limba et al., 2023). Referred to as a formulated impulse Conservation of momentum is a very useful tool for discussing collision processes. Based on whether kinetic energy is conserved or not, collisions can be categorized into perfectly elastic collisions, partially elastic collisions and inelastic collisions. The collision event lasted a short time but that does not mean it cannot be analyzed, therefore good recording equipment is needed to collect collision data so that it can be analyzed properly (Mahardika et al., 2022).

The dynamics of problems in physics learning are the underlying reference for exploring teachers' abilities because there are still many students who have problems understanding abstract material. Constructive science material is a challenge for teachers to present good learning. In the physics learning process, it can bridge abstract material into concrete, one of the benefits of using media. The solution that can be used to build or understand physical science concepts is with the help of technology, one of the technologies that is often used in learning is internet media with a website-based access platform which is easy to design by hosting Word Press-based web application (Mutiah et al., 2023). The web is a simplification of the words World Wide Web (www), namely software that presents digital information and applications on a collection of pages connected to a Clint-Server based network system (Batubara, 2021). To build web-based learning, you need an application that can create the website itself. There are many software/applications that can build web-sites, they are classified into two, and namely CMS and LMS (Kustandi & Darmawan, 2020), one of the CMS that is commonly used is a website developed using WordPress application. Based on data from W3techs, 43% of websites available on the internet in 2022 will use WordPress as a platform for developing websites,

this number shows that the WordPress platform has high popularity (Arsa, 2020).

This is the biggest challenge facing education systems throughout the world. This metamorphosis requires adaptation from all parties, both those directly involved (teachers, students and parents) and indirectly (education sector stakeholders) to integrate technology in classroom learning.

The teacher's ability to integrate technology in classroom learning and student independence in interacting with technology are very important supporting factors. Educational institutions must replace face-to-face learning systems with online learning with website-based learning without any preparation. The absence of face-to-face contact and minimal interaction between teachers and students is currently being discussed in various research studies (Setyaningrum et al., 2021) regarding the development of technology that can facilitate human activities, for this reason the ability to think plays an important role and is very necessary in solving every physics concept.

Improving thinking skills in learning is important to do because in learning students are required to be able to develop knowledge so that they can create a variety of ideas. According to Puspitasari et al. (2018) that creative thinking skills are high-level skills that provide a stimulus for new ideas to emerge. Further, Creative thinking skills are needed in finding ideas and solving problems (Armitage et al., 2015; Wahyuni et al., 2018; Qadri et al., 2019). In addition, creative teaching materials are delivered with a rare model of innovation such as guided inquiry (Saputri et al., 2023) it is interesting and can improve students' creative thinking skills (Sukarso & Muslihatun, 2021; Sukarso et al., 2022). Creative thinking skills are always associated with creative habits or in other words, creative thinking cannot be separated from the character of creative habits (Sawu et al., 2023). It is followed by Learning media development is needed to be able to overcome problems in the learning process in schools. One form of learning media development is the use of information and communication technology (ICT). Schools even need to provide virtual laboratories so that they are interesting and can improve students' creative thinking skills (Sari et al., 2020). Furthermore, according to Nogerbek et al. (2022) explained that creativity is very important to be raised as a product to improve learning outcomes due to technological demands. Therefore, media development with the latest technology is needed for educational units.

School is an educational unit institution. Education that takes place at school is a purposeful process. The implementation of education in schools that involves teachers' act as educators and students as students is applied in the form of teaching and learning interactions or learning processes. The needs analysis resulted in the finding that there is a need for learning media that can help students learn. Most teachers believe that students have creative potential (Leen et al., 2014). A number of studies have shown that learning using media is considered effective in improving students' abilities. In general, WordPress is used for commercial media websites and is rarely used as a learning media in class. In addition, not much research has been done on the physics science of momentum, impulse and impact learning concepts with media designed by utilizing WordPress applications. Furthermore, related to creative thinking skills, not many have made WordPress-based media as a way to improve these abilities. Based on the background of the problem above, the author was motivated to conduct research with the title "Development of learning media for momentum, impulse and WordPress rocky collisions to improve the creative thinking abilities of MA Ali students Maxim" in Krapyak Kulon Panggungharjo, Kec. Sewon, Kabupaten Bantul, Daerah Istimewa Yogyakarta.

Method

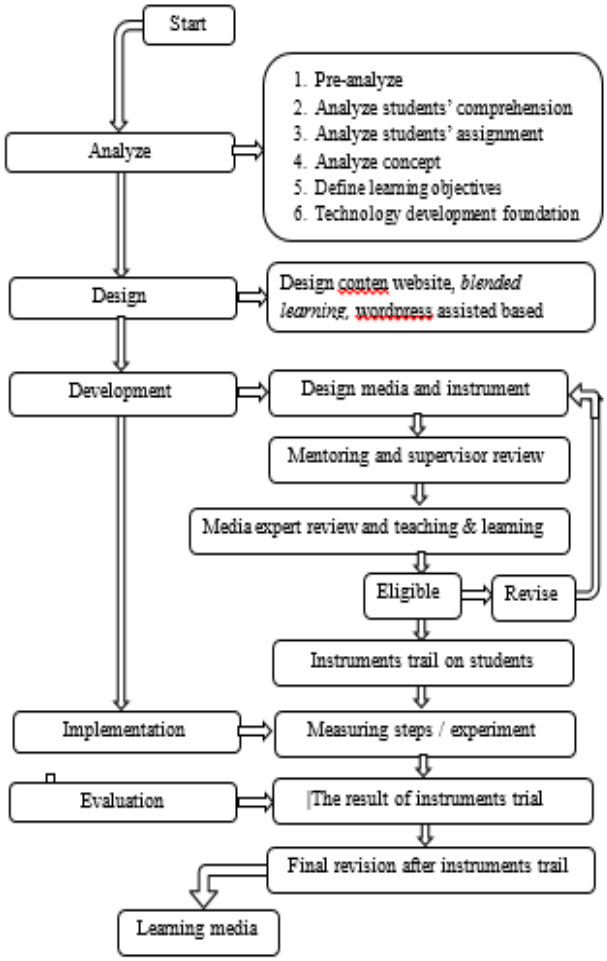

Figure 1. Flowchart of research procedures

The type of research used in this study is research and development (Research and Development) (Sugiyono, 2018; Inayati & Setyasto, 2024). Research and Development (R&D) is research used to produce certain products, and test the effectiveness of the products developed by applying these products to students. The development procedure adopted the ADDIE model includes five stages, namely the analysis stage, the planning stage, the development stage, the implementation stage, and the evaluation stage (Abdjul et al., 2022; Mutiah et al., 2023; Jumanto et al., 2024). The flow of ADDIE development model design activities carried out by researchers in the study is shown in Figure 1.

This research was conducted in class X MA Ali Maksum Special Region of Yogyakarta in the academic year 2022/2023. This research was conducted in the first semester from February 28 to March 24, 2023. The research design used a pretest- posttest control group design experiment. This research, the test subject is a quasi-experiment so that the subject is already in the form of a class. The sample of this study was 69 students who were divided into two classes, namely, class X Putri as the experimental class and X Putra as the control class.

Here's an example of a learning website media design.

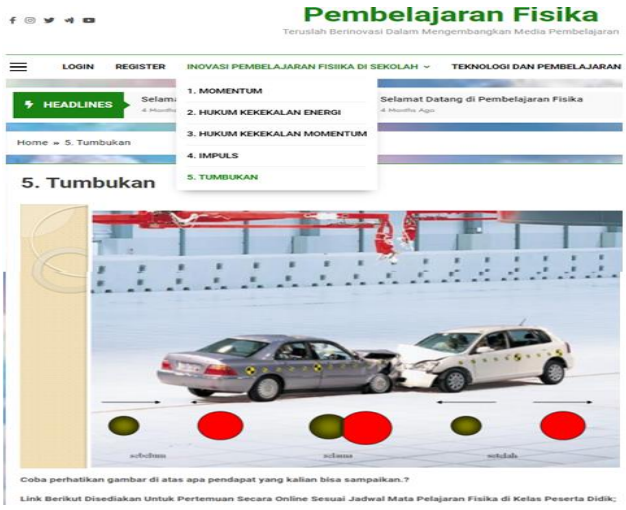

Figure 2. Example of display on collision page

Analyze the data of the questionnaire sheet of students' response to physics learning with the treatment taught using WordPress-based website learning media by calculating each sub-variable using the formula (Purwanto & Ngalim, 2013):

$$NP = \frac{R}{SM} \times 100\% \quad (1)$$

With: NP = Percentage of Value score; R = Total score; SM = Max Score

The eligibility assessment criteria are as follows.

Table 1. Feasibility assessment criteria

Interval (%)	Eligibility level criteria
80 – 100	Strongly Meet the level of criteria
66 – 79	Meet the level of criteria
56 – 65	Less of meet the level of criteria
0 – 55	Not meet the level of criteria

(Riadi & Slamet, 2014)

Data analysis of the validation sheet using Aiken's V formula. The item validity index using Aiken V, purpose by Arikunto (2006), is formulated as follows:

$$V = \frac{\sum s}{n(c-1)} \quad (2)$$

with V is the Aiken V validity index, r is the score assigned by the validator, L_0 is the lowest score of each indicator item, c is the highest validity assessment score, and n is the number of validators. The validity assessment criteria based on the Aiken V scale can be seen in Table 2.

Table 2. Eligibility level criteria

Aiken V Scale	Validities
$V \leq 0.4$	Low
$0.4 < V \leq 0.8$	Middle
$0.8 < V$	High

(Arikunto, 2006)

Result and Discussion

The results of the data analysis of the questionnaire sheet of students' responses to physics learning with the treatment taught using the WordPress website learning media for student responses is presented in Figure 3.

Based on the results in Figure 3, it can be seen that the attractiveness aspect of the media has an average value of 86.3% with a very decent/good/agree category, while for the material adequacy aspect it has an average value of 87.0% with a very decent/good/agree category, and for the aspect of language use it has an average value of 83.7% also with a very decent category. However, it is suggested that web media needs to pay attention to the element of practicality to make it easier for users or users to access the website developed does not require login and can use android devices, this is in line with research conducted by Mutiah et al. (2023) that the development of web applications using PHP and HTML with hosting by WordPress is also recommended to pay attention to practicality to make it easier and more effective to use.

Furthermore, according to Liu & Yu (2011) and Nazar et al. (2020) that several advantages can be achieved if the system is upgraded to an android application, users can avoid internet access while using the system because it is only once installed.

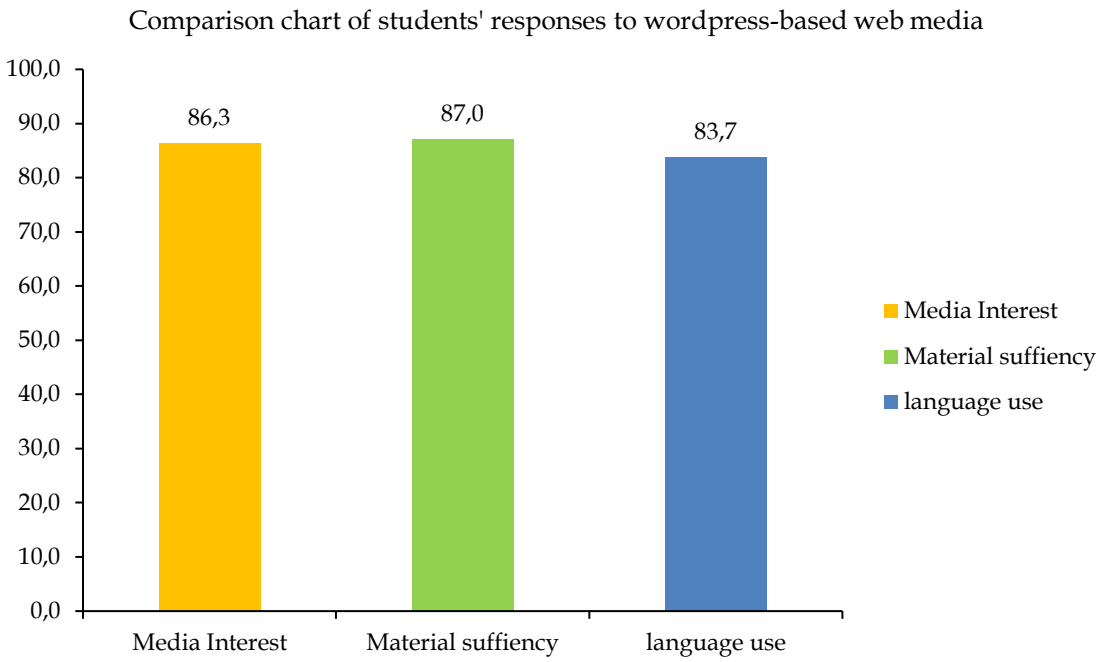

Figure 3. Questionnaire of student response results

The results of media validation data analysis by media experts using the V'Aiken test obtained data displayed as shown in the following graph.

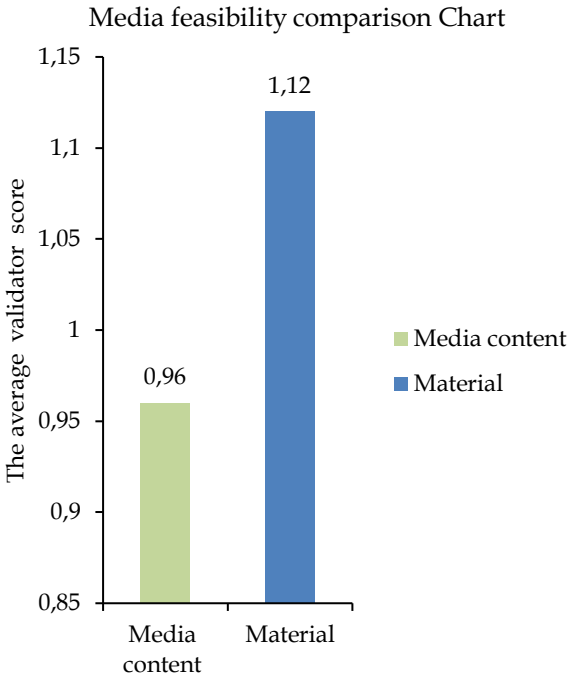

Figure 4. Media validity test results

Based on the results in the graph above, it can be seen that the content aspect of the media material has an average value of 0.96 with high validity criteria, and for the material adequacy aspect it has an average value of 1.12 also in the high category.

The results of this validation are then used as the basis for the use or not of learning media, so that the learning media for momentum, impulse and WordPress-based collisions to improve students' creative thinking skills are declared feasible to use for the learning process based on the criteria for student responses and media validation. However, it also pays attention to limitations because use requires internet access to use the product. As according to Huang & Fang (2023) that web-based systems depend on the availability of stable internet network access to be able to access the developed application. Likewise, to multiply a web-based system to an android application requires more complex work to redesign the system (Sheikh et al., 2013; Oyedele et al., 2013).

The results of data analysis of creative thinking skills using the experimental design pretest- posttest control group design show the comparative value between the control class and the experimental class as shown in the graph below.

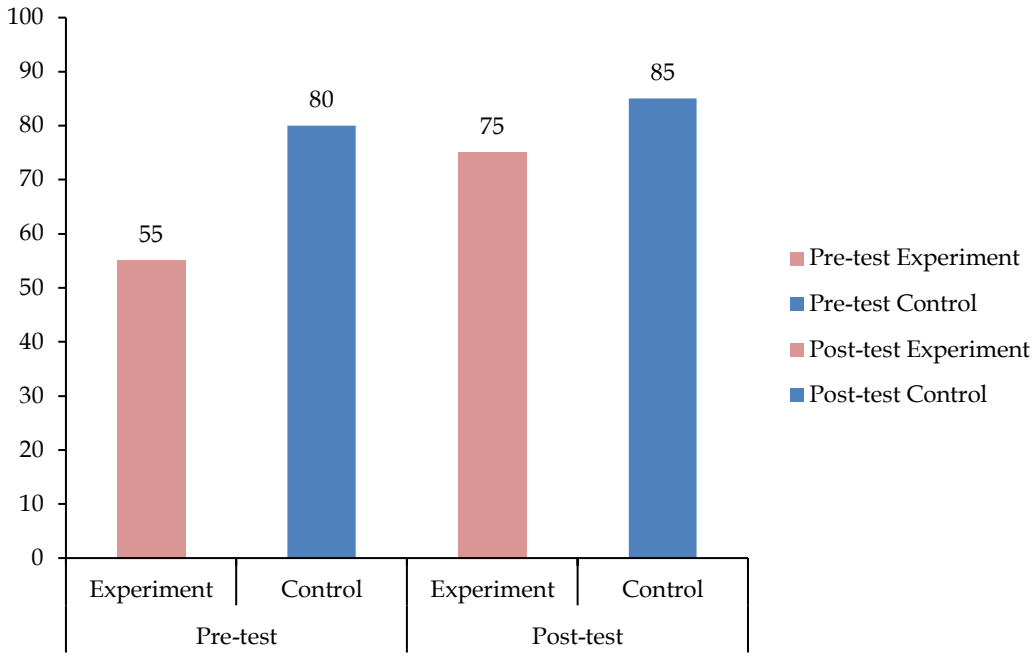

Figure 4. Comparison of students' creative thinking skills

Based on the data on creative thinking skills in the graph above, it can be seen that the pretest results for the experimental and control classes have an average of 55 and 80, meaning that the ability to think creatively between students in the experimental and control classes has a difference in value before being taught by treatment using learning media momentum, impulse and collision with WordPress rocks by 25, when viewed from the KKM used at school as a standard of completeness value, it can be said that experimental class students belong to the "not passed" category and the control belongs to the "passed" category. For this reason, it is necessary to carry out treatment in terms of the learning process for the experimental class to achieve KKM (minimum completeness criteria) and to improve their creative thinking skills, while for the control class it is also necessary to be given in the learning process in a conventional way to further improve creative thinking skills.

The results of the final test of creative thinking ability, the results obtained for the experimental class have a class average of 75 while the control class has an average of 85. This shows that the class of students who take part in learning by using the learning website media momentum, impulse and impact of WordPress rocks (experimental class) there is an increase of 20 higher than the class of students who take part in learning with conventional learning (control class) which is 5. In addition, the creative thinking ability of the experimental class when viewed from the posttest-pretest comparison there is an increase, so that experimental class students who previously did not reach the KKM value after being taught using the learning website media momentum, impulse and impact of WordPress rocks KKM is achieved. In general, research using media can improve the ability to think creatively among students, as according to Yulianci et al. (2021) that there is an effect of using multimedia with a visual learning style on students' creative thinking skills in momentum and impulse physics material has increased. In addition, interactive learning based on lectora Inspire web media effectively improves learning outcomes IPAS is feasible and practical for use in the learning process (Inayati & Setyasto, 2024), and learning with website media is classified as effective (Sina et al., 2023).

Conclusion

Based on the results of data analysis, the conclusions that can be put forward regarding the product design of the results of the development of wordpress-based learning website media to improve students' creative thinking skills. among them are If viewed from Based on the assessment of the student response questionnaire on wordpress-based website media developed is feasible to use for learning momentum, impulse and collision in MA Ali Maksum students in class X physics subjects. In addition, based on validation by respondents, the wordpress-based website learning media developed is suitable for learning momentum, impulse and

impact on MA Ali Maksum students in class X physics subjects. While seen from the results of the pretest-postest, the wordpress-based website learning media developed can be used to improve the creative thinking skills of students both indicators of fluency, flexibility, originality and detail in general for momentum, impulse and collision material of MA Ali Maksum students in class X in physics subjects.

Acknowledgments

The author would like to express his gratitude to the Head of MA Ali Maksum Special Region of Yogyakarta; lecturers of the Physics Learning Innovation Practicum course; teachers of Physics Class X MA Ali Maksum and all those who contributed either directly or indirectly so that they could not be mentioned one by one. The author hopes that the media developed for students is expected that wordpress-based website learning media on momentum, impulse and collision material can improve the quality of the learning process and be used as additional reference material for MA Ali Maksum Class X students in particular and SMA/MA public secondary education in general in physics subjects.

Author Contributions

Conceptualization, methodology, formal analysis, investigation, resources, data curation, and writing—original draft preparation, M.S.; validation, writing—review and editing, advice, and visualization, H.K. and I.W. All authors have read and agreed to the published version of the manuscript.

Funding

The funding for research and development of learning website media for momentum, impulse and collision with wordpress to improve students' creative thinking skills is privately funded. Because it is not supported by any research funding, the process of observation, literacy studies, development and implementation at school is carried out independently in terms of funding.

Conflicts

All author declares that there is no conflict of interest.

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