Blended Learning with Schoology in Impulse and Momentum Materials: The Development of Physics Teaching Materials

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Article Info	Abstract
	Information Technology Integration in the physics learning process has not happened optimally. Therefore, a study was conducted, which aims to describe the feasibility of physics teaching materials based on blended-learning with Schoology in subject matter impulses and momentum. This research is research and development using the ADDIE model. The trial subjects in this study were 28 students of class XI in one of the Vocational Schools in the city of Banjarmasin. The instruments used were media validation sheets, lesson plan implementation sheets, and learning outcome tests. Data is then analyzed descriptively quantitatively. The results of the study state that the learning materials developed 1) was valid, sourced from the results of the validation sheet, 2) was practical, based on the lesson plan implementation sheet, and 3) was effective in improving learning outcomes, seen from the results of the N-gain test. It can be concluded that physics teaching materials based on blended learning with Schoology that are developed are feasible to use in subject matter impulses and momentum. Teaching materials integrated with Schoology can be used as an alternative learning solution to improve the quality of blended learning.

INTRODUCTION

Teachers use teaching materials to make it easier to convey learning materials to students. Using materials can facilitate the teaching process, promote students' understanding and attract students' interest and motivation to learn (Maylinda & Haryani, 2021). A digital-based teaching material with a foundation of academic knowledge can be a solution for teachers and students to support the learning process (Cahyati et al., 2019).

Learning in the 21st century integrates information technology in the learning process (Zainuddin et al., 2019). In line with this, the development of information technology in the world of education is growing rapidly, so that it is also needed for the development of learning media for schools (Dewantara et al., 2019; Diani & Syarlisjiswan, 2018; Ekici et al., 2012; Goyal & Tambe, 2015; Hilyana & Hakim, 2018; Khan et al., 2012; Nuriyanti & Utami, 2013). Integrating information

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technology in the learning process can improve literacy, develop the nation's character based on knowledge for students, and can increase the effectiveness and efficiency of the learning procedure itself (Noviansyah, 2017). Besides the use of information technology can make it easier for students to find information independently.

In contrast, the results of an interview with a physics teacher at one of the vocational schools in the city of Banjarmasin stated that the learning process had never used e-learning, whereas the implementation of the test was based online, however. Even though this school has been supported by wi-fi facilities and all students of class XI have a notebook. The utilization of information technology in the learning process is still not optimal. Besides the learning outcomes of students for physics lessons, there are still a few students above the minimum completeness criteria, which is 32.14%.

The utilization of technology in learning media can be used to increase the effectiveness of learning (Hartini et al., 2017; Maimunah et al., 2016). The existence of technology in learning is one strategy that can be used to make abstract concepts more concrete (Sintawati & Indriani, 2019). The purpose of using information technology is to improve the quality of learning and teaching, increase student satisfaction, and broaden the student base. One of them is through e-learning (Alavi & Gallupe, 2003).

E-learning can be done remotely or outside of school to help students understand the learning material. In the development of information technology that is integrated into learning activities, e-learning systems are utilized in most educational institutions in the world. In foreign countries such as the United States, e-learning is used almost 90% on every basic education (Chidayati et al., 2017). Many American and European countries have carried out the application of technology in learning, so it is not uncommon for technology to help improve student competence (Abdulmajid et al., 2017).The development carried out in e-learning is in the form of website-based learning management. This is usually called a learning management system (LMS). LMS, as an interaction platform, turned out to be useful and easy to use (Pektaş & Gürel, 2014). At present, there are many kinds of LMS, such as Edmodo, canvas, and Schoology. One interesting use of LMS today is Schoology.

Schoology combines LMS with social media. Schoology has the characteristics of other LMS, which has a form that is easy to use, which is similar to the Facebook application (Suana et al., 2017). Schoology offers all the tools in classroom management needed to create engaging content, support learning, and assess student understanding (Napitupulu et al., 2020). In addition, Schoology has an attendance facility that can be used to check student attendance and analytic to see all student activities. All of that can help students in learning and readiness in learning(Aminoto & Patoni, 2015). Schoology can also assist students in improving various student abilities and skills, such as critical thinking skills (Budhiman et al., 2021; Sulisworo et al., 2020), digital literacy (Misbah, et al., 2018; Pratama et al., 2019), learning achievement (Sari et al., 2020), and so on.

The use of Schoology-based E-learning helps students increase their interest in learning physics and readiness in learning physics (Dewantara, 2018; Misbah, et al., 2018; Pratama et al., 2019). Students can improve their learning outcomes because they can get a variety of learning references, both material, video, and others integrated with Schoology to improve learning outcomes (Damayanti & Dwiningsih, 2017; Hilyana & Hakim, 2018; Misbah, et al., 2018; Murni & Harimurti, 2016). Research on the development of high school physics learning programs based on e-learning with effective Schoology is used to improve learning outcomes (Wahyudi, 2017; Warso et al., 2019). Based on existing research, no one has developed momentum impulse teaching materials using Schoology at the vocational high school level. The purpose of this study is to describe the feasibility of physics teaching material based on blended learning with Schoology in the subject matter impulse and momentum. The feasibility of teaching material is reviewed from the aspects of validity, practicality, and effectiveness.

METHOD

This research is a Research and Development (R&D), using the ADDIE development model. This study developed teaching materials based on blended learning with Schoology in the XI grade Vocational Physics subject matter of impulse and momentum. The activities in the ADDIE phase can be seen in Table 1.

Table 1: Activities in the ADDIE phase

Phase	Activities
Analyze	1) Analyze the basic competencies of the subject matter impulse and momentum. 2) Analyze the characteristics of students in class XI in one of the vocational schools in Banjarmasin. 3) Analyze the subject matter impulse and momentum according to the competency guidance.
Design	Designing teaching materials based on blended learning with Schoology.
Development	1) Produce teaching materials based on blended learning with Schoology 2) Validate the products developed
Implementation	Implementation teaching materials based on blended learning with Schoology in class XI in one of the vocational high schools in Banjarmasin,in the subject matter impulse and momentum.
Evaluation	Evaluation of teaching materials based on blended learning with Schoology in terms of practicality and effectiveness

The subjects of this study were 28 students of class XI in one of the vocational schools in Banjarmasin. The object was the feasibility of teaching materials based on blended learning with Schoology in the subject matter Impulse and Momentum. The instruments used were media validation sheets, learning implementation plan validation sheets, learning achievement test validation sheets, student worksheet validation sheets, lesson plan implementation sheets, and learning outcomes test.

Validation data were measured using validation sheets which were assessed by 3 people, namely 2 practitioners and 1 academic. Reliability assessment of the device (validation) used was the Alpha formula (Arikunto, 2013). Determination of the reliability of the media assessment instrument was validated; the reliability criteria used was r (Arikunto, 2013). Categories of the validity of teaching materials can be seen in table 2.

Table 2. Category of the validity of teaching materials

No.	The Interval	Category
1	$x > 3.4$	Very good
2	$2.8 < x \leq 3.4$	Good
3	$2.2 < x \leq 2.8$	Enough
4	$1.6 < x \leq 2.2$	Less
5	$x \leq 1.6$	Very less

The practicality of the learning kit can be seen from the implementation of the lesson plan, which was observed by 2 observers (Mahyuddin et al., 2017). Categories of the practicality of teaching materials can be seen in table 3.

Table 3. Category of the practicality of teaching materials

No.	Percentage (%)	Category
1	0,0–20,9	Very Less
2	21,0–40,9	Less
3	41,0–60,9	Enough
4	61,0–80,9	Good
5	81,0-100,0	Very good

(Junita & Sukardi, 2020)

The effectiveness of teaching materials was measured using a test of learning outcomes, then analyzed using Normalized Gain (N-Gain) according to (Hake, 1999). Categories of the effectiveness of teaching materials can be seen in table 4.

Table 4. Category of the effectiveness of teaching materials

No.	Value	Category
1	$\langle g \rangle \geq 0{,}7$	High
2	$0{,}3 \leq \langle g \rangle < 0{,}7$	Medium
3	$\langle g \rangle < 0{,}3$	Low

RESULTS AND DISCUSSION

The teaching materials developed in this study include lesson plans, student worksheets, learning achievement tests, and impulse and momentum material. The teaching materials based on blended learning with Schoology were developed by researchers at one of the vocational schools in Banjarmasin.

This learning activity was carried out in three meetings, at the first meeting is material impulses and momentum, the second meeting is the law of conservation of momentum, the third meeting is the types of collisions. Next, the appearance of Schoology on material impulses and momentum can be seen in Figure 1.
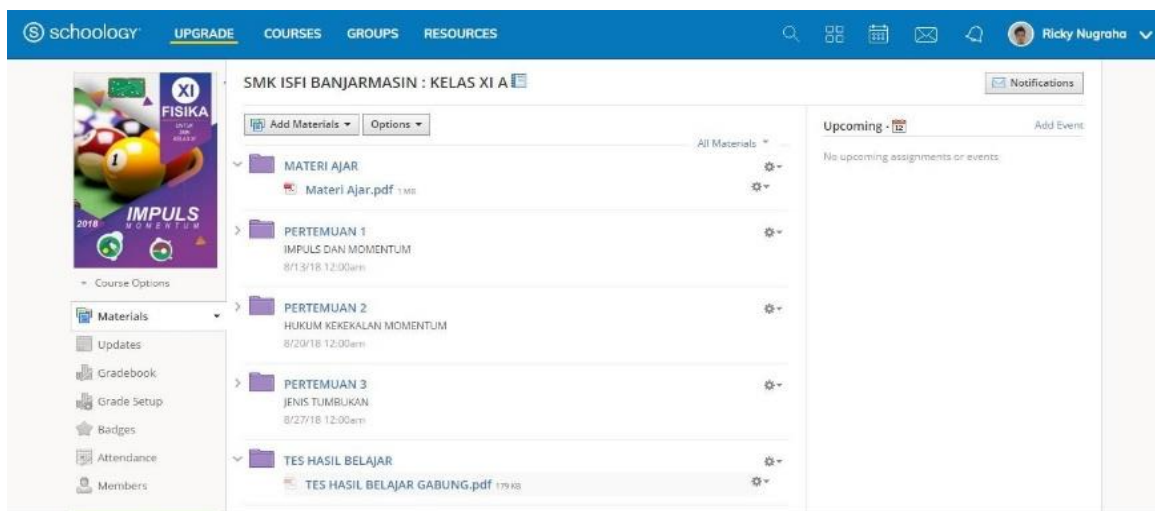

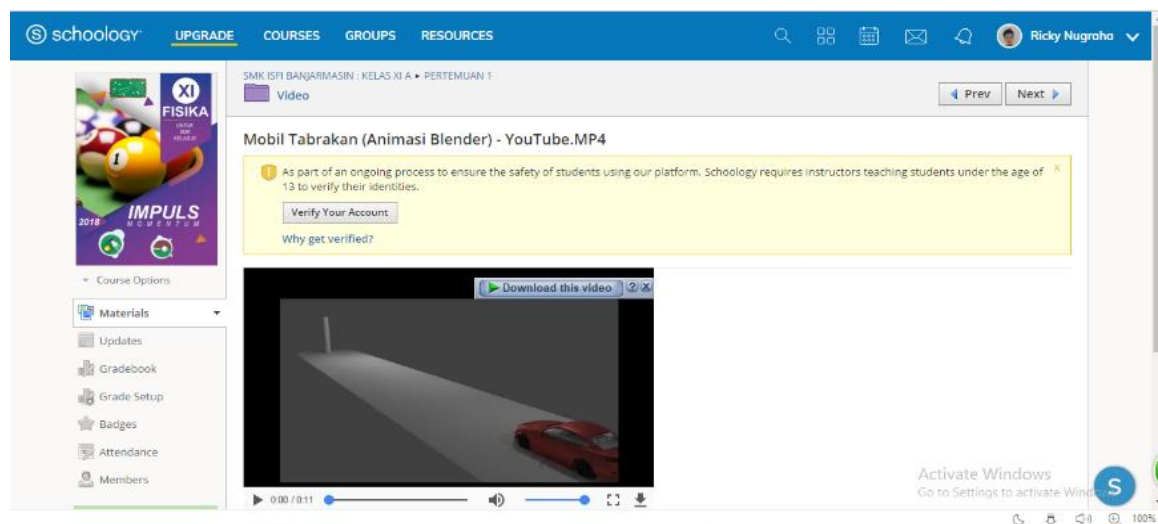**Figure 1a**. Display of Teaching Materials for Each Meeting in Schoology

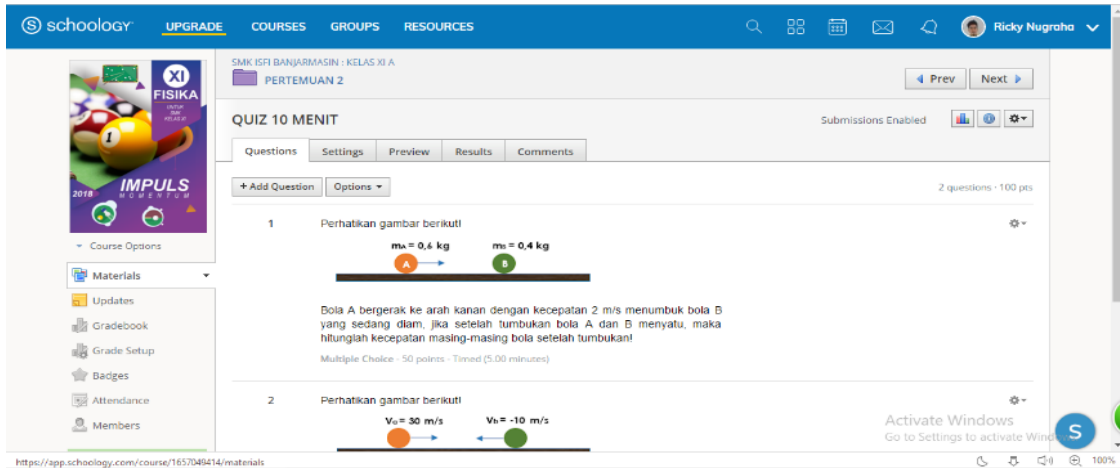**Figure 1b.** Display of Learning Videos in Schoology

Figure 1c. Display Quiz in Schoology

The teaching materials developed include lesson plans, learning outcomes tests, the student worksheet, and teaching media. This teaching materials have been validated by an expert. validator consists of 2 academic validators and 1 practitioner validator. After that, the class will be simulated and tested to produce learning materials that are valid, practical and effective. The following is a description of the development of teaching materials based on blended learning with Schoology and the results of class trials and their discussion.

Validity

Following are the validity test results data on the teaching materials that have been developed. Validation data is measured using validation sheets which are assessed by 3 people, namely 2 practitioners and 1 academic. The results of lesson plan validation can be seen in Table 5.

Table 5. Results of lesson plan validation

Assessment Aspects	Score	Category
Formulation of learning objectives	4.07	Very Good
The contents presented	3.80	Very Good
Language	3.67	Very Good
Time	3.17	Good

Table 5 shows that over all the lesson plans got very validity criteria. These results state that the lesson plan has fulfilled a good lesson plan component. A good and high-value lesson plan is a lesson plan whose components meet aspects / criteria, namely the formulation of clear learning objectives. The formulation of learning objectives is described and arranged in a complete and clear manner. Also, can encourage students to think at a high level. The contents are served. The learning scenarios (beginning, core, end) are detailed and complete, and the learning steps reflect the learning model / method used. In addition, it allows for optimal student involvement. There is a time allocation, organizing the time at each step of learning is clear, systematic, and continuous. Language, the lesson plan used by the teacher uses language that is easily understood and does not cause multiple interpretations. The preparation of the lesson plan is adjusted to the components stipulated in the Minister of Education and Culture Regulation No. 22 of 2016 concerning basic education process standards (Akbar, 2013).

The developed student worksheet consists of 3 sub-materials, namely: momentum impulses, the law of conservation of momentum, and collisions. The worksheets developed are presented in Figure 2.
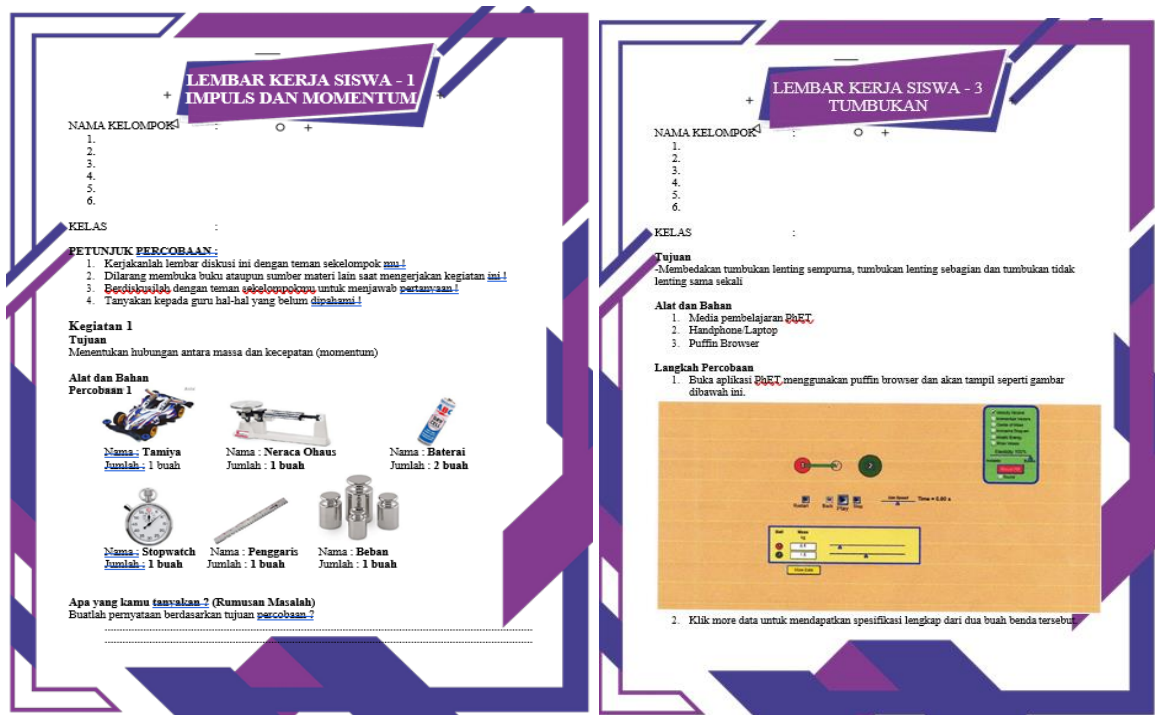
Figure 2. The Student Worksheet

The results of the validation of student worksheets can be seen in the following Table 6. Table 6 shows that overall, student worksheets obtained very valid validity criteria. The results state that the student worksheet has fulfilled the requirements so that a student worksheet can be said both in terms of content and language.

Table 6. Validation Results of student worksheets

Assessment Aspects	Score	Category
The contents presented	3,94	Very Good
Language	4,00	Very Good

The results of the validation of the learning outcomes test can be seen in Table 7. Table 7 shows that when viewed from the aspect of general construction, the learning achievement test has obtained a very good category. General construction aspects include instructions for working on problems; clarity of scoring guidelines; the quality of the e-learning display; type and size of letters; layout design and suitability; objectivity in giving scores; practicality; and the suitability of time usage. Good learning outcomes tests are tested with theoretical validation in one panel consisting of several aspects of assessment, namely, general construction and language(Osnal, Suhartoni, & Wahyudi, 2016). A learning achievement test can be stated as a test that has general construction validity, that is if the learning achievement test is reviewed in terms of practicality, arrangement and layout, framework, or design it can accurately reflect a construction, in the sense of meeting the test criteria well (Harefa, 2007). The results of the validation test of learning outcomes are presented in table 7.

Table 7. Results of test validation of learning outcomes

Assessment Aspects	Score	Category
General Construction	3,29	Good
Item Validity	3,22	Good

The results of the learning media validation using Schoology can be seen in Table 8.

Table 8. Learning Media Validation

Assessment Aspects	Score	Category
Submission Variations	3.83	Very Good
Achievement	3.78	Very Good
Overall Media	4.00	Very Good
Media Design	4.00	Very Good
Full view	4.00	Very Good

Table 8 shows that aspects of the delivery variation, achievement, overall media, media design and overall appearance are categorized as very good. This shows that the developed media has fulfilled the aspects of media validity.

Practicality

The practicality of the learning kit can be seen from the implementation of the lesson plan, which was observed by 2 observers. The following is the observation result data of the lesson plan that can be seen in Table 9.

Table 9. Implementation of lesson plans

Meet	Percentage(%)	Category
First	90.77	Very Good
Second	86.16	Very Good
Third	86.90	Very Good

The lesson plan implementation data is used to measure the practicality of blended learning based learning tools using Schoology (Misbah, et al., 2018). Based on observations of the implementation of the lesson plan, namely meeting one, two and three categorized very well, the lesson plan that was developed can be implemented very well so that it is practical to use. The lesson plan developed consists of the steps of the cooperative learning model. Each step is associated with the use of Schoology in learning, such as viewing video shows in Schoology, opening teaching materials contained in Schoology, and so on.This shows that the Schoology-based learning tools developed are practical for both teachers and students to use.

Practicality is partly because Blended learning makes teachers transfer knowledge in learning in creative and innovative ways (Khan et al., 2012). Blended learning has a lot to do with innovative pedagogy to apply to learn using technology (Kintu & Zhu, 2016). The use of technology media in learning not only can simplify and streamline the learning process itself but also can make the learning process more interesting and not boring (Mahyuddin et al., 2017).

Learning using e-learning with Schoology provides a learning experience through video, animation, or virtual demonstration (Misbah, et al., 2018). Students can get a hands-on learning experience and interesting, even though virtually (Wahyudi, 2017). Thus, the application of Schoology in blended learning fosters student motivation to carry out learning (Saregar et al., 2019).

Effectiveness

The results of the pre-test and post-test that have been carried out are obtained by learning outcomes test data to measure the effectiveness of the products that have been developed. The test used in the form of 10 essay questions in the subject matter impulse and momentum. The result of the N-gain Test score is 0.34. The score shows that effectiveness is of medium category (Hake, 1999).

Innovations in the development of instructional media during the period of information and communication technology advance significantly encourage the birth of concepts and mechanisms of technology-based learning. One way is to apply the use of Schoology in learning (Wahyudi, 2017). *Schoology is a website that combines e-learning and social media. Schoology features have Courses, Groups, Discussions, Resources, Quiz, Attendance, and Analytics* (Suana et al., 2017). Schoology

supports the use of text, formulas, and images, while it can also conduct assessments in learning physics (Hilyana & Hakim, 2018).

Based on the gain score obtained from the pre-test and post-test results, the gain score is in the medium category. However, learning tools can still be said to be effectively used to improve student learning outcomes. This is consistent with the results of previous studies that learning using blended learning Schoology eligible for use in learning (Syafei et al., 2020). Also, can improve student learning outcomes (Dewantara et al., 2019; Hilyana & Hakim, 2018; Wahyudi, 2017; Warso et al., 2019).

The use of blended learning can correct some of the weaknesses of conventional learning methods, one of which is the lack of time in face-to-face meetings (Dewantara, 2018; Suana et al., 2017). Blended learning mixes the face-to-face and online learning environment (Psycharis et al., 2013; Rizkiyah, 2015). Thus, students are able to regulate the rhythm of learning not only in the classroom but also outside the classroom through the blended learning system (Mutaqin & Syamsuri, 2016).

The implementation of blended learning allows the use of online learning resources, especially web-based ones, without leaving face-to-face activities, so that with blended learning, learning will become more varied and meaningful (Wahyudi, 2017). A learning model that combines (blending) the method of face to face learning with e-learning in an integrative and systematic way will make the learning process more meaningful (Divayana, 2017).

Blended learning gives more flexibility and helps students in the learning process (Yam & Rossini, 2011). This blended learning model, learning takes place more meaningfully because the learning material provided is designed so that students more easily understand it (Sandi, 2012). The use of blended learning can stimulate students to become more active, creative, and independent in finding the information needed so that they can learn independently and understand the concept well (Suana et al., 2017).

Schoology makes it easy for users to access learning material contained in this matter because learning devices are published online so that they can be accessed anytime and anywhere on any computer or laptop and smartphone, connected to the internet and have web browser applications (such as Opera, Mozilla Firefox, Google Chrome, etc.). Relevant research results (Muhammad, 2020) mentioned that Schoology has succeeded in promoting learner autonomy by considering several facts such as active participation of students through logging in and commenting on other people's ideas; student control in determining modes, settings, and learning materials; and enthusiasm of students to solve the challenges of lecturers. In addition, Schoology that looks like a social network makes it easy for users to access their content (Wahyudi, 2017). All the advantages and advantages of learning by implementing Schoology using blended learning, this learning tool is able to improve student learning outcomes. Teaching materials integrated with Schoology can be used as an alternative learning solution to improve the quality of blended learning.

CONCLUSION

The product developed in this research is Schoology-based e-learning media on impulse and momentum material. Based on the results of development, the results of trials, and findings obtained, it can be concluded that Schoology-based blended learning tools developed for Impulse and Momentum material are appropriate to use. It because the criteria to be declared valid, practical, and effective. In the student worksheet, apart from the impulse and momentum and collision practicum activities, it is necessary to add analytical questions to master the impulse-momentum material taught. Therefore, teachers or researchers can carry out learning using tools that have been developed because it can make students have a variety of information and media that are useful and reliable for students to get information and knowledge.

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