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Developing Impulse & Momentum Mobile App to Improve Student's Conceptual Understanding of Physics

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Abstract

Impulse and momentum mobile app can be another alternative to overcome the problem of using printed teaching materials. Impulse and momentum mobile app present concepts accompanied by examples in everyday life in images, animations, and videos. It can reduce students' difficulties in connecting concepts or materials with phenomena. The difficulties experienced by these students can have an impact negative on students' understanding of physics concepts. The impulse and momentum mobile app shows valid results with an average value of 3.32. Comments and suggestions from the validator are considered as revision material so that impulse and momentum multimedia teaching materials in mobile applications are better, more attractive, worthy of being tested for effectiveness. The mobile app needs to be revised based on comments and suggestions given by physics lecturers and teachers.The improvement of students' understanding of physics concepts is shown by testing the effectiveness of multimedia teaching materials in the experimental class and class control. In the analysis of the different tests with t-test, which involved 70 student respondents, the value of t count is 19.587 with t table of 1.99. P-value is p = 0.000, where the P-value is smaller than 0.05. It can be concluded that there is a significant difference in post-test value data on the ability to understand concepts between the experimental class and the control class. These results indicate that impulse and momentum mobile app effectively improves the ability to understand concepts of student physics.

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Introduction

The 21st-century learning paradigm requires learning that can integrate technology and information in learning. The integration of technology is changing the way of learning in the classroom. Education tends to encourage students to find out from various observation sources, not just given information in one direction or teacher-centered. Learning designed to be centered on students (student-centered) will have higher learning outcomes than teacher-centered learning. Research about the integration of technology and information in education has been carried out by (Ghavifekr & Rosdy, 2015; Kuznekoff & Titsworth, 2013; Martin & Ertzberger, 2013; Patten & Harris, 2013; Tondeur et al., 2016).

Integration of technology and information in related learning with the use of learning media in the classroom. Learning media plays an essential role in delivering material to student’s student (Puspitarini & Hanif, 2019). Media of learning can be distinguished from media that are directly used by teachers in education and media made by the teacher and then adjusted to the abilities and needs of students. The use of appropriate learning media is expected to support the implementation of good learning in the classroom. Other elements that can support the implementation of learning apart from learning media are teaching materials. The teacher can use teaching materials as a complement and addition in explaining the material so that students get a wide and exciting variety of learning activities (Aydin & Aytekin, 2018; Yolanda, 2020). Teachers and students can also use teaching materials as a guide in learning to achieve the learning objectives that have been formulated. Teaching materials are the primary and determining component in the implementation of education where its role as the primary media in learning interaction is essential.

The development of 21st-century technology supports the use of maximally non-printed teaching materials to be used in learning. One of them is multimedia teaching materials containing much information and combining elements of text, images, audio, video, and animation. The multimedia is a combination of more than one media. This multimedia teaching material is also appropriate for use in physics subjects (Nurhasnah et al., 2020). In general, in physics print-out teaching materials, students find it challenging to relate concepts or materials to actual phenomena (Chao et al., 2016; Putranta & Supahar, 2019). It requires high imagination, which is difficult done for students. Print-out type can make misunderstanding student concepts (Dancy & Beichner, 2006). In the development of teaching materials, especially physical teaching materials, there is no sole but to accommodate technological developments, also based on the characteristics of the subject matter and characteristics (Widayanti et al., 2019).

The development of teaching materials is based on the characteristics of physical materials, which is part of natural science, which cannot be separated from human life (Umriyah et al., 2012). The implication is that students can connect the concept they received with their experienced natural phenomena (Yuliati, 2013). In general, teaching materials can contain facts, concepts, principles, procedures, attitudes, and values. These materials are equipped with pictures, charts/tables, animations, and videos that can strengthen the students' understanding. The teaching materials are listed in the materials teaching materials that students can use for learning guidelines. Based on the survey results, the teaching materials commonly used in the classroom are books that contain explanations of physics concepts accompanied by static images. Using the textbook causes difficulties for students when visualizing abstract physics concepts that are only assisted by books containing static images. Using textbooks causes problems for students when visualizing abstract physics concepts that are only helped by books containing static images. It also makes students passive. Students' learning in the classroom carried out by using textbooks would seem bored and result in students being passive.

Mobile devices (mobile phones and tablets) are portable device that shows rapid development (Patten & Harris, 2013). The more many people who use mobile devices open up opportunities use of mobile devices in education. It is strengthened with data that has been taken with the subject of high school students. Categories of ownership of mobile devices such as mobile phones, tablets, and smartphones are as follows: 99.03% stated that students have smartphones and 0.07 states students have tablets. Based on survey results, almost 100% of students used mobile devices only for entertainment (games, internet, music player, media social, etc.). Even though the opportunity for using mobile devices for education is vast, it significantly helps teaching and learning activities carried out by the teacher.

The use of teaching materials that are operated through mobile devices can facilitate students to get a complete understanding of physics concepts. These teaching materials also have similar characteristics to Computer Assisted Instruction (CAI) operated on a computer. The difference lies in the place of operation, namely through the mobile (smartphone and tablet) owned by each student. It's easier for students to access and utilize teaching materials. This is for learning anywhere and anytime. Research and development on CAI teaching materials that can improve student achievement and understanding of student concepts (Hendikawati et al., 2019; Maier et al., 2016; Martin & Ertzberger, 2013; Rahmatiah et al., 2013; Wiyono, 2017). It is similar to teaching materials in the form of mobile applications, which are expected to be able to enhance students' experience of ideas through visualization of images, animations, and video. Also, the video will provide complete understanding for students. It supports the goals of learning physics is to improve and promote learning in students about nature or related to valuable knowledge (Hill et al., 2015). The K13 curriculum also states the characteristics of applying the learning experiences students gain in schools in active community life (Nurhasnah et al., 2020).

One of the physics materials that high school students must learn is impulse and momentum. Impulse and momentum are closely related to energy-matter and Newton's laws which are considered fundamental concepts in physics (Eraikhuemen & Ogumogu, 2014). For students to understand theories and concepts in impulses and momentum will lead students to the formation of knowledge intact basis (Eveline et al., 2019). Impulse and momentum are too closely related to the phenomena that occur in the surrounding environment. The spectacle covers the interaction between force and motion between 2 objects or more in real-life contexts. For example, when someone hits a baseball with a stick. The short contact force between posts with a baseball can make the baseball change shape and move accelerated. The change in the form of the baseball takes place in a fraction of a second so that the normal eye cannot see it. The visualization can help students understand the process of changing impulses and momentum in various events (Kaniawati et al., 2016; Yuberti et al., 2019).

Visualization of the interaction between force and motion in impulse & momentum is very important for students to know. An impulse can change the momentum of an object and its implications for changes in shape and velocity that thing. Dynamic images in videos or animations can be one solution to clarify the visualization of the force and motion (Eraikhuemen & Ogumogu, 2014; Eveline et al., 2019). The visualization is packaged in multimedia teaching materials in the form of a mobile application that is expected to provide an overview and understanding complete understanding of the concept to students.

A learning mechanism in the classroom can be assisted by mobile devices (Kuznekoff & Titsworth, 2013; Martin & Ertzberger, 2013; Patten & Harris, 2013). Mobile devices are used for several advantages, including other mobile devices that are easier to use than computers. Even now, mobile devices are more popular and practical to use as tools to learn. This mobile-shaped teaching material is one of one concrete example of the integration of mobile devices into learning systems in class.

Method

The method used in this research is the research method and development (Research and Development), which implements measures to develop a product. The product to be developed is in the form of materials impulse and momentum multimedia teaching in a mobile application. Research design and product development of multimedia teaching materials impulse & momentum in the form of a mobile application used is a 4D design expressed by (Thiagarajan & Others, 1974). 4D research design can be seen in Figure 1.

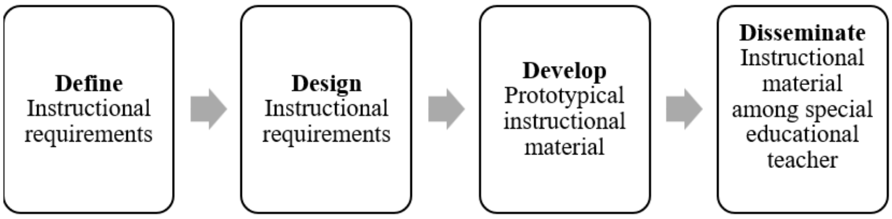

Figure 1. 4D Design

The 4D research design consists of four stages of development, namely (1) define, (2) design, (3) develop, and (4) disseminate. On step (1) define consists of front-end analysis, learner analysis, task analysis, concept analysis, and specifying instructional objectives. In step (2), the design constructs a criterion-referenced test, media selection, format selection, and initial design. In step (3), the development consists of expert appraisal and developmental testing. In step (4), dissemination consists of validating testing, packaging, and diffusion.

The development stage aims to produce the end of the impulse & momentum multimedia teaching materials in the form of mobile applications after revisions based on input from experts/practitioners and test result data. Expert assessment or expert validation of teaching materials impulse & momentum multimedia in the form of a mobile application includes two aspects: the confirmation of the content/product content and the verification of the content of the questions. Characteristics listed in product content validation. First, (1) conformity of product content components, (2) suitability of product presentation components, (3) linguistic components that are used in product preparation, and (4) product design components. Expert validation will be carried out by two people with criteria, including a material expert and a media expert. A material expert is experienced in physics material, a physics lecturer, and a teacher with at least five years of experience. A Media expert is experienced in mobile learning with the software used in mobile learning, namely lecturers who have a minimum of five years of experience.

Development trials or limited trials are carried out after testing by experts so that input is obtained to revise the product. It constantly makes products more precise, effective, and easy to use, and of good quality. The participants in this development trial were ten high school students in class XII. In this trial, students were asked to fill out a questionnaire or questionnaire to provide input (suggestions and comments) on the results of the developed product. The results of the development trial were carried out to determine the readability of the resulting product if students used it. The define and design stage results are used as the basis for revisions until an effective and consistent product is obtained. The next step is further testing to determine the product's effectiveness on the ability of high school students to understand concepts. Students are also asked to fill out a questionnaire or questionnaire to provide input (suggestions and feedback) in the product effectiveness test.

Table 1. Data Instruments and Analysis

Data Type	Instrument	Data Analysis
• Leaning needs • Learning skill & competency	• Questionnaire • Interview • Analysis of curriculum	Descriptive
• Main products	• Assesment Questionnaire (Likert scale)	Percentage & descriptive
• Mobile app Impulse & momentum	• Pretest-postest based on statistical test to see conceptual understanding • Effectivity test • Students response to mobile app	• T-test • Descriptive

The product's effectiveness testing was conducted on students' conceptual understanding skills by taking samples representing the population. The research sample was taken using a purposive sampling technique, namely sampling based on specific considerations. The method used to test the effectiveness of impulse & momentum multimedia teaching materials in a mobile application is a quasi-experimental, pre-test and post-test design model (Creswell, 2002). This product trial is intended to determine the effectiveness of impulse & momentum multimedia teaching materials in the form of a mobile application to improve the concept understanding ability of high school students after implementing impulse & momentum multimedia teaching materials mobile app.

Table 2. Mobile App Effectivity Test using Pre-test-post-test Design

Class	Pre-test	Treatment	Post-test
Control	O_1	X_1	O_2
Experiment	O_1	X_2	O_2

(Creswell, 2002)

Results and Discussion

The initial stage of developing teaching materials in the form of a mobile application is to analyze the needs of teaching materials in the field. Field studies conducted through the distribution of questionnaires and interviews about physics teaching materials to students and teachers of high school physics subjects found that the teaching materials circulating in the market have not been following the needs of students and teachers. The teaching materials used by students and teachers have printed teaching materials that cannot visualize actual physics concepts. Printed teaching materials also often have a large size and mass. Learning in the classroom has a passive tendency if using printed textbooks.

Teachers and students want teaching materials containing physics concepts and are equipped with practice questions and their discussions. The teaching materials are also expected to be used by students independently (not necessarily in class) to recall the physics lessons that have been obtained. It is because the allocation of learning in the classroom is minimal. In addition, teachers and students want teaching materials that can visualize physics concepts. Video phenomena in everyday life are examples of visualization of physics concepts that can attract students' attention. Activities that help students visualize abstract concepts will foster development understanding of concepts (Suryani et al., 2018; Thahir et al., 2020).

The development of 21st-century technology provides an alternative solution for learning physics desired by teachers and students, namely in multimedia devices that can be used as a learning tool. One of the multimedia devices is a smartphone, which can be used to operate multimedia teaching materials. Multimedia teaching materials are mobile applications that combine elements of text, audio, video, animation, and images that are easy and practical for students to use independently. Based on an initial study conducted through distributing questionnaires and interviews to students, one of the materials that are considered complex and require an in-depth understanding of concepts is impulse and momentum. Students experience misconceptions related to the definition of impulse and momentum and their application in daily life (Hill et al., 2015; Thahir et al., 2020). The next stage is to formulate learning indicators for multimedia teaching materials based on analysis of core competencies (KI) and essential competencies (KD) in the 2013 Curriculum. The following describes the indicators of impulse and momentum multimedia teaching materials in the form of mobile applications in Table 3.

The development stage begins by compiling an Outline Media Development and compiling the initial draft of teaching materials in PowerPoint slides. The purpose of preparing the initial draft in PowerPoint slides is to make it easier for developers to compile materials and adjust the navigation of buttons that will be included in teaching materials. The second draft of these teaching materials is the product of teaching materials in a mobile application. The media components included in the teaching materials in mobile applications include text, images, animation, audio, and video. Furthermore, teaching materials in mobile applications are communicated to the supervisor to obtain criticism and suggestions for improving teaching materials.

Table 3. Learning Competency of Impulse & Momentum

Competency	Competency Indicator
Applying the concepts of momentum and impulse, as well as the law of conservation of momentum in everyday life	**Impulse** • State and explain the concept of impulse and its application in everyday life • Solve problems related to the concept of impulse • Analyze examples of impulse concepts in life daily **Momentum** • Mention and explain the concept of momentum • Solve problems related to the concept of momentum • Analyzing examples of the concept of momentum in everyday life • Explain the impulse-momentum theorem in everyday life **Law of Conservation of Momentum and Collisions** • Restate and explain the law of conservation of momentum in a collision • Solve problems regarding collisions in everyday life using the law of eternity momentum • Distinguish between perfectly elastic collisions, elastic partial, and not elastic • Analyzing the working principle of rockets by applying the law of conservation of momentum

The development of teaching materials carried out produces the final product in the form of multimedia teaching materials in mobile applications that can be operated with a smartphone or mobile device. The development of multimedia teaching materials in the form of a mobile application is limited to the material of impulse and momentum. The following explains the characteristics of multimedia teaching materials in the form of applications: mobile generated from the development process in Table 4.

Table 4. Characteristic of Mobile App

Competency	Competency Indicator
Language	Indonesia (Bahasa)
Operating System	Android Iphone
Product	**Front Cover** • The opening page, which contains the title of the teaching material and the momentum impulse series • Page to enter the main menu **Contents** • Menu of learning competencies, materials teaching, practice questions, evaluation (daily test), developer product, instructions for use • On each page, the menu for teaching materials are equipped with navigation buttons that make it more accessible to users for operation

The display on the Mobile App can be seen in Figure 1. This start page is the first to appear when teaching materials multimedia in the form of mobile applications began to operate. This main page contains the identity of teaching materials and contains a button to go to the primary page of teaching materials. The main page (homepage) contains the main menus and navigation buttons that support the performance of impulse and momentum multimedia teaching materials in the mobile application. The menu consists of learning competencies, teaching materials, practice questions, evaluations (daily tests), product developers, instructions for use, and an exit button from the mobile application. The main page can be seen in Figure 2.

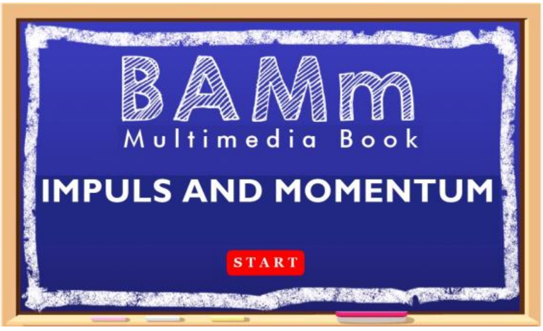

Figure 2. The Start Page & The Main Page of Mobile App

The presented materials contain elements of text, images, graphics, audio, animation, and video phenomena in everyday life related to impulses and momentum. Presentation teaching materials begin with showing a video of phenomena related to the concept that will be studied. The description of the material is presented next to help students understand physics concepts. The description of these concepts is completed to explain the relationship between video phenomena and the physics concepts presented. On the teaching materials page, examples of everyday life are presented, which is close to student life, so it is hoped that students will easily understand it. It is associated with the essence of the 2013 Curriculum, which integrates science and technology. In learning, multimedia teaching materials are also equipped with discussions examples of applied technology related to the concepts discussed. The contents page is shown at Figure 3.

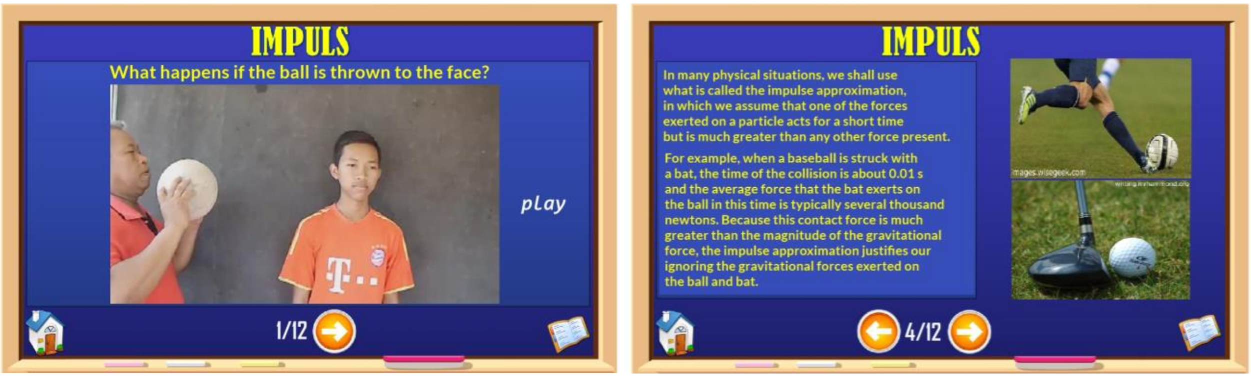

Figure 3. The Content Page of Mobile App

The question practice page consists of 15 multiple choice questions that students can answer to test their understanding of concepts related to impulse and momentum. On the practice questions page, students are free to choose the questions to be answered first. Each answer will be given feedback in the form of information that is true or false in answering the question. Besides, after answering the practice questions, students can choose the question discussion menu or move on to the next question. The practice questions presented are closely related to material on teaching materials that are on the previous menu. Questions on the menu are also presented with pictures, videos, and language that is easily understood by users. The practice question page can be seen in Figure 4.

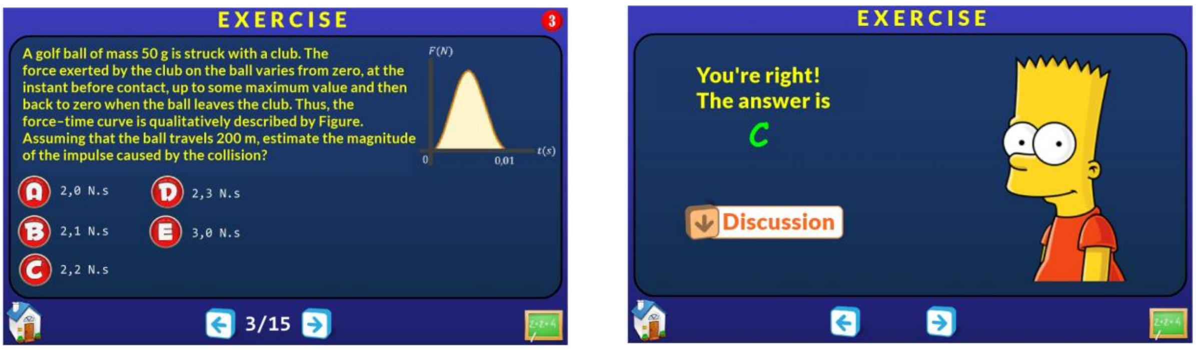

Figure 4. The Practice Question Page of Mobile App

The evaluation page or can be referred to as the daily test, consists of 28 multiple-choice questions. This evaluation can be used to measure understanding of students' concepts of the material that has been learned based on impulse and momentum multimedia teaching materials in the form of mobile applications. Evaluation menu is equipped with a password to access it. This is due to maintain the confidentiality of the matter. In this evaluation menu, students can directly know the score he got after answering all the questions in the evaluation. The students' final score results are displayed with a description of the number of questions that have been completed answered correctly, the number of questions that have been answered incorrectly, and identity (student's name).

The evaluation menu (daily test) also features navigation buttons, making it easier for students to answer evaluation questions. Free students choose the question to be answered first. When students feel sure to know, the score is there for evaluation (daily tests). If the student is unsure of the answer, the student can go back to the evaluation questions (daily tests). Evaluation questions presented closely related to the material in the teaching materials that were on the menu previously. The questions on this menu are also presented with pictures, videos, and language easily accessible to students. In addition, there is also a daily quiz discussion menu that is equipped with a password to access it. Passwords can be shared with students after the daily test is done. It is intended that students are more understand the questions that have been tested. The evaluation page can be seen in Figure 5.

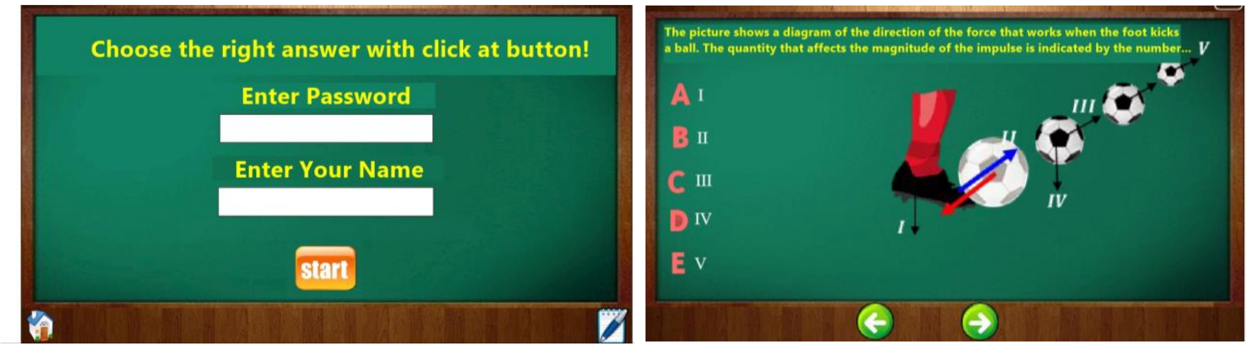

Figure 5. The Evaluation Page of Mobile App

Validation of the development of impulse and momentum multimedia teaching materials in the form of a mobile application obtained from two physics lecturers and one teacher. Data were obtained on limited trials in the form of quantitative and qualitative data. Quantitative data is obtained from filling out a questionnaire based on a Likert scale. In contrast, qualitative data research is obtained from the results of criticism and suggestions written by experts on the sheet the end of the questionnaire.

Table 5. Expert Validation of Mobile App

Contents	Score	Criteria
Content component	3.67	Valid
Presentation	3.33	Valid
Language	3.00	Valid enough
Design	3.28	Valid
Average	**3.32**	**Valid**

Based on table 5, impulse and momentum mobile app shows valid results with an average value of 3.32. Comments and suggestions from the validator are considered as revision material so that impulse and momentum multimedia teaching materials in mobile applications are better, more attractive, worthy of being tested for effectiveness. The mobile app needs to be revised based on comments and suggestions given by physics lecturers and teachers. The suggestions include creating a new logo for the material application and correctly changing the writing of symbols for physical quantities. Besides that, the presented videos are not repeated. They are equipped with play/stop buttons, changing videos that do not match, fixing buttons that do not work, and providing an incomplete symbols description.

The effectivity testing of impulse and momentum mobile app uses a pre-test and post-test design control group design. At the beginning of learning, a pre-test is carried out in class control and experimental class. The pre-test was carried out in the classroom in the form of a PowerPoint displayed on the LCD. Student answers are written on a piece of paper, and each multiple-choice question that is displayed has a deadline for processing. The next step is giving the experiment class impulse and momentum mobile app. Students can use this mobile app to study at home and school. At the end of the lesson, a post-test was carried out in the control class and the class experiment. The control class was carried out the same as in the activity pre-test, which uses a PowerPoint displayed via the LCD.

Figure 6. Students try to operate the Mobile App

The posttest in the experimental class was carried out outside of class hours, giving 1.5 hours to work on questions through each student's mobile device. Furthermore, students can upload the results of the post-test screenshot on the WhatsApp group that was created earlier.

The statistical description was carried out to know the data on the pre-test and post-test scores of students with the lowest and highest score categories. Statistical descriptions were also carried out to determine the mean value of the pre-test and post-test and the standard deviation of the two groups, namely the experimental and control classes.

Table 6. Statistic Description Students Conceptual Understanding

Class	N	Low Pre-test Score	High Pre-test Score	Low Post-test Score	High Post-test Score
Control	35	13	58	37	65
Experiment	35	16	65	69	90

Based on Table 6, the data obtained the lowest pretest value, the highest, the lowest posttest scores, the highest posttest scores, and the average pretest-posttest scores from the experimental class and the control class. The results of data analysis show that the average posttest value of the experimental class is higher than the posttest value control class. It is a result of giving treatment to the experimental class in an impulse & momentum mobile app.

Table 7. Homogeneity Test

Lavene Statistic	df1	df2	Sig.
2.083	3.67	68	0.154

The homogeneity test aims to determine the data on the pretest-posttest value of students' conceptual understanding abilities. Based on table 7, the significance value of the posttest value that was obtained for students' conceptual understanding ability is 0.154. It is more significant than 0.05 (95% confidence level), so it can be concluded that post-test value data of students' conceptual understanding ability from both classes have the same variance (homogeneous). Lavene's statistical value shows that the smaller the value, the greater the homogeneity.

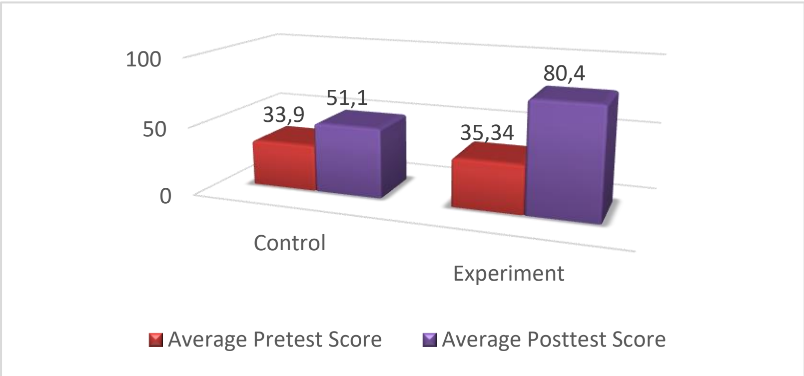

Figure 7. Average Score of Pre-test and Post-test

The normality test aims to determine the pre-test and post-test value data of students' conceptual understanding abilities from the experimental class, and the control class usually are distributed or not. The normality test in this study used the Kolmogorov-Smirnov statistical test. If the significance value on the Kolmogorov-Smirnov test shows a result greater than 0.05, it can be said that the data from two or more groups are normally distributed. Based on Table 8, in the Kolmogorov-Smirnov column, it is known that the value of significance for the experimental class is 0.059 and for the control class is 0.068. The significance value of the two classes shows results greater than 0.05, so it can be concluded that the post-test value data for understanding ability the concept between the experimental class and the control class is typically distributed.

Table 8. Normality Test

Class	Kolmogorov-Smirnov			Shapiro-Wilk		
	Stat	df	Sig.	Stat	df	Sig.
Control	0.143	35	0.068	0.966	35	0.340
Experiment	0.145	35	0.059	0.947	35	0.089

The different tests in this study used the Independent Sample T-Test statistical test. It is used to determine whether or not there is a difference in the average value between the experimental class and the control class after being given treatment. The intended treatment is the impulse & momentum mobile app in the experimental class. Based on the Table 9, the t-test for Equality of Means column, the t count value is 19.587. Based on the test criteria to find out H0 is accepted/rejected, the t count value is compared with the t table value. The value of t table can be searched using the 2-tailed test with degrees of freedom (df=n-2) or using Ms.Excel with the formula tinv (=tinv(0.05;68). The ttable value for df=68 is 1.99, so the value of tcount > ttable (19.587 > 1.99). In the t-test for Equality of Means column, Sig. 2-tailed or P value of 0.000. The P-value is smaller than 0.05; it was concluded that there was a significant difference in the post-test value data the ability to understand concepts between the experimental and control classes.

Multimedia teaching materials in the form of mobile applications are non-printed teaching materials that are operated through mobile devices. According to the grouping of teaching materials, the form of teaching materials can be grouped into printed and non-printed teaching materials (Aydin & Aytekin, 2018). Multimedia teaching materials in a mobile application that combines elements of text, images, audio, video, and animation into one.

Table 9. T-test Result

Post-test	Levene Test		t-test for Equality of Means				
	F	**Sig.**	**t**	**df**	**Sig.(2-tailed)**	**Mean Fid Sig.**	**Std. Error Diff**
Equal variances assumed	2.083	0.154	19.587	68	0.000	29.300	1.496
Equal variances not assumed			19.587	63.68	0.000	29.300	1.496

With these multimedia elements, teaching materials Multimedia can be categorized as a good teaching material because it can visualize the concept of physics in the form of media that is easy to understand and according to student experience (Chao et al., 2016; Hung et al., 2017). Multimedia teaching materials in the form of mobile applications, as we call mobile app, are teaching materials developed based on the assumption of student-centered learning (student-centered). Students use multimedia teaching materials in mobile applications to learn before taking class lessons and when learning at home is done independently. Students actively seeking knowledge from various learning sources is one of the parts of student–centered learning activities. Learning that is designed to be student-centered is believed to have resulted in higher learning.

Impulse & momentum mobile app developed based on field needs and core competencies and essential competencies in the 2013 curriculum. It is because teaching materials should be based on the characteristics of the material lessons and characteristics of users or students and teachers (Nurhasnah et al., 2020; Widayanti et al., 2019). In impulse & momentum mobile app are presented with various physical materials associated with the phenomena of everyday life. It is inseparable from physics which is part of the natural sciences and closely related to human life (Umriyah et al., 2012). Students can learn to connect physics material/concepts acceptance with the natural phenomena they experience (Suryani et al., 2018; Yuliati, 2013). The menu of impulse and momentum mobile app contains the presentation of material that begins with show videos that contain phenomena in everyday life. The video show is also accompanied by questions that lead students to concepts to be studied. The impulse and momentum mobile app are equipped with pictures, graphics, animations, and videos related to applying concepts in everyday life. Based on a questionnaire of criticisms & suggestions by students, the presentation of material in teaching materials is different from teaching materials in general. Presentation accompanied by examples of concepts and videos of phenomena gives the impression of excitement and more knowledge. It is followed by (Yuliati, 2013), who revealed that presenting the material associated with the social and technological context of everyday life can develop learning activities and students' cognitive processes. The question practice menu contains a collection of multiple-choice questions totaling 15 questions accompanied by direct answer feedback and a discussion of questions that can help students check correct and incorrect answers. This practice question is one of the formative assessments that students can do independently. Based on a questionnaire of criticisms & suggestions by students, the menu of practice questions helps students find out materials that have not been understood mastered so that further action is needed to overcome them. It fits as disclosed by (Park, 2019) regarding formative assessment, which serves to monitor students' progress in the learning process.

In the evaluation menu, there are two menu options, namely daily tests and discussion. The daily test menu contains 28 multiple-choice questions that students can answer and use as daily tests. After answering these questions, students can immediately find out the score they got along with the number of questions they answered individually, right or wrong. Based on a questionnaire of criticisms & suggestions by students, the evaluation menu & discussion is accommodating in learning because it provides a complete discussion of questions and honest assessments by displaying score just after they finish the evaluation. Knowing the live score includes feedback activities that increase confidence in student work success (van der Kleij, 2019).

Impulse and momentum mobile app can be another alternative to overcome the problem of using printed teaching materials. Impulse and momentum mobile app present concepts accompanied by examples in everyday life in images, animations, and videos. It can reduce students' difficulties in connecting concepts or materials with phenomena (Chao et al., 2016). The difficulties experienced by these students can have an impact negative on students' understanding of physics concepts. The improvement of students' understanding of physics concepts is shown by testing the effectiveness of multimedia teaching materials in the experimental class and class control. In the analysis of the different tests with t-test, which involved 70 student respondents, the value of t count is 19.587 with t table of 1.99. P-value is p = 0.000, where the P-value is smaller than 0.05. It can be concluded that there is a significant difference in post-test value data on the ability to understand concepts between the experimental class and the control class. These results indicate that impulse and momentum mobile app effectively improves the ability to understand concepts of student physics. Other research related to the use of teaching materials that have characteristics almost the same as multimedia teaching materials, namely CAI (Computer Assisted Test), effectively improves students' conceptual understanding ability. The use of CAI teaching materials equipped with motion pictures, graphics, animations, and videos can improve learning achievement and understanding of students' physics concepts (Kaniawati et al., 2016; Wiyono, 2017).

Conclusion

Impulse and momentum mobile app are validated by experts, namely material, language, and graphic design experts. It is also measured practicality levels with one-to-one trials (revision-1), small group trials (revision-2), and final tests (revision-3). Based on the study results, show the impulse and momentum mobile app that fit students' needs are physics conceptual understanding. Meanwhile, evaluations following the suggestions and responses from experts show that the quality of contextual-based physics teaching materials with the overall percentage of these components is very feasible. The impulse and momentum mobile app is valid and practical.

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