Journal of Innovative Physics Teaching
Volume 2, Issue 1 June 2024, 47 - 61
ISSN: 3021-8551 (Online)
Doi: https://doi.org/10.24036/jipt/vol2-iss1/31
https://jipt.ppj.unp.ac.id/index.php/jipt

Design of E-book Chapter on Impulse Momentum and Collision Materials Oriented CBR and Integrated 4C

Nabilah Iffah Azzahra*, Fanny Rahmatina Rahim, Amali Putra, Silvi Yulia Sari
[4] Departement of Physics, Universitas Negeri Padang, Jalan Prof. Dr. Hamka, Air Tawar Padang 25131, Indonesia

Article Info

Article history:

Received December 27, 2023
Revised June 10, 2024
Accepted June 23, 2024

Keywords:

E-book
Momentum
CBR

ABSTRACT (10 PT)

As technology develops, developments in the education sector are also made to keep pace. One effort that can be made to develop education is to implement education that is integrated with 4C (Critical Thinking, Creative, Communication, and Collaboration) and using a case based reasoning (CBR) approach. Based on data found in the field, schools that have not implemented 4C in learning have learning outcomes that are still relatively low, so an e-book chapter was designed on integrated 4C CBR-oriented momentum and collision material for class X. This research aims to develop an electronic book 4C oriented which integrates CBR in physics subjects in class . This research was carried out using the ADDIE development model which consists of the Analysis, Design, Development and Evaluation stages. Each stage can be evaluated if necessary. The results of the study obtained data on the validity of the contents and constructs of the product by experts as well as the results of the practicality test in schools filled by physics subject teachers and class X students. The validation results carried out by the validator stated that the results of the e-book chapter product design were in the very category. So the product is valid.

***Correspondence:**
Nabilah Iffah Azzahra, Departement of Physics, Universitas Negeri Padang, Jalan Prof. Dr. Hamka, Air Tawar Padang 25131, Indonesia
email : nabilahiffah419@gmail.com

INTRODUCTION

The development of technology and education is one of the important foundations in advancing the development of the nation in the 21st century (Kusumaningtyas et al., 2020). The development of science and technology always goes hand in hand, this requires all parties involved to be able to adjust the development of education with the development of technology, in order to receive information or knowledge more easily in a variety of types, sources, and forms. The more and more diverse information or knowledge obtained, the closer the Indonesian people are to the goal of advancing the country. The solution that can be sought by the government in the development of education is to provide curriculum changes that always adapt to current conditions.

Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 36 of 2018 discusses the revised 2013 curriculum, which contains the objectives of this curriculum, one of which is to equip students with certain abilities so that students can contribute to the life of the nation and state and students can also contribute to progress of world civilization. The skills in question include the ability of students to think critically and creatively. This ability can be found in 4C-oriented learning, where 4C stands for Critical thinking, Communication, Collaborative and Creative skills.(Ningsih et al., 2020), where all of these abilities are basic and important for students to have.

The 4C skills are very important to be applied in physics learning, because in 4C skills there are 4 aspects of skills that are in accordance with the demands of the 2013 curriculum, where the first 4 aspects of these skills are students' skills in critical thinking or Critical, these skills require to be able to solve and analyze problems regarding physical phenomena in everyday life. The second skill is communication or communication skills, these skills require students to be able to communicate and convey ideas, opinions, input, and knowledge well and clearly so that they are easy to understand. The third skill is collaboration skills or Collaboration. Where this skill requires students to be able to carry out learning activities in groups well because this skill requires students to be able to participate and be responsible for group work and respect the opinions of others. The last skill is the creativity of students or creative, this skill requires creative and innovative thinking to find, develop and convey new ideas and ideas about phenomena in physics. We can conclude that learning physics cannot be separated from 4 aspects of 4C skills which include critical thinking skills, communication skills, collaboration skills, and thinking skills. The last skill is the creativity skill of students or creative, this skill requires creative and innovative thinking to find, develop and convey new ideas and ideas about phenomena in physics.

The government has launched various efforts to achieve 4C, both through the application of a scientific approach in learning and in the selection of appropriate teaching materials to achieve 4C skills. The recommended approach in learning the 2013 curriculum is a scientific approach, while the characteristic of the scientific approach is that there are 5 activities carried out in learning, namely observing activities, questioning activities, information gathering activities, association activities, and communicating activities.(Sani, 2014). Apart from the scientific approach, we can also use other approaches to achieve 4C learning skills, one similar approach and can be used as an alternative for this learning is to use a case-based reasoning approach or commonly called the CBR approach. The CBR approach is an approach used to solve new problems based on similar problems that have occurred before (Kalam et al., 2014).

CBR has 4 stages in its approach, namely Retrieve, Reuse, Revise, Retain(Agnar & Plaza, 1994).In the first stage, it goes through the Retrieve stage, which is the stage that begins by reviewing the facts of the new case, then recalling events that are similar to the new case. The second stage is the reuse stage, which is the stage that reuses possible solutions to be reused in new cases. The third stage is the Revise stage, which at this stage simulates the use of the old solution. And at the last stage there is the Retain stage, where at this stage the new solution is stored back that has been successfully used in new cases, to be reused in future cases.

The stages that have been described have similarities to the 5M step in the scientific approach, where at the retrieve stage, where at this stage begins with reviewing facts, the fact-study activity will require students to be able to first analyze the new case to be solved and then it will be carried out as well. the activity of collecting facts to find out the right solution for the new case, then the reuse stage which is the stage of reusing the solution deemed appropriate in the previous case to be reused in a new case, this stage requires a questioning activity, where this questioning activity will be carried out to find out the right solution for the new case. Next step is the revision, where at this stage a simulation of the use of solutions in

old cases is carried out for solving new problems, this stage is similar to associating and communicating activities, where students are required to be able to try out solutions to old cases in new cases, if not appropriate, communicating activities are carried out by revising the solution. old to make it suitable for use in new cases. Finally, at the retain stage, this stage is the final stage, namely by storing all new solutions so that they can be reused in the next case, this stage is part of the activity of collecting information so that it can be read or recalled for the benefit of resolving further cases. Where students are required to be able to try out old case solutions in new cases, if not appropriate, communicating activities are carried out by revising old solutions so that they can be used in new cases.

Another effort made to achieve 4C skills in physics learning is to provide material using an attractive display to increase interest in learning. Teachers are free to create teaching materials or even innovate to provide new things to students. Teaching materials consist of 2 types, namely, teaching materials in printed and non-printed forms, teaching materials in printed form that are often used in schools are Student Worksheets and printed books. Student Worksheets are teaching materials that will greatly help students in practical activities and find concepts that contain worksheets, while books are more comprehensive teaching materials than student worksheets. The use of student worksheets is not evenly distributed in all schools, while books are always provided in schools. Therefore, one of the opportunities for increasing the 4Cs can be pursued by using books that do have a 4C component in them. Books consist of 2 types, namely printed books and electronic books. Basically, the use of these 2 types is the same, one of the advantages of electronic books is that they can be accessed anywhere, they are more interactive because they contain images, videos, and interactions that can occur between students and the e-books used, both in feedback. given to each student to answer the existing questions, as well as videos related to the explanation of the material and can be used independently by students.

Electronic books or electronic books (E-books) are teaching materials in electronic form that present information in the form of text, images, and illustrations. E-books are innovations from monotonous printed books to electronic books that are interactive, interesting and can increase students' interest in learning and understanding of the material being studied.(Rozy & Anggana, 2017). E-books can be accessed on electronic devices such as computers, laptops, smartphones so that it can make it easier for students to access information wherever and whenever needed(Fitria & Heliawan, 2017). E-book is a book that contains complete material, for an E-book that displays only one or two materials can be called an E-book chapter.

Observations made at school, found 2 kinds of teaching materials used in learning, namely student worksheet and books. Not all schools use student worksheet in the learning process, but books are teaching materials that are widely used in schools. Teaching materials in the form of books have 2 forms, namely printed books and electronic books, electronic books have many advantages, especially in online learning because e-books can be accessed more easily and can be used independently by students. Observations at schools saw that electronic books are still very rarely used in schools, electronic books used in schools are only in the form of books in pdf form which do not meet the actual e-book criteria. still monotonous, so students get bored easily and find it difficult to understand learning,

Based on the data observed in the field, the efforts that have been made by the government have not shown maximum results, this data was obtained from the National Examination (UN) for the 2018/2019 academic year which was sourced from Puspendik data.

Table 1. Table of Achievement in National Examination Scores for the 2018-2019

Tested Material	Academic Year		
	City/District (661)	Province (3765)	National (143.816)
Mechanics	50,12	47.74	45.93
Waves and Optics	49.66	45.68	44.42
Thermodynamics	44.73	41.92	42.50
Electricity, Magnetism and Modern Physics	53.03	50,18	48.06

According to Lewy criteria HOTS ability in the range 0-25 is in very low criteria, at the 26-50 range is in the low criteria, then the 51-75 range is in the medium criteria, and in the range 76-100 it is in the high criteria (Kusdianti et al., 2019).

As seen in Table 1, in Padang City there are 661 students. In physics subjects, there are 4 subjects that are tested on students, namely (1) mechanics, (2) waves and optics, (3) thermodynamics and (4) electricity, magnetism and modern physics. In the subject of mechanics, only 50.12 percent of students passed. in the subject of waves and optics there were 49.66 percent who passed, in the subject of 44.73 percent of students who passed, and in the subject of electricity, magnetism and modern physics there were 53.03 percent of students who passed. The percentage of students who pass each material are still categorized in the low category based on Lewy's ability criteria.

Furthermore, interviews with physics teachers at several schools in the city of Padang, the results of the interviews showed that students' interest in learning was quite low. In addition, teachers have difficulty in applying 4C skills in the classroom and have not used the CBR approach, especially when using printed books. The printed books used tend to be monotonous so that students get bored easily and find it difficult to understand the material.

The next step is an effort to collect initial data through distributing questionnaires to students to find out the obstacles experienced by students in learning. Questionnaires distributed include statements about learning styles and 4C skills possessed by students. Learning styles have 3 categories, namely, learning styles in the form of audio, visual and audio visual, analysis of the questionnaire shows that the tendency of students to have an audio-visual learning style is 85%, while audio learning styles are 56%, and learning styles are visual. 83%. Based on this learning style data, it can be concluded that students need audio-visual teaching materials, but the needs for audio-visual teaching materials have not been met in schools. because the teaching materials that tend to be used in schools are still visual, marked by the teaching materials used are printed teaching materials. The electronic teaching materials are only the embodiment of printed teaching materials in the form of pdf files, not books that are actually made to be e-books. Then when viewed from the 4C skills, students who are only able to limit problems by 53%, creative thinking skills in the range of 49%, and students who are only able to formulate problems 51%. In this study, the author focuses on making an e-book chapter, where the e-book chapter is a small part of an electronic book that wants to be developed, this e-book chapter aims to create an illustration or model that can be used as an example to develop an e-book on other material,

Based on the initial data, it can be concluded that the indicators of the 4C skills of students are still low, so to improve them students must have learning resources or learning materials that support the 4C skills. In general, teachers often provide teaching materials in the form of printed books to students, but the use of printed books is still lacking in increasing student interest in learning, this is the cause of the lack of student activity in learning.

E-book chapter can be used as a solution to make it easier for students to access their learning and also to improve the quality of learning. The 4C-based chapter e-book that uses the CBR approach will support the learning process for both students and teachers who use it.

Based on the description of the 2018/2019 National Examination results, it can be seen that all the material tested is still in the low category of students' understanding. The author is interested in focusing on developing an e-book chapter on one of the materials on the topic of mechanics, namely momentum, impulse and collision material. This material was chosen because this material has more cases that are suitable for use in learning using the CBR approach. Momentum, impulse and collision materials are found in KD 3.10, this material was chosen because it has KD guidelines to apply where this will require students to have critical and creative thinking skills found in 4C skills and also require a learning approach that is in accordance with the material provided, like the CBR approach.

Based on the problems found, the authors feel the need for the development of a teaching material in the form of an e-book chapter to overcome the low 4C skills of students. This has become the focus of the author's attention and has aroused the author's interest in conducting research on the design of an E-book chapter on the material of impulse momentum and collision oriented 4C integrated CBR in class X high school physics learning.

METHODS

This research is a Research and Development (R&D) research, where in this development research will examine a theory, concept and approach to create a new product. Research using R&D is carried out in accordance with the stages and of course in accordance with scientific principles.

Research and Development is a research method that aims to produce certain products. By doing Research educational problems first and then find appropriate solutions so that you can develop and apply more innovative education (Okpatrioka, 2023). This research aims to develop oriented electronic books 4C integrated with CBR in high school physics subject class X semester 2 namely on momentum and impulse material using the I-Spring application pay attention to aspects of validity, namely construct validity and validity content and practical aspects.

The model used is the ADDIE model (Analyze, Design, Develop, Implement, Evaluate). The ADDIE model developed by Dick and Carry (1996) aims to design a learning system. Before using the product produced in the ADDIE model, product testing is carried out, through 5 stages, namely, analysis, design, planning, implementation and evaluation.

The first stage is to analyze the feasibility and requirements conditions for development. The first thing to analyze is the need for updates in e-book creation. E-book found at the school has several shortcomings that need to be addressed development of e-books so that students can get learning resources fulfilled. The analysis stage that the researcher carried out included three things, namely needs analysis, curriculum analysis, and student analysis. At this needs analysis stage, the researcher analyzes the state of the teaching materials used to support the implementation of learning. Here the researcher determines which teaching materials need to be developed interactive in helping students. This analysis was carried out through observations, interviews, and filling out questionnaires by teachers and class students X, then continued with developing teaching materials based on students' needs in learning. At the curriculum analysis stage, researchers pay attention to characteristics curriculum being used in schools. Curriculum analysis is carried out so that product manufacturing can be in

accordance with the demands of the applicable curriculum, Then the author also examines KD to formulate achievement indicators learning. The next stage of student analysis is analysis to see interests and motivational attitudes learning, learning styles and students' thinking abilities towards teaching materials used in the learning process. Students as objects who are learning and developing have their own uniqueness and character. Each in the learning process (Rijal & Bachtiar, 2015). Then proceed to the e-book chapter product design stage. then the development stage, then the implementation stage by using the product with teachers and students, then practicality and finally the evaluation stage.

The results of the development are then validated by validators who are experts in the field of physics, product validation of the e-book chapter includes material substance, visual communication display, learning design, software utilization, critical thinking ability assessment, creative thinking ability assessment and CBR assessment. After the e-book chapter product is declared valid, then proceed with conducting practicality tests conducted in schools by teachers and students. Data were collected through questionnaires distributed to teachers and students.

The validity value can be calculated using Aiken's V formula:

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

$$s = r - l_0 \quad (2)$$

Information:

V = rater deal index

l_0= The lowest validity rating score (in this case 1)

c= The highest validity rating score (in this case 5)

r= Number given by an appraiser

n= Number of raters

After obtaining the rater agreement index, the category of the index value is decided. The results of category decisions based on Aiken's index are in Table 2:

Table 2. Decision Based on Aiken's V Index

interval	Category
0.4	Invalid
0.4 < V 0.8	Valid
0.8 < V	Very Valid

(Retnawati, 2016)

The practicality value given by teachers and students can be calculated using the formula:

$$Nilai = \frac{Bobot\ Total}{Bobot\ Maksimum} \times 100\% \quad (3)$$

The practicality assessment of the e-book chapter product obtained from the results of the practicality test will be determined based on the score interpretation criteria obtained as shown in Table 3.

Table 3. Practical Test Interpretation Criteria

Percentage (%)	Criteria
0%-21%	Very impractical
21%-40%	Not practical
41%-60%	Practical enough
61%-80%	Practical
81%-100%	Very practical

RESULTS AND DISCUSSION

Results

Result of Analysis Phase

This activity consists of 3 activities including analysis, needs analysis, curriculum analysis and characteristics analysis. Needs analysis was carried out by conducting observations, interviews and filling out questionnaires given to teachers in high schools throughout the city of Padang. Based on the results of interviews, observations, and analyzes on the e-book, it is necessary to develop an e-book.

Furthermore, curriculum analysis is carried out. The purpose of this curriculum analysis is so that the e-book chapter can be developed in accordance with the current curriculum needs. At this stage of curriculum analysis, an analysis of the use of the e-book chapter that will be developed and analysis of learning materials is carried out. The material presented in the e-book chapter is adjusted, it is necessary to study the KI and KD learning physics. The material used in the e-book chapter is momentum, impulse and collision material.

KD used is KD 3.10 and KD 4.10, which has the final target of students who are able to achieve the level of cognitive ability to apply in accordance with the demands of KD 3.10 and the final target of KD 4.10 students are able to present the results of experiments related to momentum, impulses and collisions which has been done.

Result of Design Phase

The design stage is an activity in designing the appearance for the e-book chapter in accordance with the 2010 Ministry of National Education, containing titles, instructions for use, learning instructions, e-book information, KI and KD, achievement indicators, materials, practice questions (examples of questions), competency tests (evaluation), glossary, references (bibliography), and compiler biodata.

Figure 1. E-book Cover

The cover is the first page displayed when accessing the e-book chapter. On this cover page there is information regarding the title of the e-book chapter and the approach used in the e-book chapter. The cover page is equipped with navigation buttons at the bottom left of the cover display.

Figure 2. Instructions for using e-book

On the user manual page there is an explanation of the navigation buttons found on each page in the e-book chapter. The navigation buttons aim to make it easier for users to use e-book chapters. Before entering the material, the function of each navigation button is first explained so that users are not confused when using the e-book chapter.

The navigation buttons consist of a home button to return to the cover page of the e-book chapter, a material button to display the e-book material, a student worksheet button to go to the student worksheet display in the e-book chapter, an evaluation button to direct you to the evaluation practice questions. The table of contents button to review the table of contents of the e-book chapter, and finally the exit button to exit the e-book chapter when finished using the e-book chapter.

Figure 3. Core competencies

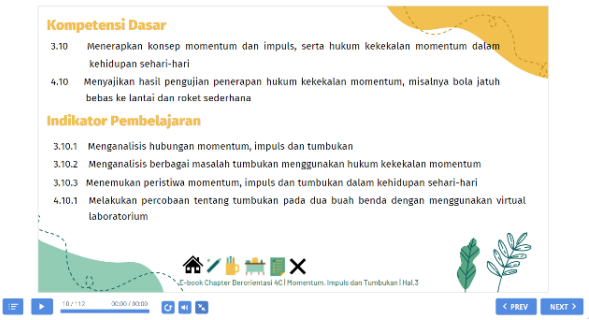

Figure 4. Basic competencies

This page contains Core Competencies. KI was created based on Minister Regulation of Education and Culture No. 37 of 2018, an amendment to Minister Regulation No. 24 of 2016 concerning core competency. This core competency consists of 4 aspects including, KI-1, namely living and practicing the teachings of the religion one adheres to." Then KI-2, namely showing honest, disciplined, responsible, caring behavior (mutual cooperation, cooperation, tolerance, peace), polite, responsive and proactive and showing an attitude as part of the

solution to various problems in interacting effectively with the social environment and nature and in placing oneself as a reflection of the nation in world relations. Next, KI-3 is understanding, applying, analyzing factual, conceptual, procedural knowledge based on curiosity about science, technology, arts, culture and humanities with insight into humanity, nationality, statehood and civilization regarding the causes of phenomena and events, as well as applying procedural knowledge in a specific field of study according to his talent and interest in solving problems. Finally, KI 4 is processing, reasoning and presenting in the concrete and abstract domains related to the development of what one learns at school independently, and being able to use methods according to scientific principles.

Basic Competency which is abbreviated as KD in Indonesia was also created based on Minister Regulation of Education and Culture No. 37 of 2018, an amendment to Minister Regulation No. 24 of 2016 concerning KD. The KD used in this chapter's e-book material is KD 3.10 and KD 4.10 which have the final target of applying the concepts of momentum and impulse in everyday life in accordance with KD 3.10. The final target of KD 4.10 is students who are able to present test results on the application of momentum and impulse.

Competency achievement indicators are developed based on basic competencies. Indicators on momentum, impulse and collision material were developed to improve students' critical thinking abilities and creative abilities, namely in the C4 to C6 cognitive realm. The indicators in KD 3.10 were developed into 3 indicators and KD 4.10 into 1 indicator.

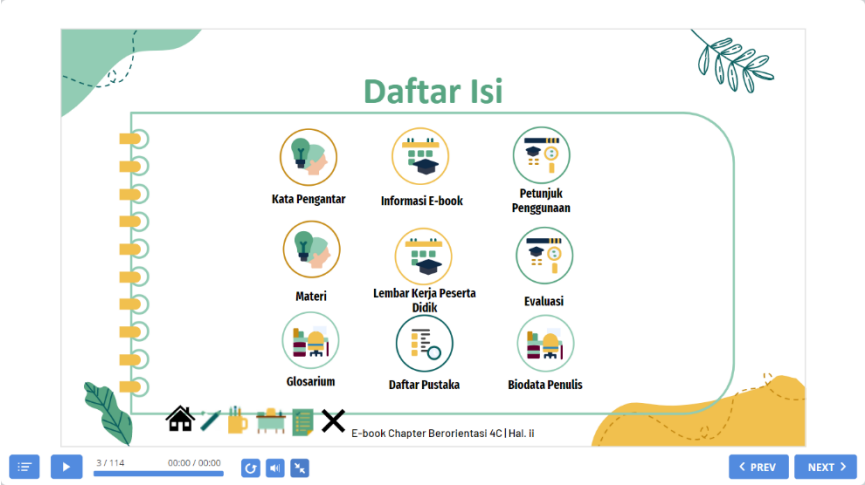

Figure 5. List of contents

On this page there is a list of contents for the e-book chapter including (1) Foreword, (2) E-book chapter information, (3) Material, (4) Student Worksheets, (5) Evaluation, (6) Glossary, (7) Bibliography, (8) Author Biodata. In this table of contents, buttons can be clicked directly to go directly to the desired page.

Result of Develop Phase

Based on the results of the design carried out in the previous stage and then carried out the development stage, this stage aims to produce a valid momentum, impulse and momentum e-book chapter. At this stage, validation activities were carried out by 3 validators, namely three physics lecturers, FMIPA UNP. The results of the validation carried out can be seen in Table 4.

Table 4. Validation Results Against E-book Chapter

Rated aspect	The average value of the assessment items	Criteria
Material substance	0.81	Very Valid
Visual communication display	0.88	Very Valid
Learning design	0.81	Very Valid
Software utilization	0.9	Very Valid
Assessment of critical thinking skills	0.79	Valid
Assessment of creative thinking skills	0.73	Valid
CBR Rating	0.75	Valid

Based on the product development of the e-book chapter on the material of momentum, impulse and collision, overall it is in the valid and very valid criteria. The product validity decision refers to the decision of(Retnawati, 2016), where values below 0.4 are included in the invalid category, large values from 0.4 to small equal to 0.8 are included in the valid category, and values above 0.8 are categorized as valid products. Products that have been declared valid can be continued by conducting practical trials to see the practicality of the e-book chapter product.

Result of Implement Phase

The e-book chapter product that has been declared valid is then continued to the practicality test to see the practicality of the e-book chapter in the use of learning in schools. Implementation activities were carried out by filling out questionnaires by teachers and students from 3 SMAN in Padang City which were selected based on the high, medium and low school categories as seen from the results of the 2019 national exam at the Puspendik. The schools selected in this study include, SMAN 2 Padang as a school with a high school category, SMAN 8 Padang as a school with a medium school category, and SMAN 12 Padang as a school with a low school category.

Table 5. Practical Test Assessment Results

Evaluator	Average (%)	Category
SMAN 2 Padang	90.5%	Very Practical
SMAN 8 Padang	89.6%	Very Practical
SMAN 12 Padang	92%	Very Practical

Based on the assessment given by the teacher, overall, the e-book chapter products on momentum, impulse and collision materials are in the very practical category. the practicality category is seen from the Likert scale which states that 0%-21% is in the very impractical criteria, the range 21%-40% is in the impractical criteria, the 41%-60% is in the quite practical criteria, the range is 61%-80 % is in the practical criteria, the range of 81%-100% is in the very practical criteria. The evaluation of the product of the e-book chapter on momentum, impulse and collision material is on the criteria of sufficient or quite practical, strong or practical, and very strong or very practical(Riduwan, 2015). Products that have been declared practical can already be used in learning at school as well as independent use by students at home.

Result of Evaluate Phase

The evaluation stages of the ADDIE development method are carried out at each stage if necessary. The evaluation activity aims to perfect the e-book chapter product on momentum, impulse and collision material so that it can be more valid and more practical in its use. The evaluation was carried out based on the suggestions given by the validators, teachers and students who filled out validity and practicality questionnaires. This can reduce the shortcomings of e-book chapters.

The results of the e-book chapter design are assessed from 7 components including (1) material substance, (2) visual communication display, (3) learning design, (4) software utilization, (5) critical thinking ability assessment, (6) thinking ability assessment creative, and (7) CBR assessment. The assessment of each statement in the questionnaire sheet is in the range of 1-5 with the maximum score for each question is 5. The score and average value for one assessment component is determined from the scores of all indicators contained in an assessment component.

Based on the average value obtained by the 7 components of this validity assessment, the value of the overall validity of the product can also be calculated by averaging the validity value of the 7 components above so that an average value of 0.81 is obtained, which at this value is an e-book product. chapter can be categorized as a very valid product.

Then at the product validation stage, the product goes through several stages of revision including revisions on the appearance of the e-book chapter, learning designs and revisions on the contents of the e-book chapter. Then the validator gives a value to the product developed after the revisions made have met the suggestions given by the validator. Based on this assessment, the product is categorized as valid and can be used for the practical phase. According to (Arikunto, 2015)the results of the validity test can generally state the validity of the product.

After the e-book chapter product is declared as a valid product in the validity test, then the practicality test of the e-book chapter is then carried out to teachers and students at SMAN Padang at each school that is included in the category of schools with high, medium and low abilities. Schools are categorized based on the results of the 2019 National Examination. After collecting data on schools in the city of Padang, the schools chosen to be the place for the practicality test of the E-book chapter are SMA N 2 Padang as a school with a high category, SMA N 8 Padang as a school with a category medium, and SMA N 12 Padang as a school with a low school category.

The second result achieved is the result for the practicality test of the 4C-oriented chapter e-book with the CBR approach on impulse and collision momentum material from two categories, namely the practicality test conducted by the teacher and the practicality test conducted by the students. The practicality test was carried out by 2 teachers in each school and also filled by 3 students in the medium category school. The practicality instrument given to the sample is an instrument that has previously been declared valid in instrument validation, the practicality instrument consists of several indicators including easy to understand, attractive and efficient. The practicality category is seen in the practicality category according to (Riduwan, 2015). The assessments given by teachers and students are useful for knowing the responses and opinions of teachers and students on e-book chapter products.

The results of the easy-to-understand indicator assessment are included in the very practical category. The indicator items in the easy-to-understand component consist of 11

items. Based on the results of the practicality test assessment carried out, all items on the easy-to-understand indicators are stated in the very practical category. The results of the assessment of interesting indicators are included in the very practical category. The indicator items in the interesting component consist of 4 items. Based on the results of the practicality test assessment carried out, all items on the attractive indicators are stated in the very practical category. The results of the efficient indicator assessment are included in the very practical category. The indicators for the efficient component consist of 6 items. Based on the results of the practicality test assessment carried out, all items on the efficient indicator are stated in the very practical category.

In this practicality test there are several assessment items that are given a value of 3 or enough of them, examples of questions that are owned by the e-book chapter are easy to understand, this item is given a value of 3 by practical A, the examples of questions contained in the e-book chapter have a CBR approach. According to(Kalam et al., 2014) CBR is a method for solving problems based on the previous problem, in which case examples will be provided that will be able to assist students in answering evaluation questions later.

Then on the item regarding the examination of the evaluation of the e-book chapter, no special skills are needed, a score of 3 is given by practitioners B, E and H. Where in the evaluation activities held by the e-book chapter, it will give a score according to the number of wrong and correct answers given. by the user.

Then on the item completeness of the material contained in the e-book chapter in adding insight and information to students, which is given a value of 3 by practitioner B. This 4C-based e-book chapter and has a CBR approach already has content and content that has been declared complete. from the very valid value given by the validator at the previous validation stage. Furthermore, the time needed to study the material contained in the e-book chapter is in accordance with the standard lesson hours set by the government, which is given a score of 3 by practitioners C, E and G. This is related to the reduction in lesson hours caused by the pandemic. However, this e-book chapter is designed to be used by users independently, not only for classroom learning.

According to Rochmad (2012) in development research, a product can be declared as a practical product if the experts have agreed on the product theoretically, that the product can be applied in schools and the level of product implementation is in a good category.

Based on the results of the practicality test of the e-book chapter which was assessed by physics subject teachers and students, it was obtained an overall average which can be concluded that the e-book chapter is very practical. Based on the data from this practical test, it shows that the e-book chapter with momentum, impulse and collision material has fulfilled the components that are easy to understand, interesting and efficient to use in learning. In accordance with aspects that can be considered in practicality according to(Sukardi, 2011)namely when the time used in the implementation of learning is effective and the attractiveness aspect of the e-book chapter increases students' interest in learning.

Discussion

After the e-book chapter product is declared as a valid product in the validity test, then the practicality test of the e-book chapter is then carried out to teachers and students at SMAN Padang at each school that is included in the category of schools with high, medium and low abilities. Schools are categorized based on the results of the 2019 National Examination. After collecting data on schools in the city of Padang, the schools chosen to be the place for the

practicality test of the E-book chapter are SMA N 2 Padang as a school with a high category, SMA N 8 Padang as a school with a category medium, and SMA N 12 Padang as a school with a low school category.

The second result achieved is the result for the practicality test of the 4C-oriented chapter e-book with the CBR approach on impulse and collision momentum material from two categories, namely the practicality test conducted by the teacher and the practicality test conducted by the students. The practicality test was carried out by 2 teachers in each school and also filled by 3 students in the medium category school. The practicality instrument given to the sample is an instrument that has previously been declared valid in instrument validation, the practicality instrument consists of several indicators including easy to understand, attractive and efficient. The practicality category is seen in the practicality category according to Riduwan (2015). The assessments given by teachers and students are useful for knowing the responses and opinions of teachers and students on e-book chapter products.

The results of the easy-to-understand indicator assessment are included in the very practical category. The indicator items in the easy-to-understand component consist of 11 items. Based on the results of the practicality test assessment carried out, all items on the easy-to-understand indicators are stated in the very practical category. The results of the assessment of interesting indicators are included in the very practical category. The indicator items in the interesting component consist of 4 items. Based on the results of the practicality test assessment carried out, all items on the attractive indicators are stated in the very practical category. The results of the efficient indicator assessment are included in the very practical category. The indicators for the efficient component consist of 6 items. Based on the results of the practicality test assessment carried out, all items on the efficient indicator are stated in the very practical category.

In this practicality test there are several assessment items that are given a value of 3 or enough of them, examples of questions that are owned by the e-book chapter are easy to understand, this item is given a value of 3 by practical A, the examples of questions contained in the e-book chapter have a CBR approach. According to(Kalam et al., 2014)CBR is a method for solving problems based on the previous problem, in which case examples will be provided that will be able to assist students in answering evaluation questions later.

Then on the item regarding the examination of the evaluation of the e-book chapter, no special skills are needed, a score of 3 is given by practitioners B, E and H. Where in the evaluation activities held by the e-book chapter, it will give a score according to the number of wrong and correct answers given. by the user.

Then on the item completeness of the material contained in the e-book chapter in adding insight and information to students, which is given a value of 3 by practitioner B. This 4C-based e-book chapter and has a CBR approach already has content and content that has been declared complete. from the very valid value given by the validator at the previous validation stage. Furthermore, the time needed to study the material contained in the e-book chapter is in accordance with the standard lesson hours set by the government, which is given a score of 3 by practitioners C, E and G. This is related to the reduction in lesson hours caused by the pandemic. However, this e-book chapter is designed to be used by users independently, not only for classroom learning.

According to Rochmad (2012) in development research, a product can be declared as a practical product if the experts have agreed on the product theoretically, that the product can be applied in schools and the level of product implementation is in a good category.

Based on the results of the practicality test of the e-book chapter which was assessed by physics subject teachers and students, it was obtained an overall average which can be concluded that the e-book chapter is very practical. Based on the data from this practical test, it shows that the e-book chapter with momentum, impulse and collision material has fulfilled the components that are easy to understand, interesting and efficient to use in learning. In accordance with aspects that can be considered in practicality according to Sukardi (2011) namely when the time used in the implementation of learning is effective and the attractiveness aspect of the e-book chapter increases students' interest in learning.

CONCLUSION

Based on the results of research and discussions that have been carried out, conclusions can be drawn on how to develop a valid and practical e-book chapter. The process of developing the e-book chapter follows the research and development steps proposed by ADDIE. The e-book chapters that have been developed consist of titles. The developed e-book chapter is in the category of high validity value. This shows that the product already contains (1) material substance, (2) visual communication display, (3) learning design, (4) software utilization, (5) critical thinking ability assessment, (6) creative thinking ability assessment, and (7) the CBR assessment designed for the e-book chapter is in accordance with the good and correct indicators of the validity of the e-book chapter. Furthermore, based on the results of the practicality test of the e-book chapter on the practicality test of teachers and students, it has a very practical category. This indicates that the e-book chapter that was developed is easy to understand, interesting and efficient, so that the e-book chapter can be used in school learning and independent learning by students which can be accessed more easily when needed. Furthermore, the design of the e-book chapter can be continued by other authors by including materials that can be adapted. so that the e-book chapter can be used in learning at school as well as independent learning by students which can be accessed more easily when needed. Furthermore, the design of the e-book chapter can be continued by other authors by including materials that can be adapted. so that e-book chapters can be used in school learning and independent learning by students which can be accessed more easily when needed. Furthermore, the design of the e-book chapter can be continued by other authors by including materials that can be adapted.

REFERENCES

Agnar, A., & Plaza, E. (1994). Case-Based Reasoning: Foundational Issues, Methodological Variations, And System Approaches. *AI Communications*, *7*(1), 39-59.

Arikunto, S. (2015). *Dasar-Dasar Evaluasi Pendidikan*. Bumi Aksara.

Fitria, T. N., & Heliawan, Y. A. (2017). Meningkatkan Kemampuan Mahasiswa Prodi S1 Akuntansi Dalam Memahami Buku, Ebook dan Artikel/Jurnal Akuntansi Berbahasa Inggris. *Jurnal Akuntansi Dan Pajak*, *17*(02).

Kalam, M. Z. E., Setiawan, B. D., & Ratnawati, D. E. (2014). Implementasi Metode Case Based Reasoning (CBR) dan K-Nearest Neighbor (K-NN) dalam Sistem Pendukung Keputusan untuk Menentukan Tingkatan Depresi. *Repositori Jurnal Mahasiswa PTIIK UB*, *4*(6), 1–7.

Kusdianti, I., Sitompul, S. S., & Mahmuda, D. (2019). Analisis Kemampuan Peserta Didik Dalam Menyelesaikan Soal HOTS Kelas XI SMAN 2 Sungai Raya. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, *8*(6), 1-10.

Kusumaningtyas, R., Sholehah, I. M. A., & Kholifah, N. (2020). Peningkatan Kualitas Pembelajaran Guru Melalui Model dan Media Pembelajaran bagi Generasi Z. Warta LPM, 23(1), 54-62.

Ningsih, I. S., Darvina, Y., Ramli, R., & ... (2020). Uji Validitas LKS Berbasis Problem Solving Bermuatan Keterampilan 4C Pada Materi Dinamika Partikel Dan Hukum Newton Tentang Gravitasi Kelas X SMA/MA. *Pillar of Physics Education,* 13(2), 265-272.

Okpatrioka, O. (2023). Research and development (R&D) penelitian yang inovatif dalam pendidikan. Dharma Acariya Nusantara: Jurnal Pendidikan, Bahasa dan Budaya, 1(1), 86-100.

Pusat Penilaian Pendidikan Badan Penelitian dan Pengembangan Kementerian Pendidikan dan Kebudayaan. (2020). *Ringkasan Eksekutif Hasil Ujian Nasional 2018 Masukan untuk Pembelajaran di Sekolah SMA/MA IPA*.

Retnawati, H. (2016). *Analisis Kuantitatif Instrumen Penelitian*. Parama Publishing.

Riduwan, A. (2015). Belajar Mudah Penelitian Untuk Guru-Karyawan dan Peneliti Pemula. In *Journal of Chemical Information and Modeling* (Vol. 53, Issue 9). ALFABETA.

Rijal, S., & Bachtiar, S. (2015). Hubungan antara Sikap, Kemandirian Belajar, dan Gaya Belajar dengan Hasil Belajar Kognitif Siswa. *Jurnal Bioedukatika*, 3(2), 15.

Rochmad. (2012). Desain Model Pengembangan Perangkat Pembelajaran Matematika. *Kreano: Jurnal Matematika Kreatif-Inovatif*, *3*(1), 59-72.

Rozy, A. F., & Anggana, Y. (2017). Pengembangan Media Pembelajaran Elektronika Berbasis 3D Pageflip Pada Mata Pelajaran Penerapan Rangkaian Elektronika Di SMK Negeri 1 Kediri. *Jurnal Pendidikan Teknik Elektro*, *6*(1), 1-7.

Sani, R. A. (2014). *Pembelaran Saintifik untuk Implementasi Kurikulum 2013*. BUMI AKSARA.

Sukardi. (2011). *Evaluasi Pendidikan, Prinsip, dan Operasionalnya*. BUMI AKSARA.