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Analysis of Availability of Case-Based Reasoning Approaches on Physics Textbooks Class X Semester 1

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Abstract

Learning is strengthened by using an approach to learning. In the 2013 curriculum, it is recommended to use an approach to learning, one of which is the Case-Based Reasoning (CBR) approach. One approach similar to the current process standards is the CBR approach, which helps teachers provide more student involvement in learning activities. There are many physics textbooks that many publishers have circulated, so It is vital to investigate whether or not these books have provided a CBR approach to learning to improve reasoning skills and higher-order thinking as suggested in the 2013 curriculum. This research was done to analyze the CBR approach. CBR is in a physics textbook for class X, semester 1, at Public High Schools in the City of Padang. The research carried out included descriptive research using a qualitative approach. The research population consisted of all physics textbooks for class X high school published in Indonesia and used in the city of Padang. The research samples were three Physics textbooks for Class X High School Semester 1: ER, IP, and TS. The research results showed that no CBR approach was found in the three physics textbooks analyzed. Hence, we concluded that no textbooks are currently available that provide a CBR approach.

Keywords: Analysis; Case-Based Reasoning; Text Book

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INTRODUCTION

The curriculum is a means that determines the direction of education (Fadlillah, 2014; Fahmi & Bitasari, 2021). Therefore, the curriculum must be applied thoroughly to the learning process to achieve educational objectives. Changes to the curriculum are made so that Indonesia does not left behind other countries (Aziz et al., 2022; Chaerani et al., 2022).

The 2013 curriculum, which has been revised several times, can be a solution to the challenges of the development of the times, as in Permendikbud No. 36 of 2018, which stated that the purpose of the Curriculum 2013 revision is to prepare students in order to have character as individuals and citizens who have skills and can cooperate with society, nation, country and also contribute to world civilization. The

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2013 revision curriculum can guide students to adapt to their environment. The implementation of the Curriculum 2013 revision contains three areas of competence: “perspective, knowledge, and skills”.

The implementation policy of the Curriculum 2013 Revision has had a significant impact on many elements of education in Indonesia. One of them is the development of national education standards, which is the foundation for the maintenance of education in Indonesia. According to Article 2, “Regulations of the Government of the Republic of Indonesia Number 32 of 2013 on National Standards of Education”, “the scope of the National Standard of Education consists of 1) Content standards; 2) Process standards; 3) Competence standards; and 4) Educational standards and training skills.” 5) Standard Sarana and Prasarana 6) Management Standards 7) Financing Requirements 8) Education Evaluation Standards The purpose of establishing national education standards is to support education quality.

The standard of the process plays an important role in improving the quality of education because it is very closely related to the activities of the learning process in the school. According to Permendikbud No. By 2022 on the Standard of process, learning processes must use models that shift the principle of learning from informed students to students looking for information. The learning process is also strengthened by using approaches to the learning process, for example, scientific approaches, integrated thematic and thematic. The characteristic feature of the scientific approach is to have five learning stages: observe, question, collect information, associate, and communicate (Putri et al., 2016; Sani, 2014).

In addition to scientific approaches, we can also use other approaches. One of the similar approaches that can be used as an alternative to this learning is the CBR. This approach is used to solve new problems that are guided by similar problems that have occurred before (Kalam et al., 2014; Mukhlis & Oktalina, 2018). CBR has been phased in solving a problem: retrieve, reuse, revise, and retain (Aamodt & Plaza, 1994; Supic, 2018). The first phase, the retrieve phase, is a phase that begins with the student exploring the facts of a new case, then recalling similar events in new cases. The second stage is the reuse stage, which is the stage in which students reuse solutions that allow them to be reused on a new case. The third phase is the revision phase. At this stage, the student performs a simulation using old solutions; if they are inappropriate, they will look for another solution based on similar previous events. The last stage is the retention stage, at which the student saves a new solution that has been successfully used in a new case to be reused in a future case.

The stages of the CBR described have similarities with step 5M on the scientific approach. At the stage of retrieval this stage begins with investigating facts. Investigating the facts will enable the learners first to analyze the new case that is to be resolved, then gather facts to know the right solution for a new case. Then the reuse stage, which is the stage of reuse of the solution considered appropriate in the previous case to be reused in the new case, leads the participant to the presence of the activity, which will be carried out to find the appropriate solution for the new case. Following the revision stage, in which the student performs a simulation of the use of solutions in the old case to resolve new problems, this stage is similar to associating and communicating. The student must be able to try the solution of the old case in the new case if it is not

appropriate to do the communication activity by reviewing the old solution to be suitable for use in a new case. Last, in the retain phase, this phase is the final phase, i.e., with the student storing all the new solutions so they can be reused in the subsequent case. This stage is part of collecting information to be read or remembered for resolving the case later.

CBR can be used effectively in the expansion process and for academic success (Aesyi & Wardoyo, 2019; Rahman et al., 2019). CBR provides significant benefits for learning. The CBR approach allows individuals to access relevant knowledge quickly and improve their problem-solving abilities and overall performance (Mokmin & Masood, 2015; Martin, 2016).

The CBR cognitive model is the core of a constructive learning approach by leveraging relevant knowledge in solving problems (Tawfik & Kolodner, 2016; Teng et al., 2016). The CBR approach perfectly matches the characteristics of physical lessons. The CBR approach guides learners to seek information first before the learning process takes place. CBR is a problem-solving method based on previous learning experiences. CBR is a way of solving a problem by using the solution of a previous problem that has similarities (Smiti & Elouedi, 2011). CBR has four stages in solving a problem: retrieve, reuse, revise, and retain (Salem & Hisham, 2013). CBR can be adapted to the lessons to facilitate teachers and students in physical learning activities related to problem-solving, similar to the concept of physics because, according to Dahar (2011), the ability to solve problems is the highest order of intellectual skills.

CBR is defined as problem-solving through the use of previous experience. The CBR approach enables students to discover and solve problems independently by adapting the learning material to their daily lives (Rahman & Budiyanto, 2019; Oconitrillo et al., 2021). The CBR approach can be combined with the learning resources used in providing facilities for the implementation of CBR methods in the learning process so that learning has a positive impact on problem-solving and analytical thinking skills (Mukhlis & Oktalina, 2018; Raste et al., 2021).

To provide support for achieving the learning process goals, the need for learning resources and teachers' experience significantly impact knowledge-based reasoning (Gegenfurtner et al., 2020; Samsinar, 2020). A textbook is a learning resource that is very helpful in the learning process and is often used. A textbook or a book widely known as a teaching book has the function of becoming an information medium or a learning source that can be in print or electronic form. As for textbooks in printed form, they can help students in the teaching process and provide teachers with ease in explaining materials to students. A textbook can help learners prepare themselves before participating in the learning process, and learners can participate more in the class (Sitepu, 2012; Rahmawati, 2016; Permatasari & Anwas, 2019).

The teaching book will provide assistance for teachers and pupils to facilitate the process of learning and teaching. The textbooks cannot be separated from the lessons of physics in high school, either by traditional teaching methods or by creative learning models. Learning should use a scientific methodology so that it can be implemented in accordance with the criteria of the educational process, which will depend on the source of learning used. The learning resources used must facilitate the application of scientific approaches to the learning process of physics. Also, to apply the CBR approach to learning, students need a textbook to help them apply it.

The government has tried to implement the Curriculum 2013 in one of them by preparing textbooks as a learning resource for students. No government regulations 32 in 2013 article 43 said that "in the sector of procurement of textbooks taught implemented by the government, the book has been regulated by the Minister as the primary learning source after examination and evaluated by BNSP before teachers and pupils use the textbooks as a learning source in the educational unit. The textbook must meet several aspects, among them: 1) the material aspect; 2) the language aspect; 3) the presentation aspect; and 4) the graphic aspect (Depdiknas, 2008).

Research conducted by Tawfik & Keene (2013) on the application of CBR showed that students have difficulty solving tasks with problem transitions to unstructured problems and recommended CBR to facilitate the transition of these problems.

Thus, this research is needed to analyze the teaching book as one of the learning sources used by the students in working tasks. Modern cognitive researchers note the importance of solving unstructured problems to emerge and develop higher thinking skills such as reasoning, argumentation, and evaluation.

The CBR method is used to deal with new cases using past knowledge. The implementation of this learning process can be done in education. The research carried out by Wahidin (2023) aims to produce humans skilled in applying information technology by applying CBR and AI. The study also discusses the importance of CBR in education and its potential impact on learning activities. Then it is necessary to analyze the availability of the CBR approach in textbooks since textbooks are often used as a resource in learning activities.

With the large number of physics textbooks that have been spread through a number of publishers, it is necessary to examine whether the books already provide a CBR approach to the learning process. Observations have been carried out in 16 Kota Padang schools to determine which textbooks for class X physics lessons are used in the learning process. Based on the observations that have been made, the books used by teachers in learning at the schools are presented in Table 1.

Table 1 High school physics class x in the high school

Authors	Publisher	f
Marthen Kanginan	Erlangga	10
Pujianto et al.,	Intan Pariwara	7
Muhammad Farchani Rosyid et al.,	Tiga Serangkai	5
Hari Subagya	Bumi Aksara	4
Aris Prasetyo et al.,	Mediatama	2
Kamajaya	Grafindo Media Pratama	2
Sunardi et al.,	Yrama Widya	1

From the observation data, three of the most frequently used textbooks in schools were selected as samples for research, which will be assessed regarding the presentation of material associated with the CBR component. Therefore, in order to obtain a suitable textbook and facilitate the application of CBR methods in learning, it is necessary to examine textbooks that deny the components of the CBR approach.

The textbook analysis is carried out by evaluating the four indicators of the CBR approach contained in the textbook. CBR is an effort to solve problems using previous experience (Main et al., 2001). CBR is a relatively

new problem-solving technique attracting increasing attention (Watson & Marir, 1994). This is in line with the opinion of Dahar (2011), which reveals that the highest order of intellectual skills is the ability to solve problems. The problem-solving mechanism with the CBR approach adopts the steps/cycles proposed by Aamodt & Plaza (1994).

Based on the problems that have been presented, there are rare studies related to analyzing the availability of CBR approaches in textbooks have been found. Further research is carried out by conducting descriptive research. This study aims to analyze the availability of the Case-Based Reasoning approach in the Physics Class X semester one textbook at the state high school in Padang.

METHOD

This research belongs to the descriptive research conducted through a qualitative approach. Descriptive research aims to provide a systematic view of the facts of the research object (Sukardi, 2012). The desired results of this study are not generalizations based on quantity but on the quality of the events studied (Prastowo, 2016). This study resulted in a report of the objects carried out by the research, referring to the facts found and describing what is presented in the high school physics class X semester one textbook. The analysis is carried out in four stages: retrieve, reuse, revise, and retain.

The stage of the CBR cycle in learning is four. At the retrieval stage, the researchers found problems and variable problem equations. At the reuse stage, solutions to previously existing problems were explored and detected in the case of similar problems. At the revision stage, solutions from old problems to new problems were adapted, and differences in new problems were corrected. In the final retention phase, new problem solutions were stored as knowledge and learning experience, and an understanding of new problem-solving was developed.

The population of this study is the entire textbook of high school physics Class X published in Indonesia and used in the city of Padang. The sampling was done using non-probability sampling techniques. Non-probability sampling is a technique for determining samples but does not give equal opportunities for each portion of the population to become a sample (Sugiyono, 2017). In this study, the researchers assigned a sample of three high school physics textbooks of Class X, namely the Erlangga book, the Priwara Intan book, and the Tiga Serangkai book, which was carried out through four stages consisting of "preparation, implementation, analysis, and reporting.

Content analysis is a method of concluding contextually, so communications messages can be understood complexly (Prastowo, 2016). Content study is a procedure used to draw correct conclusions from books or documents (Moleong, 2009). Thus, data analysis techniques with content studies are procedures used to produce conclusions from books or documents so that comprehension can be done complexly. The technique for processing the data from this research was carried out by means of:

1. Summarize the appearance of CBR approach instruments in the physics textbooks analyzed;
2. Calculate the percentage availability of the CBR approach in a textbook for high school physics class X with formulas.
3. Determine the percentage of the average proportion of each CBR category in all the physics textbooks analyzed.
4. Determine the criteria for the availability of the CBR approach in

the textbook of high school physics class X, semester 1, as observed in Table 2 (Riduwan, 2012).

Table 2 CBR availability criteria for high school physics textbook class x

Criteria of percentage	Category
81%-100%	Highly available
61%-80%	Available
41%-60%	Fairly available
21%-40%	Less available
0%-20%	Not available

RESULTS AND DISCUSSION

Based on the research on the availability analysis of the CBR approach to the physics textbooks of class X semester 1, through indicators such as retrieve, reuse, revise, and retain. The material covered is for class X, semester I. Based on the analysis results in the above image, it is obtained that the percentage of the CBR component in each textbook is different. The results of the analysis of each indicator of the CBR approach are shown in Figure 1.

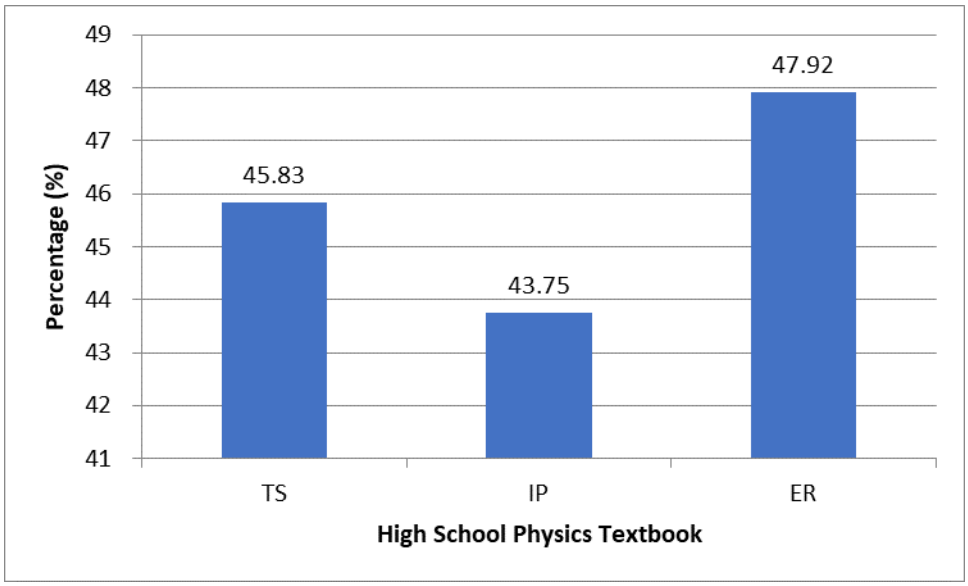

Figure 1 Diagram of retrieve average for each textbook

First of all, the indicator was retrieved. The results of the availability analysis of the CBR approach for the retrieve indicator can be seen in Figure 1.

Figure 1 shows the average percentage of one of the CBR indicator retrieval approaches in the three textbooks. Erlangga textbooks obtained the highest percentage. The lowest percentage is in the book edition of Intan Pariwara, with a fairly available category available. The average availability of the CBR indicator retrieval approach in class X semester one textbook is fairly available.

The second indicator is reuse. The results of the availability analysis of the CBR approach for the reuse indicator can be seen in Figure 2.

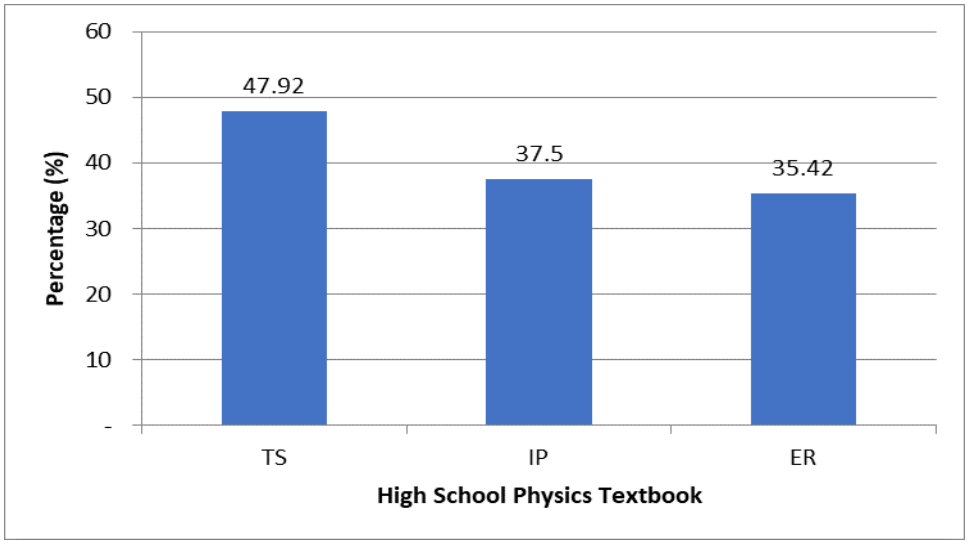

Figure 2 Graph of reuse average for each textbook

Figure 2 displays the average percentage of one of the CBR reuse indicators approaches on each textbook, with the highest percent obtained on textbook editions of Tiga Serangkai with categories fairly available. The lowest percentage is found in Erlangga textbooks with fewer categories. The average availability of the CBR reuse indicator approach on class X material in semester one is categorized as less available.

The third indicator is revision. The results of the analysis of the availability of the CBR approach for the revision indicator can be seen in Figure 3.

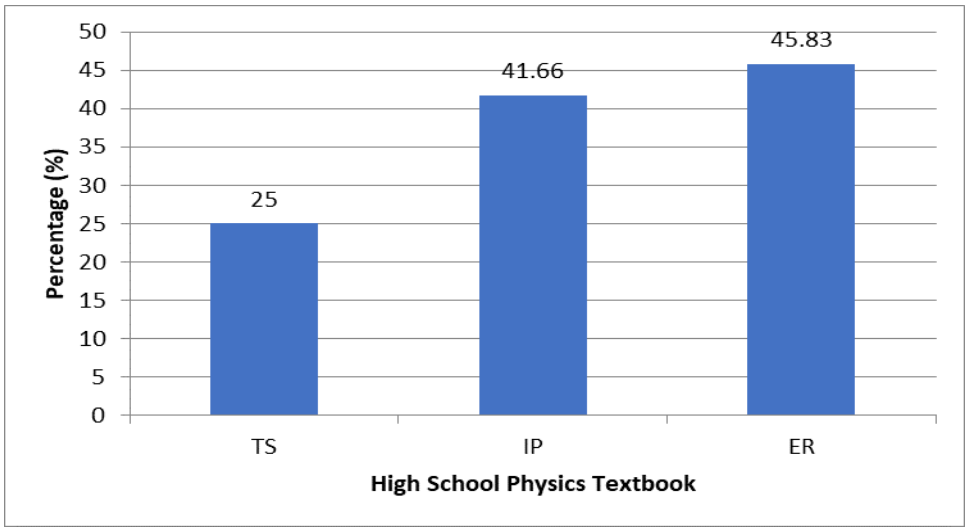

Figure 3 Graph of revision average for each textbook

Figure 3 shows the average percentage of one of the CBR revision indicators approaching a textbook, with the highest percent obtained from Erlangga textbooks with fairly available categories. The lowest percentage is found in Tiga Serangkai textbooks, which have fewer categories. The average availability of revision indicators on textbooks in class X semester 1 categories are less available.

The fourth indicator is retention. The results of the availability analysis of the CBR approach for the retain indicator can be seen in Figure 4.

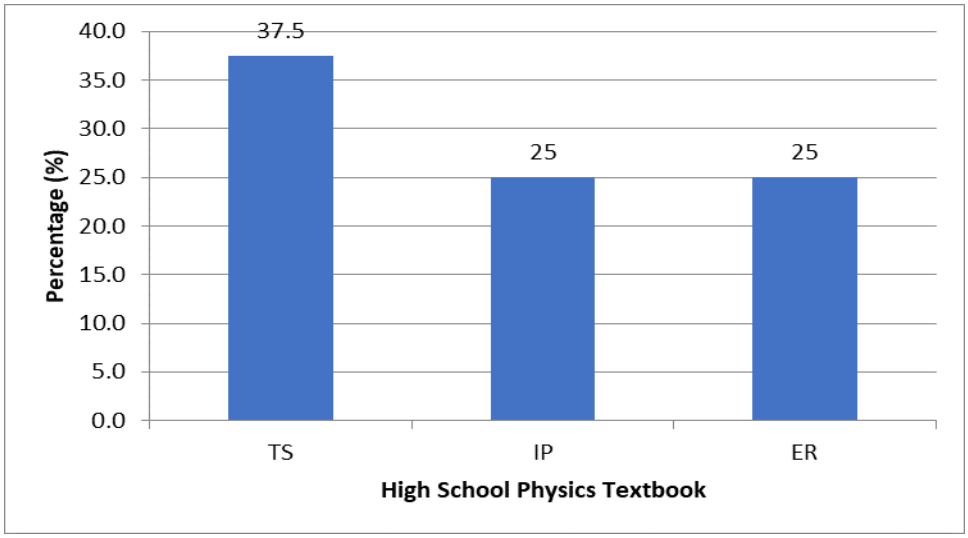

Figure 4 Graph of retain average for each textbook

Figure 4 shows the average percentage of one of the CBR approaches on retain indicator on textbooks, with the highest percentages obtained from three categories with fewer available categories and the lowest percent of textbooks obtained from Intan Pariwara and Erlangga with less accessible categories. The average availability of the retain indicator on class X material in semester one is categorized as less available.

Analyzing high school physics textbooks for class X semester one aims to determine the availability of CBR approaches. The analyzed textbooks are the three most widely used textbooks in the entire High school system of the State of Padang.

The analysis of textbooks is carried out by evaluating the four indicators of the CBR approach contained in the textbooks. CBR is defined as problem-solving using experience (Main et al., 2001; Mokmin & Masood, 2015). Each CBR indicator has two instruments used to evaluate textbooks. Indicators and CBR instruments can be described as follows:

First, for the retrieve indicator. Based on the analysis of the availability of the CBR approach in the textbook of high school physics class X performed analysis was categorized as fairly available. According to Aamodt & Plaza (1994), who proposed the CBR measures for the first time, on this indicator retrieve, the existing problems are analyzed to find the same problems. Class X Erlangga High School Physics textbooks have higher retrieval indicators than Intan Pariwara and Tiga Serangkai textbooks, but these three textbooks are fairly available. According to Gerhana (2013), the retrieval process in the CBR is the basic stage that must be implemented when dealing with a new problem. This result is not consistent with Kolodner et al. (2009). He mentioned that in the CBR paradigm, learning is called for by expanding knowledge by adding new experiences to memory to be applied to problem-solving.

The second indicator is reuse. Based on the results of the analysis of the availability of CBR lifting on the reuse indicator that exists in the textbook of high school physics class X that

performed the analysis, which is categorized as less available, we adapt the problem to be the same with the characteristics of the current problems (Aamodt & Plaza, 1994; Raste et al., 2021). High school physics textbooks in the Class X Tiga Serangkai have higher reuse indicators with a categorized average that is fairly available. Intan Pariwara and Erlangga high school physics textbooks have lower reuse indicators and are less categorized.

The third indicator is revision. Based on the analysis of the availability of CBR resistance on the revised indicators in the textbook of high school physics class X, the analysis was categorized as less available. On the revision indicator, after applying a solution to a problem, it is examined whether the solution can solve the problem (Aamodt & Plaza, 1994; Raste et al., 2021). Class X ER High School Physics textbooks have a higher percentage of revised indicators with average categorized indicators fairly available. Intan Pariwara has a revised categorized indicator for Class X High School Physics textbooks. As for textbooks, Tiga Serangkai has the lowest percentage and is categorized as less available.

The fourth indicator is retained. Based on the analysis of the availability of the CBR approach on the retain indicator that exists in the textbook of high school physics class X semester one implemented, the analysis process is categorized as less available. Tiga Serangkai Physics textbooks have a higher percentage of retain indicators than the Intan Pariwara and Erlangga textbooks. However, these three textbooks have an average of less categorized percentages available. Retain is the last CBR approach indicator. The solution is used on this retain indicator, and then the result is stored in the Case Method (CM). If the solution succeeds, it is saved to help resolve the coming problems. If it fails, it is stored in the CM along with the correction of the solution for the problem (Aamodt & Plaza, 1994). Tiga Serangkai textbooks have a percentage of retains that are categorized as less available.

In the learning process of Curriculum 2013, which suggests using approaches to the learning process, one of the approaches that can be used is the CBR approach. This is useful in achieving the 4C skills that are essential to apply in learning, which includes the skills to think critically, the ability to communicate, the ability to collaborate, and the skill to think creatively.

CBR is reasoning that combines problem-solving, learning, and integrating everything with memory (Kolodner et al., 2009). New problems to be solved are identified, among other experiences. This requires learners to resolve or remember the problems closest to the new problem (Avramenko & Kraslawski, 2008). If there is a lack of implementation of the CBR approach to learning, then the students' reasoning will also be reduced.

Research using the CBR approach and providing accurate results in many fields has been carried out (Mulyana, 2009). Research done by applying the CBR approach to manual calculations through the test process has achieved good results (Wahanani et al., 2020). It can be implemented in the learning process, and CBR-integrated learning products can improve students' learning skills. In order for learning to obtain good results, it is in line with the research already carried out that the results are achieved where the application of CBR can provide support in managing problem solutions, referring to the approach to retrieve, reuse, revise, and retain data knowledge, problems, and solutions available (Putri et al., 2016; Indah et al., 2018).

The added value of the CBR approach will be so beneficial because it can eliminate the need to extract the

model (Rismawan & Hartati, 2013). The structural CBR approach is useful in domains where additional knowledge and cases should be used to produce good results (Bergmann et al., 2003; Mokmin & Masood, 2015). For better learning outcomes, teachers can apply this CBR approach consistently. One of the efforts to consistently implement the CBR approach is using CBR-based teaching materials to integrate learning into the CBR approach.

CONCLUSION

The results of the analysis of the availability of the CBR approach that has been studied showed that there are less available CBR methods in the three physics textbooks analyzed. In general, the availability of the CBR approach in the three textbooks was categorized as less available, with a percentage of 38.19%, making it less available for the physics textbooks that provide the CBR approach. The Class X High School Physics textbooks published by Tiga Serangkai have the highest percentage of CBR approach indicators with an average percent of 39.06% in the less available category, while the physical textbooks distributed by Intan Pariwara have the lowest percentage of CBR approximation indicators with 36.98% percent of categorized less available. The CBR approach indicator with the highest percentage of 45.83% is found on the retrieve indicator with the less available category. The CBR approach indicator has the lowest percentage of 29.17% on the retain indicator, with less available categories. Thus, it can be concluded that less available provide a CBR approach.

The research results were carried out, as well as the conclusions obtained, then the researchers suggested to continue creating products in the form of media distribution that contains the CBR approach in them so that teachers can use them and also students in the learning process.

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