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Integrative Teaching Material with Project-based Learning Approach to Improve Elementary School Students' Bilingual Literacy and Numeracy Skills

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ABSTRAK

Ketersediaan bahan ajar dengan pendekatan berbasis proyek untuk meningkatkan kemampuan literasi dwibahasa masih sangat terbatas. Solusi alternatifnya adalah mengembangkan bahan ajar integratif berbasis proyek. Penelitian ini bertujuan untuk mengkaji kelayakan bahan ajar integratif berbasis proyek, berupa buku dan aplikasi yang bernama TOY App. Penelitian ini merupakan penelitian dan pengembangan yang mengikuti model Thiagarajan. Penelitian ini melibatkan 3 ahli pembelajaran yang memvalidasi buku dan aplikasi dalam tiga aspek yaitu materi, bahasa, dan desain, dan 10 siswai. Pengumpulan data melalui lembar validasi produk dan angket. Data dianalisis dilakukan dengan menghitung rata-rata persentase setiap aspek. Hasil validasi ahli menunjukkan bahwa baik buku maupun aplikasi memiliki tingkat validitas yang sangat baik, dengan persentase rata-rata 87,1% untuk aspek materi, 85,6% untuk aspek bahasa, dan 88,3% untuk aspek desain, sedangkan TOY App memperoleh persentase sebesar 82,7% untuk aspek materi, 83,1% untuk aspek bahasa, dan 85,7% untuk aspek desain. Respon siswa terhadap buku berada pada kriteria baik dan kategori sangat baik terhadap aplikasi. Penelitian ini menunjukkan bahwa bahan ajar integratif, berupa buku literasi dan numerasi berbasis proyek dan aplikasi pembelajaran "TOY App", mendapatkan respon yang sangat baik dari validator ahli dan siswa. Hasil ini menunjukkan bahwa buku integratif berbasis proyek dan aplikasi TOY App layak digunakan.

ABSTRACT

The availability of teaching materials with a project-based approach to improving bilingual literacy skills still needs to be improved. An alternative solution is to develop project-based integrative teaching materials. This study examines the feasibility of project-based integrative teaching materials in the form of books, and an application called the TOY App. This research is research and development following the Thiagarajan model. This study involved 3 learning experts who validated books and applications in three aspects: material, language, and design, and 10 students. Data collection through product validation sheets and questionnaires. Data were analyzed by calculating the average percentage of each aspect. The results of the expert validation show that both the book and the application have a very good level of validity, with an average percentage of 87.1% for the material aspect, 85.6% for the language aspect, and 88.3% for the design aspect. The TOY App obtains 82.7% for material aspects, 83.1% for language aspects, and 85.7% for design aspects. The student's response to the book is in the good criteria, and the application category is very good. This study showed that integrative teaching materials, in the form of project-based literacy and numeracy books and the learning application "TOY App," received very good responses from expert validators and students. These results indicate that the project-based integrative book and the TOY App application are feasible.

1. INTRODUCTION

The selection of project-based learning as the main approach in implementing the Merdeka curriculum is certainly not random. Various studies conducted both at the elementary school level and higher education in various countries show the effectiveness of this learning model (Afriana et al., 2016; Anazifa & Djukri, 2017b; Brown, 2019). The application of the project-based learning model has proven to be effective in improving thinking skills, learning motivation, problem-solving abilities, students' activity, students' complex problems completion, collaboration, communication skills, until skills in managing learning resources by students (Anazifa & Djukri, 2017a; Togou et al., 2020; Wurdinger & Qureshi, 2015).

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The application of project-based learning also provides students with experience in learning and practice in organizing projects, as well as making allocations of time and other resources such as equipment to complete assignments (Issa & Khataibeh, 2021; Mufida et al., 2020; Sirisrimangkorn, 2021). Project-based learning provides a learning experience that involves students in a complex manner and is designed to develop in accordance with the real world (Genc, 2015; Kartini, 2021; Rohm et al., 2021). In addition, project-based learning makes the learning atmosphere fun, so that students and teachers enjoy the learning process (Qidwai, 2011; Rati et al., 2017; Shalihah & T., 2020).

The implementation of three curricula at once starting in 2022 cannot be separated from the government's efforts to improve the quality of human resources in Indonesia in preparation for the 2045 Golden Indonesia (Machali, 2014; Yusmaliana, 2020). However, currently, the government is worried about the declining literacy and numeracy levels of students based on the results of two main international surveys, namely TIMSS and PISA which are two of the minimum competency assessment references (AKM). The latest results of the two surveys still place Indonesia in an unsatisfactory ranking. The results of the latest research by PISA (Program for International Student Assessment) which measured reading, mathematics, and science literacy achievements of school students in 2018 placed Indonesia at 72nd out of 78 countries with a score of 379 out of an international average score of 489 (Argina et al., 2017; Schleicher, 2019). In more detail, Indonesia is ranked 72 out of 77 countries in reading literacy achievement with a score of 371, far below the average reading score of all OECD countries, which is 487. Meanwhile, mathematics achievement is ranked 72 out of 78 countries with a score of 379 from the international average score of 489 and scientific achievement is ranked 70 out of 78 countries with a score of 396 out of an International average score of 489 (Argina et al., 2017; Pratiwi, 2019). Meanwhile, the results of the TIMSS (Trends in International Mathematics and Science Study) survey which was followed by Indonesia in 2015, placed Indonesia on 44th rank out of 49 countries with a score of 397 from the international average score of 500. This survey aimed to find out about the development of mathematics and science. These results indicate that the literacy (reading), math (numeracy) and science skills of students in Indonesia are still very low.

On the other hand, English proficiency is an important requirement for many sectors, ranging from education, and industry, to technology. Unfortunately, the English proficiency of Indonesian human resources (HR) is still considered low. Indonesia is ranked 80 out of 112 countries based on the EF English Proficiency Index (EF EFI) or the English Proficiency Index in the 2021 edition, released by EF Education (Levy et al., 2021; Nicholas, K., Fletcher, J., & Davis, 2012; Reder et al., 2020). Indonesia's position is far behind many neighboring countries in Southeast Asia, such as Singapore at 4th, the Philippines at 18th, and Malaysia at 28th. The results of this survey reinforce the reason that literacy needs to be improved not only literacy skills in Indonesian Language but also in English literacy. In addition to literacy skills, numeracy skills are the minimum competencies or basic competencies needed by students to be able to learn. These two competencies together support the learning process at the next level (Cahyanovianty & Wahidin, 2021; Inko-Tariah, 2014). Numeracy includes skills in applying mathematical concepts and rules in real, everyday situations. Numeracy skills in PISA (Program for International Student Assessment) are focused on students' ability to analyze, give reasons, convey ideas effectively, formulate, solve, and interpret mathematical problems in various forms and situations. Therefore, in addition to literacy competence, increasing numeracy competence is an important thing to do.

The implementation of the learning approach cannot be separated from the use of teaching materials. The selection of a learning approach that is not accompanied by the use of learning media in the form of appropriate teaching materials will certainly be very difficult in its implementation (Rahayu et al., 2021; Sumarno et al., 2021). The researchers have developed several web-based teaching materials, e-portfolios, modules, to animation (Novianti & Shodikin, 2018; Shodikin, 2017). However, the existence of teaching materials that support learning with a project-based learning approach to improve bilingual literacy skills (Indonesian and English) and numeracy of students is still very limited.

Based on the description above, to find solutions to improve student literacy and numeracy skills, both in Indonesian and English, research on the development of teaching materials with a project-based learning approach to improve bilingual literacy skills (Indonesian and English) and numeracy of students in implementation Merdeka curriculum is very important to do. The aims of this study to examine the feasibility of a project-based integrative teaching material, in the form of a book and an application, named TOY App.

2. METHOD

Model of research and development was used in this study. There are two types of teaching materials had been developed in this research. They are a project-based literacy and numeracy book and

the "TOY App" application. Among the four stages of development based on this model, this article only focused on the development stage, especially on the results of the expert validation and the students' responses after using the teaching materials. The results of this research are taken into consideration for the next development stage, namely revisions and further field trials at the dissemination stage.

The expert validation of this teaching material consisted of three aspects, namely content, language use, and design aspects. Validation was carried out by three education experts. The elements in the content aspect include elements of relevance, accuracy, up-to-date, the ability to build curiosity, and novelty. The language aspect includes five elements, namely straightforwardness, communicativeness, dialogic, conformity with student development, and conformity with language rules. From the design aspect, it includes five elements, namely presentation techniques, supporting elements, efficiency, graphics, and readability. The expert team also provided input in the comments column which was analyzed descriptively after interpreting the results of the questionnaire. The results of this validation were then interpreted based on the media eligibility criteria is show in Table 1.

Table 1. Criteria of media eligibility

Percentage Points	Interpretation
81 - 100%	Very Appropriate
61 - 80%	Appropriate
41 - 60%	Quite Appropriate
21 - 40%	Less Appropriate
0 - 20%	Not Appropriate

Furthermore, the trial phase included testing the initial product in the actual class. This study involved ten elementary school students to test and provide responses through a 1-5 Likert scale questionnaire. The five points that were asked were ease of use, language understanding, functionality, appearance, and arouse curiosity. Data were obtained by using a questionnaire. To analyze the data, a beta test was performed. The results of the questionnaire were analyzed descriptively and interpreted based on the criteria for student responses

3. RESULT AND DISCUSSION

Result

This project-based literacy and numeracy book is designed by prioritizing four competencies, namely Indonesian language literacy, English literacy, numeracy (Mathematics), and creative works. Indonesian literacy and English literacy can also be referred to as bilingual literacy. This book is created to support the implementation of the Merdeka Curriculum. The specialty of this book is that it applies integrated thematic principles of several subjects, that is Indonesian, English, and Mathematics. The book has been developed is entitled "Project-Based Literacy and Numeracy Book: I Like Reading, Counting, and Creating for Elementary School/MI Grade 1". The display of the contents of the developed book is shown in Figure 1.

Figure 1. Display of the Contents of the Developed Book

This textbook is developed based on the learning outcomes (CP) of the three subjects: Indonesian, English, and Mathematics. From the CP, the learning objectives (TP) and learning objectives flow (ATP) are formulated. These ATPs apply an integrative thematic concept where the three subjects are mixed in one lesson using one teaching module. There are 10 (ten) themes in this textbook, namely: (1) I dare to get acquainted, (2) make a favorite toy, (3) send a secret message, (4) a mission to save animals, (5) I can make a salad, (6) I can read the clock, (7) I can count things around, (8) I can make houses, (9) morning routines, and (10) I know the weather.

In the preparation of this teaching module, the intended learning objectives are directed at achieving literacy and numeracy skills based on the Merdeka Curriculum. The literacy skills being developed include spelling, tracing, recognizing new vocabulary, imitating sounds, and making simple sentences. While the numeracy skills being developed include counting, sorting, comparing quantities, comparing sizes, addition, substraction, and recognizing geometric shapes. Furthermore, the ability to do creative-works are obtained from the project that the students do according to the themes in each chapter. The full content of this book can be seen in the appendix. This textbook is equipped with the "TOY App" application that supports bilingual literacy skills (Indonesian and English), numeracy (mathematics) and creative-works (making projects).

TOY App is an android-based application (software) designed as an interactive learning tool so that the learning process becomes easier to understand and fun. This application is used as a supporting media and practice questions in the student teaching and learning process. There are 10 total levels in this application, all of which are correlated with the chapters in the "Project-Based Literacy and Numeracy Book: I Like to Read, Count, and Create for Elementary/MI Grade 1" which has been developed. In each chapter (level) there are practice questions that can train the student's ability to understand the material which includes bilingual literacy skills (Indonesian and English), and numeracy (mathematics). There are also 10 fun projects that can be easily done by students. In this project section, video tutorials related to the materials and the procedure of the project work are presented. The display of the home page and main page of the TOY App is shown in Figure 2.

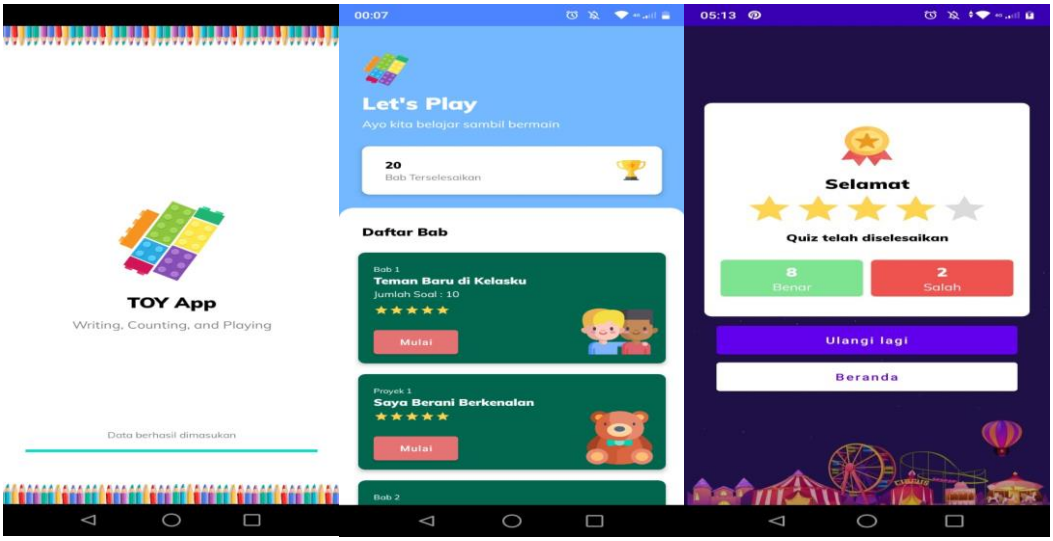

Figure 2. Display of the Home Page and Main Page of the TOY App

Base on Figure 2, show at each level (chapter), there are 10 random questions containing Indonesian language literacy, English literacy, and numeracy skills. The questions are presented with attractive and simple visualizations and are equipped with appropriate audio. This practice question is designed to be a game so that students are encouraged to complete all the chapters. At the end of each practice session, students will be shown the true and false scores they got. Students can only continue to the next level (chapter) if all the questions presented are answered correctly.

Indonesian language literacy skills being developed in the TOY App include spelling, tracing, imitating sounds, and making simple sentences. While the English literacy being developed is getting to know new vocabulary and simple presentation exercises in English. The numeracy skills are also developed in this application by practicing counting, sorting, comparing quantities, comparing sizes, addition, subtraction, and recognizing geometric shapes. The page showing questions about Indonesian language literacy, English literacy, and numeracy (Mathematics) are shown in Figure 3.

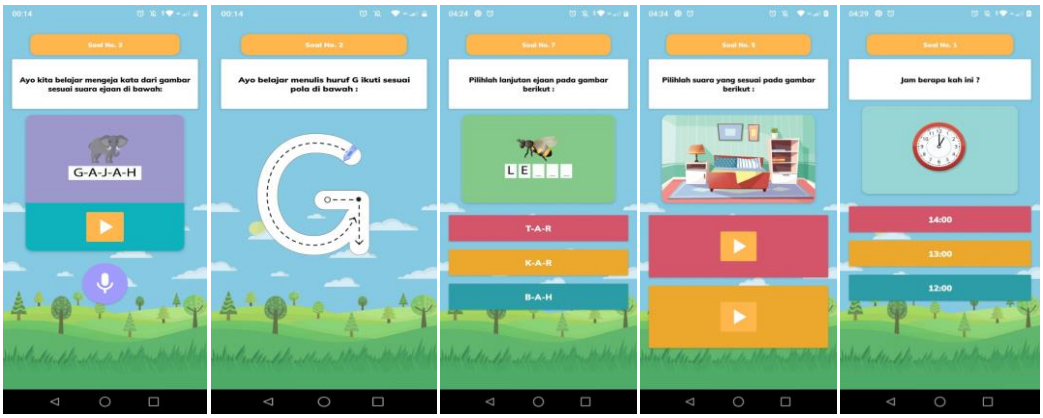

Figure 3. Display of Practice Questions

Furthermore, in the project section, there are 10 interesting, fun, and creative projects that students can easily do. Video tutorials related to the materials and the procedure of the project work are presented in this section. The project page view is presented in Figure 4.

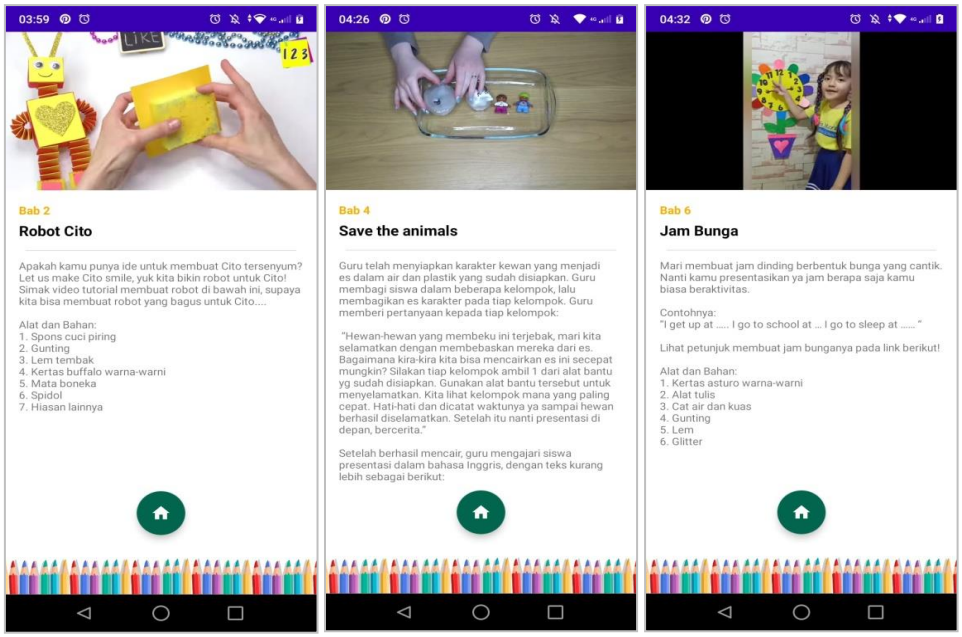

Figure 4. Display of Projects

The projects presented are among others making the Cito Robot, creating secret messages, saving the animals, making flower clocks, making vegetable and fruit salads, etc. The project also contains elements of STEAM (science, technology, engineering, art, mathematics). The STEAM approach is believed by many experts to promote useful 21st-century skills for students.

Expert validation of the teaching materials in the form of the textbook "Project-Based Literacy and Numeracy Book: I Like to Read, Count, and Create for Elementary School/MI Grade 1" and the TOY App application is measured based on three aspects, namely validation on material, language use, and design/graphic aspects. The elements in the material aspect include elements of relevance, accuracy, up-to-date, the ability to build curiosity, and novelty. The results of expert validation on the material aspects of textbooks and the TOY App are shown in Figures 5 and Figure 6.

Figure 5 shows that the validation results on the material aspect got the overall average percentage value of 87.1%. From these results, it can be concluded that the textbook "Project-Based Literacy and Numeracy Book: I Like to Read, Count, and Work for Elementary School/MI Grade 1" has very suitable criteria to be used as teaching materials for improving literacy and numeracy based on material aspects. In more detail, in terms of the element of relevance, it shows that the criteria are very feasible with an average percentage of 90%. Very feasible criteria are also shown in the elements of material accuracy, recency, the ability to build curiosity, and novelty.

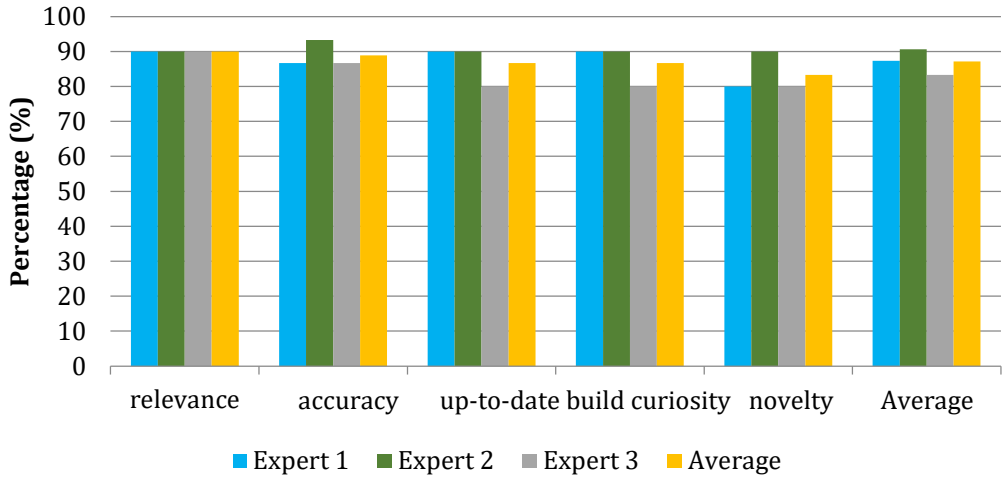

Figure 5. The results of Expert Validation on the Material Aspects of the Textbook

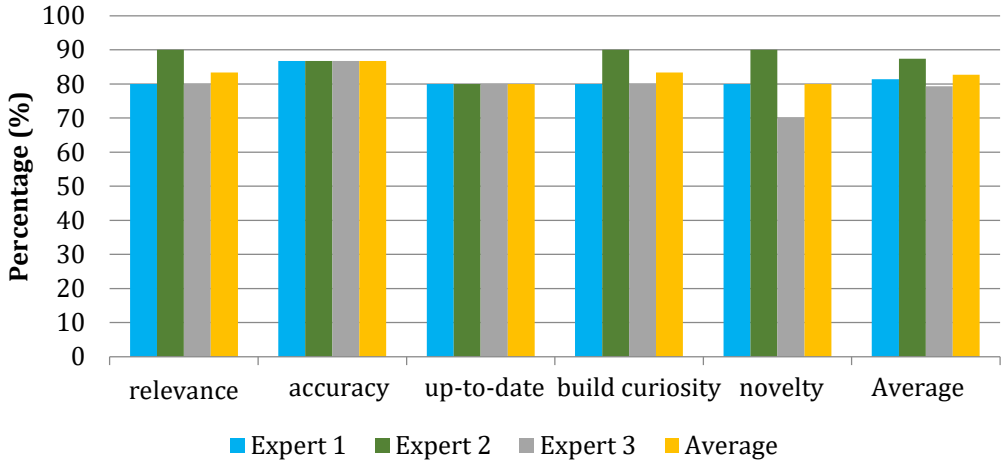

Figure 6. The results of Expert Validation on the Material Aspects of the TOY App

Figure 6 indicates that the validation results on the material aspect obtained the overall average percentage value of 71.9%. From these results, it can be said that the TOY App is very suitable to be used as supporting teaching material for improving literacy and numeracy based on material aspects. In more detail, in terms of relevance, it shows a very feasible criterion with a percentage of 83.3%. Very feasible criteria are also shown in the accuracy material with a proportion of 86.6% and the ability to build curiosity with a percentage of 83.3%. Meanwhile, from the elements of recency and novelty, this application has a decent category with the same proportion of 80%.

Furthermore, expert validation on the language aspect includes five elements, namely straightforwardness, communicative language use, dialogic language use, conformity with development, and conformity with language rules. The results of expert validation on the language aspect of textbooks and the TOY App are shown in Figures 7 and Figure 8.

Figure 7 shows that the validation results on the language aspect gained the overall average percentage value of 85.6%. From these results, it can be concluded that the textbook "Project-Based Literacy and Numeracy Book: I Like to Read, Count, and Create for Elementary School/MI Grade 1" is very suitable to be used as teaching material for improving literacy and numeracy. Judging from each element in the language aspect, namely straightforwardness, communicativeness, conformity with development, and conformity with the language rules, all of which show very feasible criteria. Each percentage is 84.5% for the element of straightforwardness, 86.7% for communicative language use, 90% for the element of conformity with student development, and 86.7% for the element of conformity with the rules of language. While the dialogic language use element got the appropriate criteria with a percentage of 80%.

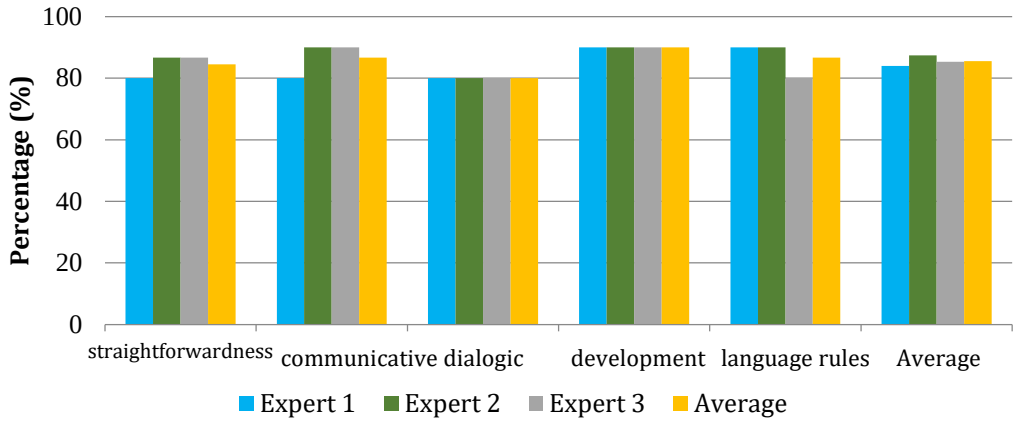

Figure 7. The results of Expert Validation on the Language Aspects of the Textbook

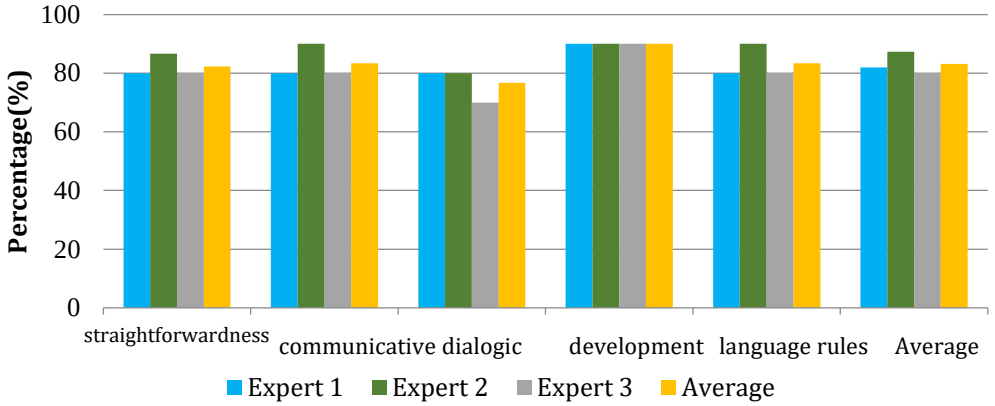

Figure 8. The results of Expert Validation on the Language Aspects of the TOY App

Figure 8 indicates that the validation results on the language aspect obtained the overall average percentage value of 83.3%, which means that the TOY App application is very suitable to be used as supporting teaching materials in improving literacy and numeracy. Judging from each element in the language aspect, namely straightforwardness, communicativeness, conformity with student development, and conformity with language rules, all of which were noted as very feasible. Meanwhile, the dialogic language use element was in the proper category.

Lastly, the expert validation then assessed the design aspect which includes five elements, namely presentation techniques, supporting elements, efficiency, graphics, and legibility. The results of expert validation on the design aspects of textbooks and the TOY App are shown in Figure 9 and Figure 10.

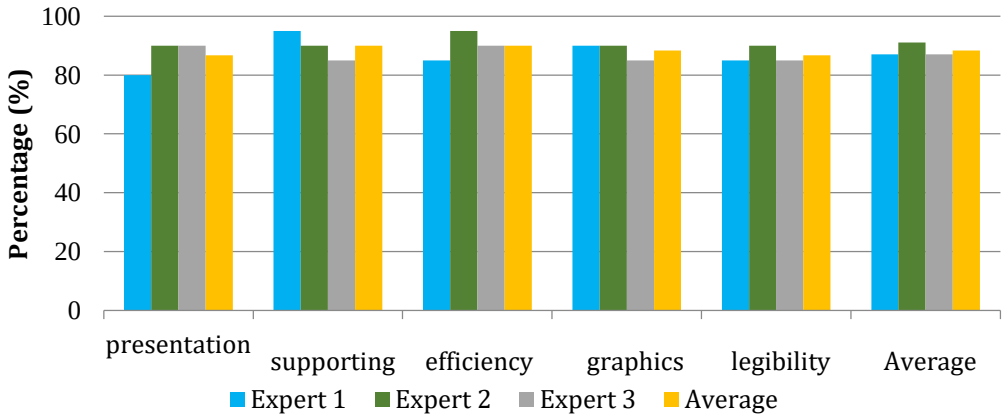

Figure 9. The results of Expert Validation on the Design Aspects of the Textbook

Figure 9 tells that the validation results on the design aspect gained the overall average percentage value of 88.3%. These results indicate that the textbook "Project-Based Literacy and Numeracy Book: I Like to Read, Count, and Create for Elementary School/MI Grade 1" is very suitable to be used as teaching material in improving literacy and numeracy according to the design aspects. In more detail, in terms of presentation techniques, supporting elements, efficiency, graphics, and readability, each of them is included in the very feasible criteria.

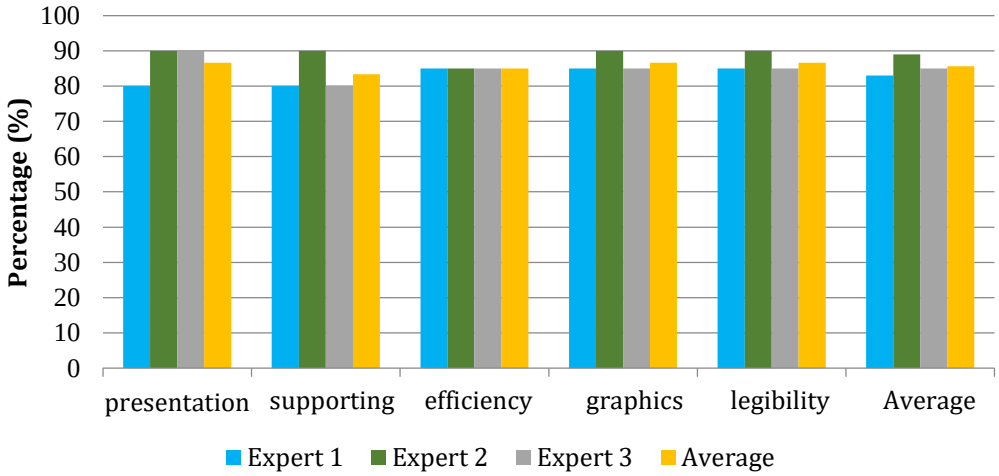

Figure 10. The results of Expert Validation on the Design Aspects of the TOY App

Figure 10 tells that the validation results on the design aspect obtained the overall average percentage value of 85.7%. These results indicate that the TOY App application is very suitable to be used as supporting teaching material in improving literacy and numeracy based on the design aspects. In more detail, in terms of the presentation technique elements, supporting elements, efficiency, graphics, and readability, each of them is included in the very feasible criteria.

Students' responses to the teaching materials in the form of the textbook "Project-Based Literacy and Numeracy Book: I Like to Read, Count, and Create for SD/MI Grade 1" and the TOY App application include five elements, namely the ease of use, language use, functionality, appearance and display, and curiosity. These students' responses were collected from 10 elementary school students in grade 1. Each of them experienced a learning process which applying one of the chapters of the textbook and trying to use the TOY App afterward. The results of students' responses to textbooks and the TOY App application are shown in Figure 11.

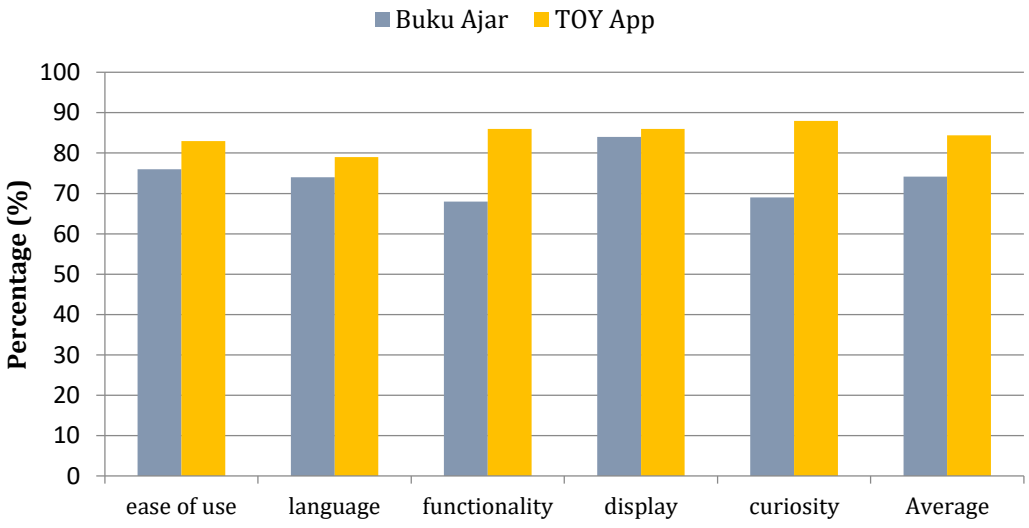

Figure 11. Students' Responses Toward the Textbook and the Application

Figure 11 shows that students' responses to the textbook "Project-Based Literacy and Numeracy Book: I Like Reading, Counting, and Creating for SD/MI Grade 1" are in good criteria with an average percentage of 74.2%. Specifically, the elements of ease of use, language use, functionality, and raising curiosity noted a good response. Meanwhile, the display element got a very good response. Furthermore, the average students' responses to the TOY App application is very good criteria with a percentage of 84.4%. All elements in the student's response, namely ease of use, functionality, appearance, and raising curiosity got a very good response, except for the element of language use which got a good response.

Discussion

Based on the results, the teaching materials have been developed in the form of a project-based literacy and numeracy book and a learning application, "TOY App", gained a very high level of validity and good response, which means that they are feasible to be implemented. This project-based literacy and numeracy book was prepared by emphasizing four competencies, namely Indonesian language literacy, English literacy, numeracy (Mathematics), and artworks (project) (Jamil et al., 2018; Mufida et al., 2020). The achievement of literacy and numeracy competencies, as well as the use of project-based learning is recommended in the implementation of the Merdeka Curriculum. Therefore, this book can be used as a supplementary support for the application of this Curriculum in the class. Hopefully, it can be successfully adjusted, in conjuction with the teachers' professional development and structured learning plans (Gorghiu et al., 2015; Sadiah & Lestari, 2020).

At the validation stage, there were several inputs from the expert validators. They argued that the language used in the book were not dialogical and the questions' type in the TOY App were not vary. The researchers also consider. Previous study suggested that dialogic reading may be a helpful strategy to promote socio-emotional learning in elementary school students (Fettig et al., 2018). The book was then improved by bringing up several dialogue activities related to the theme. Meanwhile, in the TOY App, more variations of questions's type were added, including spelling, tracing, imitating sounds, making simple sentences, getting to know new vocabulary, sorting, comparing numbers and sizes, and getting to know geometric shapes.

The book has been developed, entitled "I Like Reading, Counting, and Creating", is designed to stimulate the elementary school students with literacy-rich activities. The objective is to improve the literacy levels of the students. Literacy is a vital part of children development. It is the foundation for doing well at school, socialising with others, problem-solving, making decisions, and developing independence. Furthermore, literacy will influence the quality of a country. The higher the literacy level, the more prosperous a country is. Hence, building a strong literacy foundation from a very young age is important. It can be achieved by providing the children with great literacy exposures or practices until they are skillful.

Furthermore, numeracy skills include skills in applying mathematical concepts and rules in real or everyday situations. Numeracy skills are focused on students' ability to analyze, give a reason, convey ideas effectively, formulate, solve, and interpret mathematical problems in various forms and situations (Dulay et al., 2019; Nicholas, K., Fletcher, J., & Davis, 2012). In the Merdeka curriculum, the assessment of numeracy skills at each level is adjusted according to the phases of the students. In phase 1, for example, for elementary school students in grades 1 and 2, numeracy skills are measured in the elements of numbers, algebra, measurement, geometry, data analysis, and probability (Ho & Wong, 1997; Inko-Tariah, 2014). It is still around the ability to understand, recognize, compare, sort, solve, create, measure, describe, and presents. Whereas in phase 2 for elementary school children grades 3 and 4, besides the abilities to measure in phase 1 are also practiced the ability to determine relationships, estimate, compile, analyze, and interpret. Along with the increase in the phase of students, the measured numeracy skills also increase. The development of literacy and numeracy books as well as the "TOY App" application has been based on the competency development for elementary school children in phase 1 because it is focused on being applied to grade 1 of elementary school students.

An integrative thematic-based learning model was recommended to be applied to elementary school students during the 2013 curriculum implementation. Integrative thematic learning itself is a model learning that combines various subjects to the same theme. In the Merdeka Curriculum, although there is a re-separation of subjects including in elementary schools, the use of integrated learning is still allowed and very possible to apply. The book developed in this study applies the integrated learning model to gain more integrative and meaningful knowledge for students. This is in line with previous study that state in a bilingual school, where presenting the same topic or theme but in a different language makes students gain a deeper understanding of the topic or theme (Oktarina, 2019). The researchers referred to the learning outcomes that have been set by the ministry of education when making this book so that the output will be in accordance with the government's expectation.

Strengthening creative competence through project-producing activities greatly supports the students' creativity. This is in line with the research which state that project-based learning can increase students' creativity (Ismuwardani et al., 2019; Ummah et al., 2019). The use of project-based learning has a better impact on increasing student activity and achievement compared to the usual way of learning applied in teaching mathematics in elementary schools. The projects provide the opportunity to study rigorous mathematics; engage students in authentic and relevant issues; and developing positive relationships between teachers and students as well as fellow students (Lazic et al., 2021; Walsh et al., 2022). This makes learning more lively as well.

The use of the TOY App is also a strategic choice step to include technology as a part of teaching material, or what is often known as technological pedagogical content knowledge (TPACK). Incorporating the TOY App application as a companion for literacy textbooks in learning aims to make learning fun and effective. Several studies have revealed that the TPACK approach to learning supports the improvement of literacy and numeracy of students (Altun, 2019; Suwartono & Aniuranti, 2019). Teachers and prospective teachers have the perception that the use of technology in learning will be useful for increasing students' interest and providing an active learning experience (Dewi & Verawati, 2022; Özdemir, 2016). The use of this kind of application also affects improving fundamental motor skills in elementary school students. Basic motor skills are movement patterns that form the basis for achieving more complex movement skills. These basic motor skills are needed to support the growth and development of elementary school-aged children. The implication of this research for elementary school teachers is to be able to carry out a quality learning process and learning objectives can be achieved properly with the help of this integrative teaching material. With the project-based learning approach developed in this material, it is hoped that it will facilitate the need for teaching material in the implementation of the Merdeka Curriculum to the first graders of elementary school and improve their bilingual literacy and numeracy skills.

4. CONCLUSION

This study has shown that the integrative teaching materials have been developed, in the form of a project-based literacy and numeracy book and a learning application, named "TOY App", gained a very good response from the expert validators, and are feasible to use. This book and application were validated in terms of their content, language use, and design aspects. They were also commented on by some students during the field trial. These teaching materials hopefully can facilitate the implementation of the Merdeka Curriculum by applying a project-based integrative learning of Indonesian language, English, and Mathematics for grade 1 of elementary school.

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