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Development of Realistic Mathematics Education Mobile Learning in Elementary School

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Abstract

The research is motivated by the lack of ICT-based learning media, mathematics learning for elementary school children is still inductive, and lacks of good character attitudes. The purpose of this study was to develop realistic mathematics education mobile learning for elementary school students. The research method used ADDIE (Analyze, Design, Develop, Implement, and Evaluate). Based on the needs analysis, both students and teachers need a realistic learning media that can be represented through smartphone or tablet devices to support the learning. So, it is important to develop realistic mathematics education mobile learning. The product was validated by media experts, material experts, and practitioners. The results of expert validation get percentage of 90% with very good category for its performance, 92.5% with very good category for the content competency. Furthermore, validation results from practitioners get 89% with very good categories. The realistic mathematics education mobile learning contains elements used in context, used of models, interactivity, students contribution, and interwoven. In addition, the media contained concrete images, videos, sounds, and questions that are arranged in online system. Based on these results it can be said that the realistic mathematics education mobile learning is valid for use.

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INTRODUCTION

Industrial Revolution 4.0 stated that humans are required to follow the changing times. The emergence of the revolution does not only affect the industry of goods and services but also affects the education system in schools (Benešová & Tupa, 2017). Thus education in schools should follow the development of abilities in the 21st century, one of which is communication skills. Communication skills are skills in the field of information, media, and technological capabilities (Chu, et al. 2017).

Learning based on ICT (information and communication technologies) is relevant applied in the current era. This effort is given since that all primary school-age children have access to mobile devices such as smartphone or tablet that can be connected to the internet. During this time, students especially elementary school-age children are smart in operating these devices, but in reality, they cannot take the advantage from the mobile devices (Dubé & McEwen, 2017).

Cognitive development of elementary school children according to Piaget is including the concrete operational phase (Bakir & Bİçer, 2015). At that age, they can be said to have the ability to "be able to think" (Egan, 2012). Thus, elementary school children are only able to understand concrete concepts. In orde to give a good understanding for students, the learning content and media should be presented in real pictures. The facts showed that mathematics learning carried out in elementary school is still memorized, the material is abstract, and not in accordance with the cognitive development of primary school-age children.

Mathematics learning should refer to Piaget's cognitive development theory, where elementary school-age students are entering concrete operational phase (Egan, 2012). Thus the realistic mathematics education (RME) is one of suitable method to be used for elementary schools. RME is mathematics learning approach on combining math with the real world (Sumirattana, et al. 2017). By combining mathematics learning with real life, it will make learning activities more meaningful (Herawati, 2016). Mathematics is the core of science, So that it can lead students to think logically (Marwazi, et al. 2019).

Based on the description above, this study aims to develop media of RME mobile learning for fourth-grade students of elementary school which is expected to improve learning outcomes in accordance with the 2013 curriculum that consist of spiritual, attitudes, knowledge, and skills.

METHODS

This research is a development research. The result of product is a media of RME mobile learning for fourth-grade elementary school students. The technique used in this study is ADDIE (Branch, 2010), but only until the stage of development.

The validation of media, was carried out by using experts validation about the content, media, and practice. The instrument used was questionnaire and validation sheet using likert scale. As for the product assessment, there are four categories: very good, good, good enough, and not good.

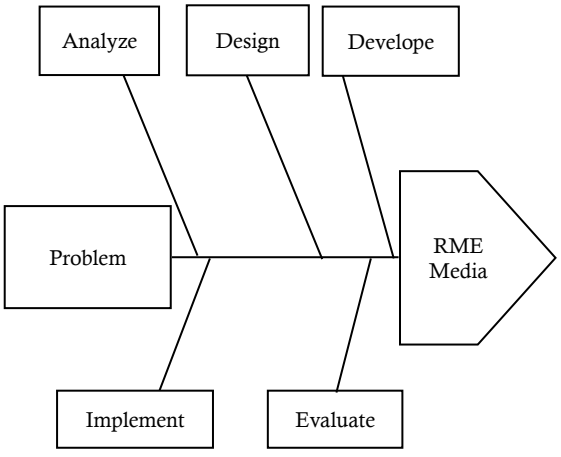

Figure 1. Research Flow

RESULTS AND DISCUSSION

The media development begins with needs analysis. In the needs analysis, there are two kinds of respondents. They are 44 students and a teacher. The needs for students include (1) mathematics learning, (2) RME, (3) learning

media, (4) the use of device devices (smartphones), and (5) mobile learning media. Whereas the teacher's need for RME mobile learning includes (1) mathematics learning, (2) realistic mathematics learning, (3) learning media, (4) the use of device (smartphones), and (5) mobile learning media implemented by using interviews.

The student needs for media mobile learning are game content, interesting videos, attractive images, and interactive content. From the results of the student needs it can be concluded that the student not enthusiastic with mathematics. This is because the material is not easy to accept. Whereas elementary school-age children in fourth grade are concrete operational phase (Bakir & Bİçer, 2015).

A number of students like and play using mobile device but not used for learning. The most of mobile device by teachers can provide an attraction to students to be used as teachers who have knowledge or approaches from various access, alternative sources of information (Wan & Nicholas, 2013). Thus students needs media that is appropriate for their conditions.

The teacher needs for media mobile learning stems from the difficulty of teaching mathematics in the classroom. The teacher difficult to teach fractions, multiplication, addition, subtraction, and division. So, the needs of teachers relating to mobile learning are real of content, using videos, and images. This is in line with Wardono, et al. (2016), that mathematics learning asks students to think logically, analytically, critically, and realistically.

The next stage is designed by making prototypes. Media prototypes must concern with the tools which can help the teaching and learning process running well (Ahmadi, et al. 2017). Preparation of RME mobile learning media consists of (1) homepage, (2) navigation menu, (3) core competencies (KI), basic competencies (KD), and goals, (4) pre-test, (5) material I, (6) practice questions, (7) material II, (8) evaluation, and (9) developer profiles. After making a prototype the next step is to compile or making media.

The first media content is the homepage. The homepage is the first page opened in media of realistic mathematics education mobile learning. The homepage contains navigation menus, search menus, media titles, and class and semester identities. Home is the opening face identity of the media. To go to the next menu students can choose the navigation menu to move to another menu. Here is the homepage in Figure 2.

Figure 2. Homepage

The next page is the core competencies, basic competencies, and goals. On this page consists of navigation menu in the upper right corner, then search menu. Media identity consisting of subjects, class/semester, and material. Then the core competencies are the core competencies that will be achieved. Next is the learning objective of the use of RME mobile learning media. The appearance of the KI, KD, and learning objectives page is presented in Figure 3.

Figure 3. KI, KD, and Learning Objectives

The next is the pre-test page. The pre-test page consists of navigation menu, search menu, title pre-test, and pre-test questions. The question sheet is pre-test that connected to the google form. The pre-test sheet consists of the title of the pre-test, question order, full name and absent number, 15 multiple choice questions, 5 description questions, and the send answer questions. The picture of the pre-test page is presented in Figure 4.

The next is the material I. This page is the first presentation of material learning. The material I page consists of a navigation menu, search menu, material I title, learning material, videos, and student worksheets. Learning material contains elements of realistic mathematics in which the material contains many realistic images such as fruit, pieces of pizza and so on. The video section is the result of a link coming from youtube. The video presented also includes link source to avoid plagiarism. Next, the student worksheet which is integrated into the google form. The material I is presented in Figure 5.

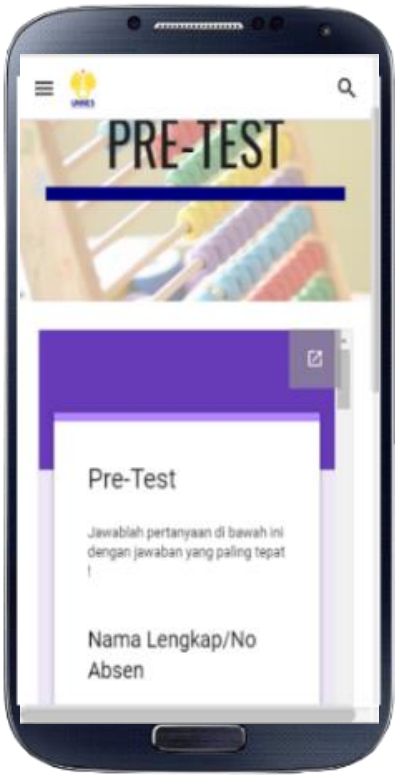

Figure 4. Pre-test

Figure 5. Material Page I

The next page is the practice page. This page integrates with Google forms. In the

practice, questions display consists of navigation, search menu, subject matter practice, and question exercise form to answer the practice questions tested. The question exercise page is presented in Figure 6.

Next is the material page II. This page is the last material presentation in RME mobile learning media on page II. Material II consists of navigation and search menus, page titles namely Material II, the title of material, learning videos, the material presented, and student worksheets. Material II page is presented in Figure 7.

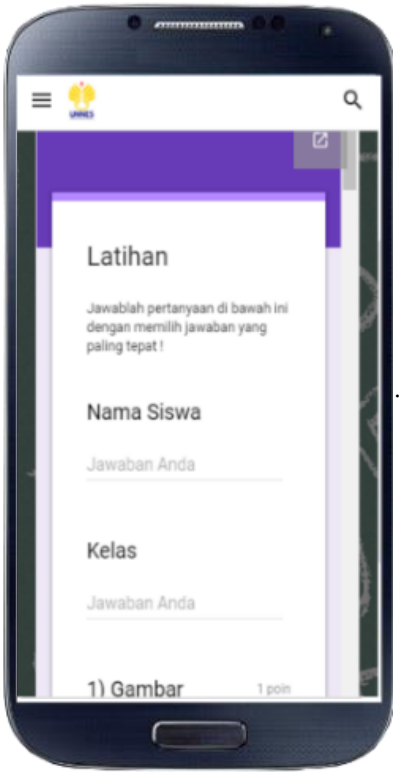

Figure 6. The Practice Page

Next is the evaluation page. This page consists of navigation, search menu, evaluation and evaluation questions that are integrated with Google forms. The evaluation sheet contained in the google form consists of evaluation titles, question orders, absent names and numbers, 15 multiple choice questions, 5 description questions, and submission questions. The evaluation page is presented in Figure 8.

Figure 7. Material Page II

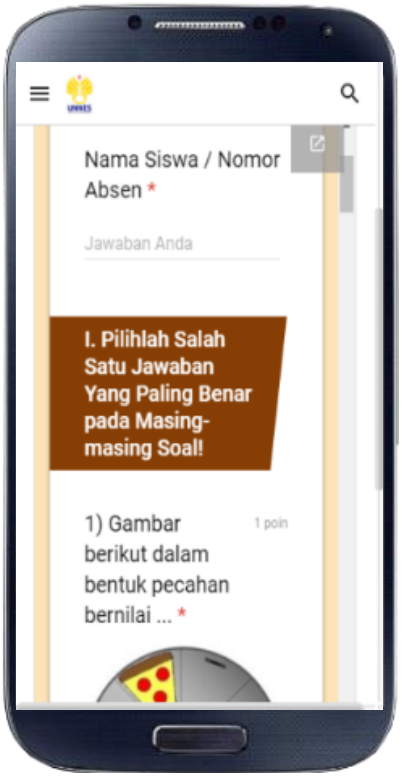

Figure 8. The Evaluation

The last page is the developer profile page. The developer profile page consists of the

navigation menu, search menu, title and profile description of media developers RME mobile learning, and comes with a personal photo of the developer profile. The developer profile page is presented in Figure 9.

Figure 9. Developer Profile Page

From the page description, there are RME mobile learning on nine pages. Where in all these pages have covered aspects of usability, connectivity, context, control, mobility, and communication (Schuck, et al. 2017).

Expert judgement items, both validation of media and validation of contents consits of ten indicators. Furthermore, validation of practice consists of nineteen indicators. Results from validation of content is presented in Table 1, and validation of media is presented in Table 2.

From the description Tabel 1 and Tabel 2 above, it can be concluded that RME mobile learning at the material testing stage received score of 36 out of 40. In this case, the media according to the material expert test was said to be very good. Whereas from the testing by media experts based on Table 2 above, the score was 37 out of 40. In this case, the media got very good criteria. While the media is said to be very good since that the percentage value reaches more than 75 percent (Sugiyono, 2012)

Table 1. Results of Content Validation

Indicator	Score	Category
KI, KD, and Indicators	4	Very good
Depth of material	4	Very good
Extent of material	3	Good
Interesting material	4	Very good
Appeal of display	4	Very good
Clarity form of pitcure	3	Good
Compliance with the material animated	4	Very good
Sync voice	3	Good
Ease of navigation	4	Very good
Ease of use	4	Very good
Total score	37	Very good

Table 2. Result of Media Validation

Indicator	Score	Category
Ability to use	4	Very good
Clarity of Identity	4	Very good
Clarity of goal	3	Good
Clarity of user	3	Good
Appeal of display	4	Very good
Used of Context	4	Very good
Used of Models	4	Very good
Interactivity	4	Very good
Student contributon	3	Good
Interwoven	3	Good
Total score	36	Very good

CONCLUSION

Based on the results of RME mobile learning development, after being analyzed and discussed in accordance with the theory that the media is valid for use. The media is to be valid through the stages of needs analysis, prototyping, testing by expert of media, expert of content, and practitioners. In addition, the developed media can be categorized as very good after going through testing with a value above 75 percent.

REFERENCES

Ahmadi, F., Sutaryono, Witanto, Y., & Ratnaningrum, I. (2017). Pengembangan Media Edukasi Multimedia Indonesian Culture (MIC) sebagai Penguatan Pendidikan Karakter Siswa Sekolah Dasar. *Jurnal Penelitian Pendidikan*, 34(2), 127-136. Retrieved from https://journal.unnes.ac.id/nju/index.php/JPP/article/view/12368

Bakir, S., & Bİçer, E. Ö. (2015). Logical Thinking and Cognitive Development Levels of Pre-service Science Teachers. *Journal of Educational Sciences Research*, 5(1), 149-163. Retrieved from http://ebad-jesr.com/images/MAKALE_ARSIV/C5_S1 makaleler/5.1.09.pdf

Benešová, A., & Tupa, J. (2017). Requirements for Education and Qualification of People in Industry 4.0. *Procedia Manufacturing*, 11(June), 2195-2202. Retrieved from https://www.sciencedirect.com/science/article/pii/S2351978917305747

Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. Boston, MA: Springer. Retrieved from https://link.springer.com/book/10.1007%2F978-0-387-09506-6

Chu, S. K. W., Reynolds, R. B., Tavares, N. J., Notari, M., & Lee, C. W. Y. (2017). *21st Century Skills Development Through Inquiry-Based Learning*. Singapore: Springer. Retrieved from https://link.springer.com/book/10.1007%2F978-981-10-2481-8

Egan, K. (2012). *Education and Psychology Plato, Piaget and Scientific Psychology*. USA: Routledge.

Herawati, F. (2016). Pengembangan Perangkat Pembelajaran Matematika dengan Pendekatan PMRI Berorientasi pada Kemampuan Representasi Matematis. *Jurnal Riset Pendidikan Matematika*, 3(1), 34-44. Retrieved from https://journal.uny.ac.id/index.php/jrpm/article/view/9685

Marwazi, M., Masrukan, & Putra, N. M. D. (2018). Analysis of Problem Solving Ability Based on Field Dependent Cognitive Style in Discovery Learning Models. *Journal of Primary Education*, 8(2), 127-134. Retrieved from https://journal.unnes.ac.id/sju/index.php/jpe/article/view/25451

Patel, S. R., Margolies, P. J., Covell, N. H., Lipscomb, C., & Dixon, L. B. (2018). Using Instructional Design, Analyze, Design, Develop, Implement, and Evaluate, to Develop e-Learning Modules to Disseminate Supported Employment for Community Behavioral Health Treatment Programs in New York State. *Frontiers in Public Health*, 6, 113. Retrieved from https://www.frontiersin.org/articles/10.3389/fpubh.2018.00113/full

Schuck, S., Kearney, M., & Burden, K. (2017). Exploring Mobile Learning in the Third Space. *Technology, Pedagogy and Education*, 26(2), 121-137. Retrieved from https://www.tandfonline.com/doi/full/10.1080/1475939X.2016.1230555

Sugiyono. (2012). *Statistika Untuk Penelitian*. Bandung: Alfabeta.

Sumirattana, S., Makanong, A., & Thipkong, S. (2017). Using Realistic Mathematics Education and The DAPIC Problem-Solving Process to Enhance Secondary School Students' Mathematical Literacy. *Kasetsart Journal of Social Sciences*, 38(3), 307-315. Retrieved from https://www.sciencedirect.com/science/article/pii/S2452315117303685

Wan, N., & Nicholas, H. (2013). A Framework for Sustainable Mobile Learning in Schools. *British Journal of Educational Technology*, 44(5), 695-715. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1467-8535.2012.01359.x

Wardono, Waluya, S. B., Mariani, S., & Candra, S. D. (2016). Mathematics Literacy on Problem Based Learning with Indonesian Realistic Mathematics Education Approach Assisted E-Learning Edmodo. *Journal of Physics: Conference Series*, 693(1). Retrieved from http://iopscience.iop.org/article/10.1088/1742-6596/693/1/012014