The eXeLearning for social arithmetics through scientific approach

N Rokhima¹²³, B L Harisnas²³, I E Ningrum³ and D Sulisworo³
¹SMP Negeri 3 Depok, Sopalan, Maguwoharjo, Depok, Sleman, Yogyakarta
²MTs Taruna Al-Qur’an, Jl. Lempongsari No. 4a, Ngaglik, Sleman, Yogyakarta
³Universitas Ahmad Dahlan, Jl. Pramuka 42 Yogyakarta, Indonesia

E-mail: nurrokhima@gmail.com

Abstract. This study aims to develop mobile learning applications in learning mathematics on social arithmetic materials. This research is development research with the 4D model that is defined, design, develop, and disseminate. The subjects of this study were seventh-grade students of Muhammadiyah Tepus Junior High School with ten students chosen randomly. The object in this study is the student's response to developing eXeLearning media in the learning of social arithmetic. The research instrument is a student response questionnaire. Based on the results of the study, development of the mobile learning mathematics application with the criteria of usefulness, ease of use, ease of learning, and satisfaction include in the excellent category. From the research conducted can be obtained the calculation results of the standard overall criteria of the questionnaire by 90. These results indicate average with a good category so that development the Mobile Learning application on social arithmetic material for students based on the 2013 curriculum through the scientific approach can be used in the learning process independently at school or outside a school.

1. Introduction
The development of science and technology further encourages renewal efforts in the use of technology in the process of teaching and learning activities. Teachers, mentors, lecturers, and trainers are the primary mediators in the transformation of learning. Active learning depends very much on the ability of educators to prepare, create, and manage situations or environments that are conducive to the learning process of students [1]. The use of media in the learning process is one of the efforts to create more meaningful and quality learning. According to Latuheru [2], the use of media in the learning process aims to make the learning process take place efficiently and effectively so that the quality of education can be improved. So the use of media in learning is very support better learning.

The meaning of the learning media itself, the term media comes from Latin which is a plural form of "medium" which means intermediary or introduction [3]. Thus, the learning media emphasizes the position of the media as a means of giving messages or teach information to condition someone to learn. In other words, when learning activities take place the learning material that students receive is obtained through the media. This is in accordance with Gagne's opinion and Briggs implicitly says that learning media includes tools that are physically used to convey the contents of teaching materials, which consist of books, tape recorders, tapes, video cameras, video recorders, films, slides (picture frame), photos, pictures, graphics, television, and computers. In other words, the media is a component of learning resources or physical tools that contain instructional material in the student environment that can stimulate students to learn. [4]. Besides that, media as all things that can be manipulated, seen, heard,
read or discussed along with the instruments used for these activities [5]. While Heinich et al [6] define the term media as the information about a source and a receiver. Meanwhile, Marshall McLuhan argues that media is a human extension that allows him to influence others who do not have direct contact with him [7]. Based on the description above, learning media can be understood as a tool that can deliver and channel messages from a planned source to create a conducive learning environment where the recipient can carry out the learning process efficiently and effectively.

The teachers are required to be able to understand the use and choose tools that are not possible that the media is following the development and demands of the times. Teachers can at least use cheap and efficient media that is even simple, but it is a necessity in achieving the expected teaching goals. The progress of science and technology has a considerable influence in various fields of human life. Education as an inseparable part of the process of human maturation indeed, on the one hand, has a significant contribution to the development of science and technology, but on the other hand, education also needs to utilize the advancement of science and technology to be able to achieve its objectives effectively and efficiently.

In this millennial era, more and more people have and use technology tools, especially students and students. This era opens up opportunities for the use of technological devices in the world of education. The technology device used because of its remarkable progress is software. Mobile learning is a technology development regarding information and communication that can affect the scope of learning [8]. Some studies show that mobile learning can be integrated with the learning process of mathematics [9]. Through mobile learning, students can access learning using their smartphones whenever and wherever [10]. So far the study of mobile learning has shown the most favourable results [11]. The device is in the form of mobile phones, PDAs and tablet PCs. With the existence of mobile learning, the teaching and learning process will be more effective. Students can access subject matter from anywhere without being limited by space and place and have flexibility because it is not related to time.

Mobile learning can be a complement to the subject matter given in class. As a compliment, mobile learning can function as reinforcement or remedial and enrichment. Mobile learning is a substitute, meaning students have the freedom to choose to use the learning model they want. There are three choices, namely: entirely using conventional learning models; some use traditional learning and some use of technology; and entirely using technology [12].

The eXeLearning program is an acronym for teach XHTML editor, a program that is used to make Web-based teaching materials designed to convey learning materials more comfortable and more interesting. Computer learning such as eXeLearning programs, the material of learning can be presented in the tutorial form and accompanied by multiple choice practice questions [13]. National Education aims to the learning process in the 2013 Curriculum for all levels carried out using a scientific approach through activities of observing, asking, reasoning, trying, and forming networks [14]. A scientific approach is an approach whose inquiry method based on evidence from objects that can be observed empirically and measured by specific reasoning principles [15]. As Kosasih [16] stated in the process of learning the scientific approach, students make use of some previous theories. Thus, students are not trapped in verbalism; do not always accept an opinion and theory. However, they also tried to prove that opinion or theory. With a scientific approach, learning is more student-centred. Students construct and understand their knowledge that they will learn through a scientific process.

The steps of the scientific approach in the learning process include many activities. There are digging up information through observation, asking, experimenting, then processing data or information, presenting data or information, then analysing, reasoning, then concluding, and creating [17]. From these theories it can be concluded that students are not only made objects with the memorized burden of various kinds of concepts and formulas but must be made subject to active learning. So learning is not teacher-centred but student-centred, and indirectly students will find their ideas or knowledge. From the explanation above, the researcher intends to develop mathematics learning media by using eXeLearning programs based on the 2013 Curriculum by using a scientific approach to social arithmetic materials in seventh-grade junior high school.
2. Method

This type of research is development research using the 4D development model developed by Thiagarajan, Semmel and Semmel consisting of four stages, including the stages of defining, designing, developing, and disseminating [18]. This study is at seventh-grade student of 1 Tepus Muhammadiyah Junior High School with a total of 10 people chosen randomly. The object in this study is the student's response to eXeLearning media that has been developed in social arithmetic topics.

The research data was obtained using data collection instruments, namely student response questionnaires. In this study, researchers designed social arithmetic learning media. Then the application is converted into an Android application. Researchers asked students to download the application using their Android smartphones. Then students are asked to do the exercises that have been developed that are about social arithmetic topics using a scientific approach. From the data that has been collected, the average can be calculated by the formula average score [19].

\[ \bar{X} = \frac{\sum_{i=0}^{n} X_i}{N} \]

with:
- \( \bar{X} \) : Average score
- \( \sum_{i=0}^{n} X_i \) : Total score
- \( N \) : Number of assessors

Furthermore, the data obtained from class VII students are converted into qualitative values based on the ideal assessment criteria.

3. Result and discussion

3.1. Collected data

The following steps obtained the trial data in this development research namely define, design, develop, and disseminate. Firstly, the define stage reference studies were carried out from various sources, discussions about the potential and problems in developing mobile learning media both from the internet and print media related to information in developing mobile learning including preliminary analysis, analysis of students, material analysis, task analysis and specifications of learning objectives.

a. Preliminary analysis

The aim of junior high school mathematics learning in the 2013 curriculum is to develop problem-solving skills and convey information or communicate ideas, among others, through verbal conversation, graphics, maps, diagrams, in explaining ideas. Learning carried out by teachers has not utilized technology maximally in achieving learning objectives. Learning like this causes students to be challenging to explore knowledge and construct the concepts learned, they tend to memorize. To practice the ability convey information or ideas and problem-solving abilities of students, it is necessary to get used to discussing various kinds of problems with friends in a group. To can cover all mathematics learning, the right learning media is needed, namely learning that utilizes technology but also creative, independent and responsible.

b. Learners Analysis

With the method of documentation and literature, the results of the analysis of students show that junior high school students are now familiar with technology and on average already have a hand phone with an Android OS. The knowledge that previous students have is not used to build new knowledge that they will learn and does not lead students to find material that demands the activity of students so that the participation of students in learning is still lacking, and also the lack of use of learning media in math.
c. Material Analysis

Based on discussions with junior high school mathematics teachers in the MGMP, in the 2013 curriculum, there were social arithmetic materials whose concepts could create through concepts that had previously been accepted by students [20].

d. Task Analysis

Task analysis was carried out after knowing the material to be taught, namely social arithmetic so that the tasks that must be completed by the students during the learning process were known.

e. Specifications of learning objectives

From the material analysis and analysis of the tasks that have been carried out, it is expected that specific learning objectives can be produced which are the basis for compiling tests and designing learning materials.

After analyzing at the defining stage, the second stage, design, learning media is compiled with Android. This media is explicitly created by taking into account the steps of learning mathematics so that it still allows students to explore their abilities. Activities in the format selection phase include designing or designing learning content, choosing strategies, approaches, learning methods and learning resources.

In the third stage, develop, mathematical mobile learning applications are carried out using the eXeLearning application. Mobile learning math is an application that can be installed on android devices [21]. The results of the application are then converted in the form of an Android application package (.apk) using the website two builder pro application. This conversion is done so that mobile learning can be installed on smartphones [21]. This media consists of the Social Arithmetic title page; Multiple Choice Questions and Descriptions page.

The first page after opening this media is the title page of Social Arithmetic which contains KD and Indicator of the problem. This media can be viewed via smartphone in portrait or landscape so that the view is bigger or clearer by rotating. An example of a view of the Social Arithmetic page in a landscape can be seen in Figure 1.

![Figure 1. Title page display (social arithmetic)](image)

On this Figure 2, students can directly use instructional media by selecting the short answer provided. Students can also check their answers. Automatically there will be feedback from the right work on the matter.
Figure 2. Activity page display

The activity page display is in Figure 3. On the Activity page, a problem is presented, which is determining profit or loss with a guided completion step made with the "Cloze Activity" menu. On this page, students can interact directly using learning media by entering answers into the box provided. Students can also check their answers by pressing the "send" button and get a score or score. Even automatically there will be feedback in the form of precise quality details in solving the problem.

Figure 3. Cloze activity page display

In the last stage namely disseminate, products that have been created are promoted online which can be downloaded at
3.2. Student response questionnaire analysis

Students' responses to the mobile learning application are developed, it is known based on the results of questionnaires given and filled out by students during the trial. The results of the student response questionnaire calculation can be seen in Figure 4.

![Figure 4. Student response questionnaire results](image)

It can be seen in the graph figure 4 that an average score of 25.5 obtains the Mobile Learning application from the trial at the research location. The details for usefulness criteria are followed ease of use criteria is obtained an average score of the results of questionnaire calculation 30.9; ease of learning criteria is obtained an average score of the results of questionnaire calculation 30.9; ease of learning criteria is obtained an average score of the results of questionnaire calculation 30.9. These results indicate average with a good category so that development the Mobile Learning application on social arithmetic material for students based on the 2013 curriculum through the scientific approach can be used in the learning process independently at school or outside a school.

4. Conclusion

After the Mobile Learning application on the social arithmetic material was developed, then a trial was conducted to find out the students' response to the mobile learning application based on a scientific approach. Based on these assessments, it can be concluded that in general the developed mobile Learning mathematics application is developed both on the criteria of usefulness, ease of use, ease of learning, and satisfaction in the excellent category. From the research conducted can be obtained the calculation results of the common overall criteria of the questionnaire by 90. These results indicate average with a good category so that development the Mobile Learning application on social arithmetic material for students based on the 2013 curriculum through the scientific approach can be used in the learning process independently at school or outside a school. As in the research that has been done [13], eXeLearning computer media programs can present material well so that students can easily understand the material as a result of learning outcomes can increase significantly, but in this study using a scientific approach. The other research states that the e-Learning presents features that can help students gain knowledge [22].

References

[1] Priyambodo E 2010 Pemanfaatan Program Aplikasi Exe (Elearning Xhtml Editor) Dalam Penyusunan Media Pembelajaran Di Sekolah [Utilization of eXe (Elearning XHTML Editor) Application Program in Preparing Learning Media in Schools] In Prosiding Seminar Nasional Pendidikan, Pendidikan dan Penerapan MIPA, Fakultas MIPA, Universitas Negeri
Yogyakarta 15.

[2] Purbasari R J, Kahfi M S, and Yunus M 2013 Pengembangan Aplikasi Android sebagai Media Pembelajaran Matematika pada Materi Dimensi Tiga untuk Siswa SMA Kelas X [Development of Android Applications as Mathematics Learning Media in Three Dimensional Material for Class X High School Students] Jurnal Online Universitas Negeri Malang 1.

[3] Muslihudin M 2018 Meningkatkan Kemampuan Guru Dalam Pembuatan Media Pembelajaran Melalui Kegiatan Workshop P2M STKIP Siliwangi 3 51.

[4] Gagné R M 1975 Essentials of learning for instruction (New York: Dryden Press).

[5] National Education Association 2014 preparing 21st-century students for a global society: An educator's guide to the "Four Cs" Washington DC: National Education Association.

[6] Muhsen A 2010 Pengembangan Media Pembelajaran Berbasis Teknologi Informasi [Development of Information Technology Based Learning Media] Jurnal Pendidikan Akuntansi Indonesia 8 1.

[7] Oemar H 2003 Media Pendidikan [Education Media] Bandung: PT Citra Aditya Bakti.

[8] Sulisworo D and Toifur M 2016 The role of mobile learning on the learning environment shifting at high school in Indonesia International Journal of Mobile Learning and Organisation 10 159.

[9] Shin N, et al 2012 Effects of game technology on elementary student learning in mathematics British journal of educational technology 43 540.

[10] Martin F and Ertzberger J 2013 Here and now mobile learning: An experimental study on the use of mobile technology Computers & Education 68 76.

[11] Bidin S and Ziden A A 2013 Adoption and application of mobile learning in the education industry Procedia-Social and Behavioral Sciences 90 720.

[12] Astra I M 2012 Aplikasi Mobile Learning Fisika dengan Menggunakan Adobe Flash sebagai Media Pembelajaran Pendukung [Physics mobile learning application using Adobe Flash as learning media support] Jurnal Pendidikan dan Kebudayaan 18 174.

[13] Copriady J 2014 Penerapan SPBM yang Diintegrasekan dengan Program eXe Learning terhadap Motivasi Belajar Mahasiswa pada Mata Kuliah Kimia Dasar [Application of SPBM which is integrated with eXe Learning Program on Student Motivation in Basic Chemistry Courses] Jurnal Pendidikan 5 95.

[14] Indonesian Regulation 2016 Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia No 22 Tahun 2016 tentang Standar Proses Pendidikan Dasar dan Menengah [Minister of Education and Culture Regulation of the Republic of Indonesia No. 22 of 2016 concerning the Standard Process for Primary and Secondary Education] Jakarta.

[15] Aprilia L and Mulyaningsih S 2014 Penerapan Perangkat Pembelajaran Materi Kalor melalui Pendekatan Sainifik dengan Model Pembelajaran Guided Discovery Kelas X SMA [Application of Calorific Material Learning Devices through a Survey Approach with Guided Discovery Class X High School Learning Models] Jurnal Inovasi Pendidikan Fisika (JPIF) 3 1.

[16] Kosasih E 2014 Strategi belajar dan pembelajaran Implementasi Kurikulum 2013 Bandung: Yrama Widya.

[17] Wijayianti A 2014 Pengembangan Autentik Assesment Berbasis Proyek dengan Pendekatan Sainifik untuk Meningkatkan Keterampilan Berpikir Ilmiah Mahasiswa [Development of Project-Based Authentic Assessment with a Scientific Approach to Improve Student Scientific Thinking Skills] Jurnal Pendidikan IPA Indonesia 3 102.

[18] Thiagarajan, S, Semmel D S and Semmel M I 1974 Instructional development for training teacher of exceptional children (Bloomington Indiana: Center of Innovation in Teaching the Handicapped).

[19] Sukarjo 2006 Kumpulan Materi Evaluasi Pembelajaran [Collection of Learning Evaluation Materials] (Yogyakarta: Universitas Negeri Yogyakarta).

[20] Yuliani K and Saragih S 2015 The Development of Learning Devices Based Guided Discovery Model to Improve Understanding Concept and Critical Thinking Mathematically Ability of
Students at Islamic Junior High School of Medan Journal of Education and Practice 6 116.

[21] Kusuma D 2016 Pengembangan Mobile Learning Matematika Sebagai Suplemen Pembelajaran Trigonometri Siswa SMA Kelas X [Development of Mobile Learning Mathematics as Supplements of Trigonometry Learning for Class X High School Students] Doctoral dissertation, Program Studi Pendidikan Matematika FKIP-UKSW).

[22] Bradford S B and Jessica E F 2013 E-Learning in Postsecondary Education The Future of Children 23 165.