



The Development of E-Atlas Learning Media Based on Mobile Learning on Cells Structure Concept

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Abstract

Cells are the one of hard-to-understand material for students, because it cannot be seen directly by students. Therefore, it requires detailed visualization of images to explain the structure and processes that occur in it. Adequate visualization is needed to study better the structure and function of cells. This is the reason why we need to develop mobile learning media. The media is an E-atlas of cell structure and function. This product is then analyzed its suitability as a learning media in SMA N 1 Kandangserang. Students of classes XI MIA 1 and XI MIA 2 academic year 2018/2019 were selected as the samples of this research using saturated sampling techniques. This is a research and development (R & D). Research shows that E-atlas is suitable as learning media. E-atlas affects the learning outcomes, where the N-gain value indicates an increase with an average of 0.72 (categorized as high) with the classical completeness of 83%. It is concluded that E-atlas mobile learning is suitable as a teaching-learning medium for students. This study would enrich media variation in teaching related biology concept.

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INTRODUCTION

Cells are one material that is considered difficult because it cannot be seen directly by students, and there are many parts must be memorized and understood well and correctly. Cell material objects are actually real but become abstract for students if there is no visualization of the structure (Azizah, 2011). The cell material requires detailed visualization because it will not provide a good understanding for students without images (Suswina, 2011). Based on the results of a questionnaire distributed in SMA 1 Kandangserang, the cell is one of the materials that is considered difficult matching with the results of low student completeness, i.e. 24.5% of the number of students in class XI of the academic year 2017/2018. One of the factors that affect the low learning outcomes in this material is the lack of detailed visualization of images that explain the structure and process that occur in it.

The learning media can help visualize cell structures so that they are more real and easy to learn. One of the media that can be appropriate is visual media such as maps or atlas. Atlas media is chosen because it gives a presentation of material using images systematically and brief and easy to understand the information. This type of media provides a pictorial experience that is learning something by looking at pictures, paintings, photos, or films. This experience helps students understand something even though they have never seen it in person (Arsyad, 2011).

The rapid advancement of technology and information at this time has an impact on human life. We can feel the advancement of technology in various fields of life such as the emergence of various technology products that make activities easier to carry out. According to data from Tribun Jogja (2017) until 2017 there were 51.7 million Android-based Smartphone users in Indonesia. The use of smartphones has only been used for social media and only a small portion is used in learning and human work (Muyaroah & Fajartia, 2017). The development of this technology should be able to be utilized in educational activities. According to Maulana (2017) android found on smartphones can be used as an alternative in the learning process because learning can be done anytime and anywhere so that it can support the learning process inside and outside of school.

Based on existing problems and potential, a mobile learning based media is developed. Mobile learning media allows students to do learning activities wherever and whenever not limited to space and time (Purnama *et al.*, 2017). The use of media in which there are pictures, animations, and videos can create a pleasant learning atmosphere that makes it easier for students to understand the material (Kholina *et al.*, 2013). Based on the research of Saefi *et al.* (2015) the use of mobile learning based media is effective in helping students understand the material and achieve learning completeness and practical use.

This study aimed to develop a mobile learning based media on the material structure and function of cells with the name E-Atlas. The results are expected to enrich media variation in teaching related biology concept.

RESEARCH METHODS

This research is a Research and Development (R&D) research design. The development model used in this study is Sugiyono's development model. The stages in this media developing are analysis of problems and potentials, data collecting, product design, validation by material and media experts, media revision, small-scale try-out, product

revision, large-scale try-out, product revision, and final product. Media validation was done in Universitas Negeri Semarang by material and media experts. The small and large-scale try-out was done in SMA N 1 Kandangserang. The sample of small-scale try-out is 15 students of XI MIA 1 class in academic year 2017/2018 which was chosen using purposive sampling. The large-scale try-out used 2 classes that are XI MIA 1 and 2 in academic year 2017/2018 with saturation sampling technique. The design of the study was One Group Pretest and Posttest Design.

RESULT AND DISCUSSION

Media Development

The result of the development in this study is E-Atlas learning media based on mobile learning that is packaged in application format (apk). Media with an application system was chosen because it is widely used by students (Sambodo, 2014). Media is used to clarify the presentation of material so as to increase motivation to learn and overcome the limitations of senses, space, and time that improve the learning outcomes (Sukiman, 2012). E-atlas has an attractive appearance with a bright blue color making it more enjoyable in learning. A lightweight display with lots of images and material that has been made per point also helps students remember and understand the material. E-atlas Media displays more images in accordance with the atlas context as non-text teaching material so that it contains images as its main component (Kusuma *et al.*, 2018). Atlas media can help students understand the material without having to observe the object directly (Wulansari *et al.*, 2015).

The final product of E-Atlas consists of several parts, such as splash screen, homepage (selection menu), material, usage instructions, curriculum, library, profiles and videos.



Figure 1 Splash Screen Display

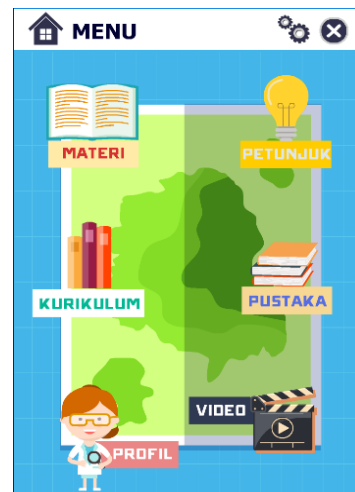


Figure 2 Homepage Display

The splash screen is the initial display when the application is opened. This menu is used as an introduction to the media title and the organization where the media is developed. The home contains six menus, i.e. material, usage instructions, curriculum, library, developer profile, and video. Each menu can be chosen by students randomly because it is not interrelated so that it facilitates students in the learning process. In addition to the six menus

in the upper right corner, there is also a settings menu to set the back sound on or off and the close menu to close the application.

This media is equipped with back sound in the form of musical instruments that accompany the media. Music sounds provide benefits for students who prefer learning through audio. The use of music is not intrusive and can be used as motivation and provide peace of students' psychology even though not all students like music (Subali *et al.*, 2012). This mobile learning media optimize the role of the senses in receiving information, through remembering, seeing, and listening. Learning media can optimize all the senses of students so that weaknesses in one of the senses can be overcome (Muhson, 2010).

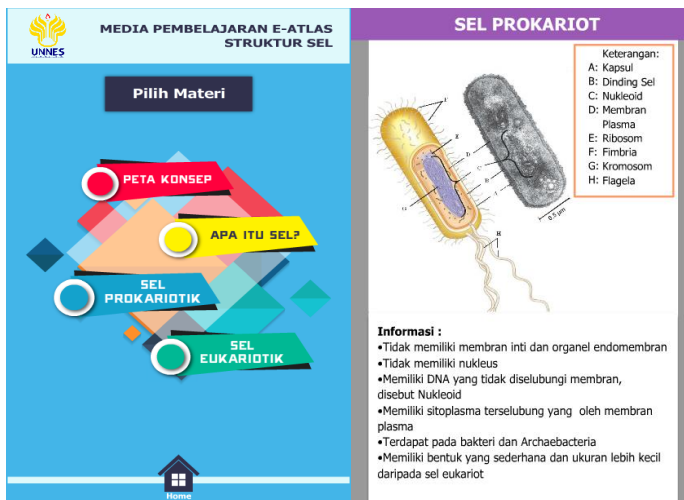


Figure 3 Material Menu



Figure 4 Usage Instruction

The material menu contains material choices that students can learn, i.e. 1) material maps, 2) what are cells?, 3) prokaryotic cells, and 4) eukaryotic cells. The menu on the material can be chosen according to the student's wishes but it is better to study it in order. The material map displays a chart including the material contained in the E-Atlas. "What are cells?" menu includes a brief explanation of the meaning of cells, a chart of cell division and size. While the menu of prokaryotic cells and eukaryotic cells include various kinds of organelles that are owned and their explanation. The Instructions menu includes how to run this application and a description of the menu contained in the application.

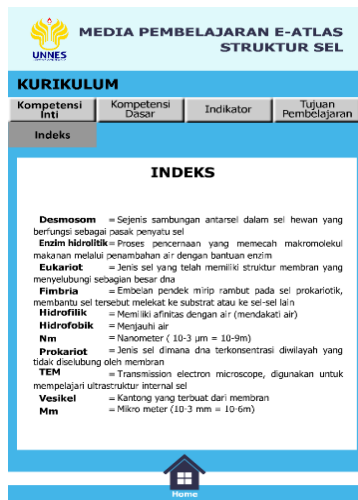


Figure 5 Curriculum Menu

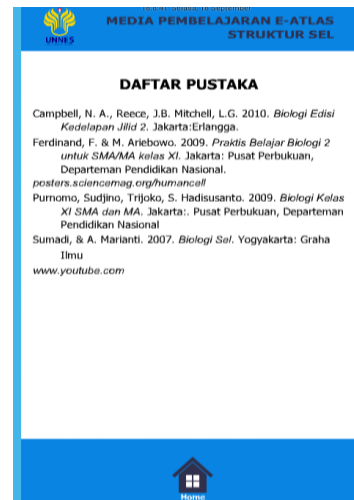


Figure 6 Bibliography Menu

The Curriculum menu involves curriculum related to the material structure and function of cells including core competencies, basic competencies, learning objectives, indicators, and an index included. This menu is used as a basis for media development and as a reference for the results that must be achieved after learning. The library menu contains a bibliography of references used in this E-Atlas.



Figure 7 Profile Menu

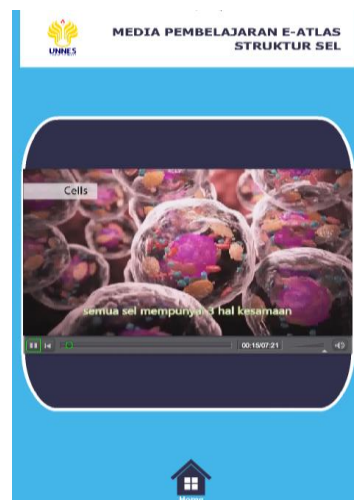


Figure 8 Video Menu

The Profile menu displays the profile of media developers. The video menu displays a video that explains the material structure and function of the cell as a whole using animation. The video is used because they are able to focus and attract students' attention (Saefi *et al.*, 2015).

E-atlas media was used as complementary learning that can be used anytime and anywhere. This media provided additional knowledge to students in addition to the teaching materials available at school and information provided by the teacher. Mobile learning media can be used to study independently without teacher guidance because the material that has

been presented is complete and equipped with pictures to clarify the material (Muyaroah & Fajartia, 2017).

Media Validation

Media validation includes the results of validation by the material expert, media expert, Biology teachers and students in the small-scale trial. Validation by material expert aims to measure and assess aspects of learning and content of the material packaged in the media. The results of validation by the material expert (Table 1) obtained a score of 36 with a percentage of 90% (very feasible). Validation by media expert aims to measure the feasibility of the media developed before being used in the next stage. Validation by media expert (Table 2) got a score of 51 with a percentage of 91.07% (very feasible). While the assessment by the teacher and students aims to find out the readability of the media and the response to E-Atlas as a learning medium. The results of the questionnaire by the Biology teacher (Table 3) get a score of 82.69% with a very feasible category and the results of the assessment by students (Table 4) get an average value of 84.23% with a very feasible category.

Table 1 E-Atlas Validation by Material Expert

No	Aspects	Score
1	Clarity of learning objectives	4
2	Relevance of learning objectives with Basic Competencies	4
3	Suitability of the material with learning objectives	4
4	Contextuality and actuality	3
5	Completeness and quality of E-Atlas	3
6	Depth of material	4
7	Easiness to understand	4
8	Systematic, coherent, clear logic	4
9	Clarity of description, discussion and example	3
10	Influence in the Science process skills	3
Score		36/40
Percentage (%)		90%
Criteria		Very Decent

According to material expert, the material presented at E-atlas is quite good and in accordance with the learning objectives of the material structure and function of cells. The material is presented systematically and coherently so that it is easy to understand. Learning media must be made in such a way as to facilitate and assist students in achieving learning goals (Nurseto, 2011).

Table 2 E-Atlas Validation by Media Expert

No	Aspects	Score
1	Effective and efficient in the development of learning media	3
2	Maintainable (Can be maintained or managed easily)	3
3	Usability (easy and comfortable in operation)	4
4	Compatibility (can be installed/run on various existing hardware and software)	4
5	Documentation of complete learning media programs	4
6	Communicative (according to the message and can be received/corrected with the target's desire)	4
7	Creative in idea	4

8	Simple and charming	4
9	Visual (design layout, typography, color)	3
10	Mobile media (animation, video)	4
11	Interactive layout (navigation icon)	4
12	Conformity of terms and symbols	4
13	Readability (commerciality in the selection of letters, formats and languages)	3
14	Consistency in the use of terms and symbols	4
	Total Score	51/56
	Percentage	91,07%
	Criteria	Very Decent

The results of validation by media experts indicate that the media is very feasible to be used as a learning medium. The media developed both regarding appearance, layout selection, color and placement of menus on consistent media. An attractive and light media display makes the media suitable for high school students and media content complete with images, materials and videos make this media worthy of use. Amirullah & Hardinata (2015) in their research stated that media that has a clear, neat appearance and have good quality in the aspect of writing, software engineering and display are good media characteristics.

Table 3 The Result of E-Atlas Media Legibility

No	Statements	Average Score by Students	Score by Teacher
1.	The navigation buttons on E-Atlas media are clear and easy to use	3.4	3
2.	The sentences used in E-atlas media are clear and easy to understand	3.4	3
3.	Appropriate font size, not too big or too small	3.2	3
4.	The explanation in the media E-atlas clear and easy to understand	3.1	3
5.	The images in E-atlas media are clear and easy to understand	3.6	3
6.	The images presented make it easy to understand the material of the cell structure	3.4	4
7.	The video presented can be used properly	3.3	3
8.	The video content helps to understand the material structure of the cell	3.4	4
9.	The color mix in E-Atlas media is proper	3.1	3
10.	The appearance of E-atlas media is generally interesting	3.5	3
11.	E-Atlas media is able to help understand the concept of cell structure material	3.4	4
12.	E-Atlas media is suitable for use as a learning medium	3.5	4
13.	E-Atlas media is easy to install and operate	3.5	3
	Obtained Score	43.8	43
	Percentage	84.23%	82.69%
	Criteria	Very Decent	Very Decent

Overall teachers and students like E-atlas as a learning media in the material of cells structure. Media in the form of mobile learning is an innovation for learning, making it easier for students to learn because they do not have to carry books and wait for the teacher to

explain. As expressed by Ibrahim & Ishartiwi (2017) that mobile learning is an important factor that influences the transfer of the concept of learning media from books to electronic media. In addition, E-atlas media, which contains pictures and videos, is very helpful for them in learning. This is because images provide an important role in cell learning, because by using student images it is easy to understand and remember the abstract concept of cell material (Rofi'ati *et al.*, 2014).

Media Effectiveness

The effectiveness media can be seen through students' learning outcome, students' activity, and students' appropriateness response. The following table shows N-gain score of students' learning outcome.

Table 4 N-gain Score of Students' Learning Outcome

Data	Pre-test	Post-test	N-gain
Amount of Data	53	53	
Min. Score	6.67	53.3	
Max. Score	40	93.3	
The number of students completes KKM	-	44	
Average	24.4	79.05	0.722

Student learning outcomes were taken based on the pre-test and post-test scores. The results of students' pre-test are found that none of the students completed the KKM and the highest score is 53. This is because students had never studied the material of cells' structure and function before so that their grades are low. The post-test scores were obtained after students completed learning the structure and function of cells using E-Atlas. The result is 44 students (83%) out of 53 students completed the KKM while 9 other students still have not reached the KKM. The results of the pre-test and post-test are then tested with N-gain to determine the increase in students' knowledge. The N-gain value obtained is 0.722 that is in the very high category.

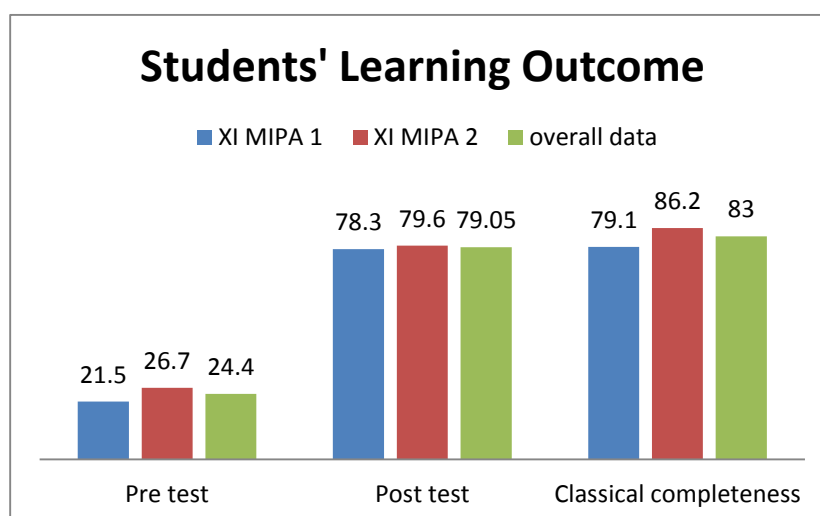


Figure 9 Percentage of Students' Learning Outcome of Pre-test, Post-test and Classical Completeness

Both classes are used as experimental classes have learning outcomes that have met the indicators of success, that is at least 80% of students meet the minimum completeness criteria of 75. The completeness of student learning outcomes is due to the use of media that helps stimulate desires, interests and motivation in teaching and learning activities. In addition, the use of media can clarify the presentation of messages and information so as to facilitate the learning process and provide the same experience for each student in the learning process (Umar, 2013). The use of media that contains audiovisuals can explain abstract material rather than just using conventional methods in Biology learning so that student learning outcomes increase (Sanusi *et al.*, 2015).

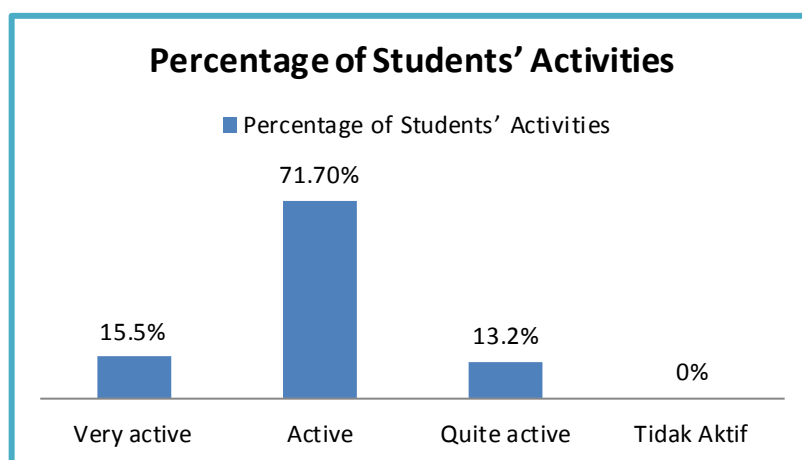


Figure 10 Percentage of Students' Activities during Learning Using E-Atlas

The students who have not completed the learning are because they do not participate maximally in the learning activities. Some of the students are not actively participating in learning because of the activities of the organization. Students who are not serious in participating in learning can lead to incomplete student learning outcomes (Yuniati, 2011). In addition, it is necessary to familiarize students when learning using E-Atlas media because this is the first time using media based on mobile learning so students are not used to using it. E-Atlas media invites students to actively learn in gaining knowledge where previously students learn passively. This also affects student learning outcomes that have not been completed. The cause of incomplete student learning outcomes according to Munadi (2013) and Pingge & Wangid (2016) can be caused by two major factors, i.e. internal factors (intellectual ability, self-confidence, learning motivation, learning habits, ability to remember and sensing abilities) and external factors (quality of learning, teacher, facilities provided for learning).

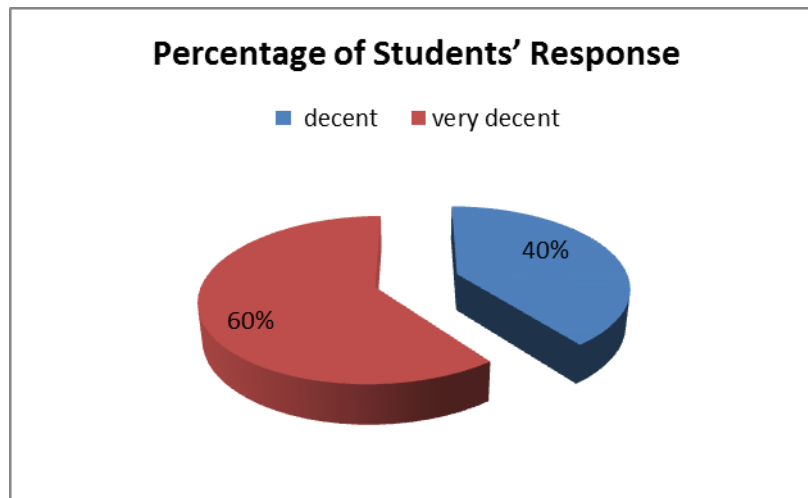


Figure 11 Percentage of Students' Response of E-Atlas Media

Based on the results of student responses given after learning, it is obtained a percentage of 85.48% and has very decent criteria. The teacher assessed that E-Atlas media based on mobile learning was very feasible with a rate of 80%. This is because E-Atlas media makes it easy for students to learn where and whenever and they don't have to bring textbooks. In addition, media that combines material with images on the material structure and function of cells is beneficial for students to visualize cell structures that are abstract. According to Rofi'ati *et al.* (2014) students it is easy to understand and remember the concept of the material through pictures. Image media is a visual medium that is easy to use to describe cells material.

Combining with the existence of animated videos makes them easy to understand the material because the video animates the cell part and its function in order with good effects so that it is easy to understand. The use of animated video media makes students focus on following the learning process (Wahyuni *et al.*, 2018). The use of technology in learning such as mobile learning can create variations in learning so that students do not bore. In addition, it motivates students to learn independently, creative, effective, and efficient (Muyaroah & Fajartia, 2017).

CONCLUSION

This study develops mobile learning android based as learning support on cells' structure and function. This media contains more cells' pictures completed with video, interesting and amusing design and also can be used offline. E-Atlas based on mobile learning is considered very appropriate to be used as learning media based on validation by media and material experts and also by the teacher and students' response. E-Atlas based on mobile learning as learning media can increase students' learning outcome on cells' structure and function material with N-gain 0.722 and students' classical completeness percentage is 83%. Students' activity is also high with classical percentage 86.67%, students are active following the learning using E-Atlas media. E-Atlas based on mobile learning is appropriate to be used as learning media on cells' structure and function material.

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