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VALIDITY OF FLASH E-BOOK OF HUMAN LOCOMOTION SYSTEM FOR 2nd GRADE SENIOR HIGH SCHOOL

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Abstract

The human locomotion system describes about structure, mechanisms, and functions of human muscles and skeleton. The description of locomotion mechanism processes cannot be visualized by printed out or electronic books that have been circulating. Therefore a book that can display animation or video is needed. Advances in technology provide a solution in form of electronic book in Flash program that can display text, images, animation and video. This learning book can facilitate explanation of the concept to students. The purpose was to produce a Flash e-book of human locomotion system and to describe theoretical and empirical feasibility. 4-D (Define, Design, Develop and Disseminate) model used without Disseminate stage. Development of e-book was conducted in the Biology Department, Universitas Negeri Surabaya, and a limited trial was conducted in SMAN 20 Surabaya. Results showed that the theoretical feasibility of e-book got 100% or very feasible category while empirical feasible got 90% or very feasible. It can be concluded that the e-book developed in this study was feasible for use in the learning process.

Keywords: e-book, flash, human locomotion system.

INTRODUCTION

Ministry of Education Regulation No. 69 of 2013 stated that human locomotion system topic includes of biology basic competence for the 2nd grade of high school. The human locomotion system describes structures, mechanisms, and functions of muscles as active locomotors and skeleton as passive locomotors. Delivery of it's requires books which can explain in detail each of the stages of motion mechanism in form of animation or video. Printed books that are used nowadays use PDF format that can only contain text and images as well as electronic school book (BSE/*Buku Sekolah Elektronik*) that is shared by the Ministry of Education. Therefore more innovative and creative learning media for the teaching-learning process are needed. Arsyad (2011) stated that development of technology encouraged efforts to use technology to solve the problems in the teaching-learning process.

Advances in technology increase popularization of electronic textbooks (e-book) as a reference of learning in addition to printed textbooks. Electronic books emerged from the influence of computer technology and the internet (Triyono et al., 2012). Availability of a wide range of applications on the internet to compose e-book provides a lot of conveniences, especially in the insertion of animations, videos, and music in it so that it could meet the demands of human locomotion system chapter.

Researchers would to apply their knowledge to develop an e-book of human locomotion systems using Macromedia Flash 8 application that could display text, images, animations, and video. It does not require high specified computer compared with other flash-maker application. An e-book that can include text, images, video, animation, and sound could give the impression of enriched reading experiences (Suarez et al., 2013). This e-book was expected to increase the level of understanding the topic and the interest of students to learn this topic so that the knowledge obtained can be applied in everyday life.

This study aimed to produce a flash e-book on human locomotion system topic and to describe its theoretical and empirical feasibility. The theoretical feasibility was inferred from the results of concept, appearance, and language validation, whereas the empirical feasibility was determined from student response.

METHOD

This developmental study adopted 4-D models, consisted of Define, Design, Develop, and Disseminate, created by Thiagarajan et al. (1974) however disseminate stage wasn't conducted. This study was organized in Biology Department, Universitas Negeri Surabaya then the limited trial was implemented to 20 students of

SMAN 20 Surabaya. The study was performed in November 2015 to September 2016.

Data collection techniques used validations and questionnaires. Validation was based on validation sheets assessed by an expert, linguists, and biology teacher. The questionnaire was based on the response sheet filled out by the students. The results of validation and questionnaire could be stated feasible if score ≥ 61%.

RESULTS AND DISCUSSION

Results of validator assessment on the developed e-book can be seen in Table 1.

Table 1. Results of Validation of Flash E-book on Human Locomotion System.

No	Aspect	Score			Percentage (%)	Category
		V1	V2	V3		
A.	**CONCEPT FEASIBILITY**					
1	Skeleton concept quality	4	4	4	100%	Very feasible
2	Skeleton concept appropriateness with Curriculum 2013	4	4	4	100%	Very feasible
3	Muscle concept quality	4	4	4	100%	Very feasible
4	Muscle concept appropriateness with Curriculum 2013	4	4	4	100%	Very feasible
5	Cognitive, affective, and psychomotor support quality	4	4	4	100%	Very feasible
Average A					**100%**	**Very feasible**
B.	**APPEARANCE FEASIBILITY**					
1	E-book appearance quality	4	4	4	100%	Very feasible
2	Text quality	4	4	4	100%	Very feasible
3	Images quality	4	4	4	100%	Very feasible
4	Animations quality (page 10; 40; 41; 42; 43; 44; 46; 47; 48; 73; 77; 81)	4	4	4	100%	Very feasible
5	Layout quality	4	4	4	100%	Very feasible
6	User guide quality	4	4	4	100%	Very feasible
Average B					**100%**	**Very feasible**
C.	**LANGUAGE FEASIBILITY**					
1	English quality	4	4	4	100%	Very feasible
2	Bahasa quality	4	4	4	100%	Very feasible
3	Identity and source information quality	4	4	4	100%	Very feasible
Average C					**100%**	**Very feasible**
Average [(A+B+C):3]					**100%**	**Very feasible**

Note:
V1 (Validator 1): Lecturer of relevant topic
V2 (Validator 2): Linguist lecturer
V3 (Validator 3): Biology teacher

The results of material, appearance, and language feasibility were 100% for each aspect. This score made the overall average validity percentage of the developed e-book as 100% or very feasible category.

Results of overall student response to the developed e-book can be seen in Table 2.

Table 2. Results of Student Response to Flash E-book on Human Locomotion System.

No	Aspect	Student response (%)		Category
		Yes	No	
A. E-book readability				
1	Is this e-book file is readable on your electronic device?	100	0	Very feasible
2	Are the font style and size readable?	100	0	Very feasible
3	Are the images presented can be seen clearly?	100	0	Very feasible
4	Are the size of images presented can be seen clearly?	100	0	Very feasible
5	Are animations (quiz and video) presented understandable and enrich your understanding?	90	10	Very feasible
6	Is the overall color of the e-book interesting?	90	10	Very feasible
7	Is the arrangement of texts, images, and animations comfortable to read?	90	10	Very feasible
8	Are the structure of Indonesian and English sentences easy to be understood?	100	0	Very feasible
9	Is the user guide for this e-book understandable?	100	0	Very feasible
10	Is the topic presented in this e-book (Human Locomotion System) easy to be understood?	100	0	Very feasible
Average A		**97**		**Very feasible**
B. Interests and Suggestions				
1	Are you happy to study using this e-book?	95	5	Very feasible
2	Does flip book (e-book with the animated page-turning feature) interest you?	95	5	Very feasible
3	Do the activities directed in this e-book help you to understand human locomotion system topic?	100	0	Very feasible
4	Do the quizzes in this e-book facilitate you to memorize the arrangement of skeleton and muscle structures?	100	0	Very feasible
5	Is the use of bilingual (English and Indonesian) languages in this e-book necessary?	100	0	Very feasible
6	Is the musical accompaniment in this book necessary?	45	55	Fairly feasible
7	Can you resolve the requirement to use an electronic device to read this e-book?	45	55	Fairly feasible
8	Do you choose to study Human Locomotion System using e-book rather than printed textbook that you already have?	70	30	Feasible
9	Are you willing to save this e-book file to be read another time?	100	0	Very feasible
10	Do you agree if this e-book is made with other topics?	80	20	Feasible
Average B		**83**		**Very feasible**
Average [(A+B):2]		**90**		**Very feasible**

The students responded e-book readability aspect got 97%, while on interests and suggestions aspect gained 84%. Therefore, overall obtained percentage of student response toward the developed e-book got 90% or categorized as very feasible.

Theoretical feasibility is seen from the results of the validity of the textbook, determined based on the concept, appearance, and language feasibility (Ministry of Education, 2004). The results of the concept feasibility validation showed that the e-book developed got 100% or categorized as very feasible. Human locomotion system concept included in the e-book in accordance with the syllabus of Curriculum 2013 and sourced from biology textbooks for the course of international standard. According to Lyanda (2014) to reduce the occurrence of misconceptions in learning, it is necessary to refer to college biology textbooks as a complement of high school literature. The developed e-book also displayed pictures and videos to support the explanation of the concept. It's made validators give a maximum score (4) in all validation aspects included skeleton concept quality, skeleton concept appropriateness with Curriculum 2013, muscle concept quality, muscle concept appropriateness with Curriculum 2013 and support quality for cognitive, affective, and psychomotor. It's was equal to the results of similar studies by Widyanita et al. (2012), which also received 100% percentage and categorized as very feasible, and higher than Perdana (2013) with 95.45% and categorized as very feasible.

An aspect of appearance validation also got 100% percentage and categorized as very feasible. The appearance of the e-book was designed to show text with various types and colors, full-color images, background music, flip animation, bilingual, interactive quiz, and video featuring an illustration of the concept. The layout of e-books such as margin spacing, line spacing, bilingual box placement, images and video arrangement were designed so as to not overlap and comfortable to be seen. Similar statements by Murniati and Yusup (2015) stated that an interesting illustration added with proper layout can make the textbook more interesting to learn. Availability of information about the e-book was complete enough, those were an identity of authors, reviewers, institution, preface, user guide, explanation of the features, table of contents, learning objectives, and concept maps. It's made validators give a maximum score (4) on all aspects of the appearance, including e-book appearance quality, text quality, images quality, animations quality, layout quality, and user guide quality. Similar research by Widyanita et al. (2012) also scored 100% with a very feasible category, although a study conducted by Nugraha and Wasis (2014) got a lower score of 90.06% with a very feasible category.

An aspect of language feasibility validation also got 100% percentage with a very feasible category. E-books are developed using English as the primary language, completed with Indonesian translation. Writing English and Indonesian were in accordance with applicable grammar. Sentences following grammar rules would be easier to be understood (Isnan, 2014). It's made validators give a maximum score (4) on all aspects including the quality of English language, the quality of Indonesian language, as well as identity and source information quality. The validation score of this e-book was higher than the results of a similar study by Restiyowati and Sanjaya (2012) that got 83.42% with a very feasible category; and study of Novita and Putri (2015) with 79.1% or very feasible category.

Empirical feasibility was seen from the student response to the developed e-book included readability, interests, and suggestions. The average number of positive-response (students who answered "YES") obtained 90% or very feasible category. It's higher than the study conducted by Restiyowati and Sanjaya (2012) which received 88.91% or very feasible category, but lower than a study conducted by Nugraha and Wasis (2014) which received 97.66% or very feasible category.

Data from limited trial explained that on the readability aspect, this e-book has received 97% positive-response or very feasible category. It's showed that students could read, understand and operate the e-book. Response on interest and suggestions aspect got 84% positive-response or very feasible category. It's caused by 55% of students response suggested to removing instrumental music as musical accompaniment. According to Christianti (2012) instrumental music was known to increase concentration. The assumption wasn't absolute if applied in the class. The data shown that some students do like the music addition but more than half of students wanted it to be removed from the e-book because they want to replace it with another genre of music according to their individual taste and some other students prefer silence without music. A similar study conducted by Perdana (2013) stated that inaccuracy in musical accompaniment selection will distract the students learning process.

The low positive-response was also caused by 45% percentage of the students have difficulty reading an e-book in an electronic device. It's caused when the limited trial was conducted, researchers were not able to provide each student with an electronic device (laptop)

for reading the e-book. Researchers could only provide eight laptops so that the process of studying the e-book was done in groups with two laptops in each group. The condition was not in accordance with the statement of Hamalik (2008) stated that every student should ideally use one computer (laptop) personally or visit the computer laboratory of the school. Researchers could not use computer laboratory at the school because there was laboratory activity using chemicals and sharp instruments that could damage electronic equipment in the school's computer laboratory. Besides, reading speed of each student were different, and when one member of the group had not finished reading, the page e-book has been turned by the other members who read faster. It's supported a study by Kurniawati (2012) that state every student had different reading speed and would affect the level of understanding.

Overall, the developed e-book acquired theoretical and empirical feasibility for use in the teaching learning process. The advantages of the developed e-book can be used to increase students understanding of human locomotion system.

CONCLUSION

Flash e-book on human locomotion system for the 2nd grade of senior high school has been produced and stated as feasible for use in the teaching learning process with 100% theoretical feasibility and 90% empirical feasibility.

SUGGESTION

It is needed to add more innovations to the developed e-book so that it can be compatible both with computers and smartphones because the developed e-book is only compatible with computers but less compatible with smartphones.

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