

UDC 373

**DEVELOPMENT OF VISUALS CARD AS EDUCATIONAL MEDIA
TO IMPROVE STUDENT'S ACHIEVEMENT ON THE SCIENCE CONCEPT
OF "HUMAN MUSCULOSKELETAL SYSTEM" FOR 5th GRADE
OF ELEMENTARY SCHOOL AT DEPOK CITY**

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ABSTRACT

This research aimed to develop visual-based science learning media on human musculoskeletal system material as an effort to improve student's achievement and understanding in mastering the material. This media was arranged in a card product called VISUALS Card. This product could be an alternative learning media for educators in the use of instructional media. The researchers applied research and development (R & D) method and used Dick and Carey's development model consisting of 10 development steps. The feasibility test of the media was conducted by involving material experts, linguists, media experts, and students. The research involved material experts as much as 88.33%, linguists as much as 86.67%, and media experts as much as 90% in which it stated that the media was worthy of use. The effectiveness of the feasibility was conducted on individual tests, small scale test, and large scale test. The effectiveness test was conducted in 3 elementary schools including SDN Sukatani 4, MI Nurul Falah, and SDIT Amal Mulia. The results of pre-test and post-test had increased so it could be concluded that the VISUALS Card media could improve the achievement and understanding of the science concept on human musculoskeletal system material. The advantage of the VISUALS Card media was that it could be used for individuals, in pairs, in groups, and for the learning in a big class.

KEY WORDS

Research, development, learning media, science, VISUALS card, elementary school.

Education is a mirror of a nation's quality. According to Heryati and Muhsin (2014), the higher education of human resources a nation has, the higher the quality of the nation. The low quality of education affects the low human resources of a nation. Ghafur (2014) mentioned that it can even be a means of sharing stupidity among the children of the nation (education as an instrument to share of stupidity among the nation). Education has an important role in improving the quality of human beings. Education in Indonesia for instance, the government always makes changes in order to improve the goals and ideals. According to the 1945 Constitution in Majid (2014), it mandates efforts to educate the life of the nation and so that the government seeks a system of national learning that is legally ordered by the law. However, until now Indonesia's education is still quite low. It is proven by the research findings in 2015 of the Program for International Student Assessment (PISA) which showed that Indonesia ranked 63 out of 70 countries in science.

The problems arose during the implementation of government's policy on the improvement of curriculum by following the development of science so-called curriculum 2013. In addition, in its application there were still many aspects that must be revised, (Retnawati, 2016). The implementation of curriculum 2013 is expected to bring Indonesian young generation into the golden generation. We are participating for the success of government programs in the field of education and taking part in finding solutions or problem solving that exist in education. Thus, research is required as an effort to improve the quality of learning both in schools and in all disciplines. One of the problems that exist in the field of education, especially the process of learning by teachers in the classroom, is on the subjects of Science.

The Science Learning in Primary School cannot be conducted in abstract way of learning but the learning must be concrete or real with everyday life. What can be carried out is to use instructional media. Musfiqon (2012) explained that the learning media can provide more real experience (abstract to be concrete). Real or concrete learning will facilitate the understanding of the students. Learning media to be used need to follow the progress of science and technology, (Stauffer and Grimson, 2000).

The research began with field observation at three elementary schools in Depok including SDN Sukatani 4, SDIT Amal Mulia, and MI Nurul Falah. This observation aimed to analyze the need for development model in term of the learning media. Observation is conducted by distributing questionnaires to the students, evaluating written tests, and interviewing the teachers and the principals.

The results of observation to the students of MI Nurul Falah showed that the science is a difficult lesson because it is difficult to understand. In contrast to SDN Sukatani IV and SDIT Amal Mulia, they showed that they enjoy the science lesson by stating that the material of science relates to daily life. However, after being taught on human musculoskeletal system material delivered by the classroom teacher and conducted a written test evaluation at the three schools, the results can be seen in the following table:

Table 1 – The Evaluation Result of the Written Test

The Interval of the Score	Category	The Percentage of the Score		
		SDN Sukatani 4	SDIT Amal Mulia	MI Nurul Falah
< 60	Low	33.33%	40%	33.33%
60-75	Moderate	47.62%	50%	50%
> 75	High	19.05%	10%	16.67%

The results of the evaluation tests mentioned that understanding of the science concept on human musculoskeletal system material still needed to be improved. Thus, there should be efforts to improve the achievement and understanding the science concept on human musculoskeletal system. Interview conducted to some classroom teachers of grade 5 at SDN Sukatani 4, SDIT Amal Mulia, and MI Nurul Falah mentioned that the obstacle to the low understanding of the students on human musculoskeletal system is not being optimal in using learning media.

Based on the description, the science lesson on human musculoskeletal system needed the development of a learning media. Media that would be developed was VISUALS card media. VISUALS card media is a two-dimensional form of applied art that combines real and virtual images. According to Nurseto (2011) VISUALS can be described as an acronym of the words: Visible: easy to see, Interesting: attractive, Simple: not complicated, Useful: beneficial/ useful content, Accurate: true (accountable), Legitimate: makes sense, Structure: structured/ well structured. Thus, VISUALS card is a form of card media that is used as materials to understand the human musculoskeletal system. In addition, the use of VISUALS card is simpler and does not require a big cost to make it, (Ito et al., 2009).

VISUALS card media is in the form of a collection of multiple cards which combine the form of augmented reality and flash card. Azuma (1997) explained that augmented reality is combination of cyberspace objects with the real world, which runs interactively within a certain time. In addition, it has an integration of 3 dimensional objects. Meanwhile, according to Doman (1997), flash card is a tool for teaching and learning process. This media is expected to improve students' understanding on human musculoskeletal system material.

METHODS OF RESEARCH

The applied research method was a research model developed by Dick and Carey consisting of the following 10 steps: (1) needs analysis and learning objectives, (2) conducting learning analysis, (3) analyzing learning and environment, (4) formulating performance objectives (6) developing learning strategies, (7) developing and choosing learning materials, (8) conducting formative evaluations, (9) revising lessons, and (10)

designing and executing summative evaluations. In addition to those stages, questionnaire analysis was also conducted to the needs of the students and interviewing the teachers and principals to analyze the initial needs. After conducting the stages, validity and field tests were carried out. The techniques of data collection used in this research were field notes, documentation, interviews, observation, tests, and questionnaires. Field notes consist of what is seen, heard, thought by researchers in collecting the data. The documentation of the research is to collect information about the result of science learning in the form of photographs and videos. The interview of the research was conducted to the principals and teachers at Primary School in Depok City who became subjects of the research. The observation was conducted by an open observation technique toward learning implementation either from the preliminary study or in the stage of feasibility test. In the test method pre-test and post-test were carried out to see the learning result of science on human musculoskeletal system material in all research process. In addition, the questionnaire was used to know the opinions of the students about the developed media as a whole.

The blueprint of the test instrument was developed through theoretical analysis, Core Competence and Basic Competence in accordance with curriculum 2013. The test consisted of 30 questions with the criteria: 1 for true answer and 0 for wrong answer. From the instrument of the science learning outcome, of pre-test and post-test score results were obtained in the learning process. Furthermore, the scores were analyzed to see the improvement that occurred after VISUALS card learning was applied. Data analysis techniques of the research were qualitative and quantitative data analysis. The analysis was conducted with one to one try out, small group, and field trial. The analysis was conducted to determine the feasibility of VISUALS card media on the science lesson of human musculoskeletal system material. Feasibility and validity tests included material experts, linguists, and media experts (Clark and Craig, 1992). In addition, it was conducted by distributing questionnaires to the students.

Feasibility tests by experts were from material experts, linguists, and media experts. Material experts were to validate the developed material; they were the experts of sciences in Elementary School. Then, the linguists were to validate the systematics and language styles of the VISUALS card media; they were the experts of the language. While the media experts were to validate the face of developed media thoroughly; it was conducted by the experts of educational technology. The data of this research were in the form of test results using the feasibility test instrument in the form of a questionnaire. The data were obtained from the expert test data in the form of assessment and input which then used as material for the improvement or revision of the science learning media, especially the material on human musculoskeletal system.

After conducting media feasibility tests which had been developed by experts. VISUALS card media was revised in the part that had been given the criticism and suggestions. Meanwhile, to assess the effectiveness of the media formative tests was conducted in the form of multiple choices. The next step, after the media is appropriate, is implementing it. The way of the implementation is to integrate VISUALS card media with the existing learning system.

The research method had been designed in such a way, in which the implementation of developed VISUALS card media will obtain the same results as before. This research method can also be used by other researchers as a material consideration and can be used as a reference for the development of the media to make it even better.

The evaluation was conducted through the questionnaires which were obtained from the feasibility test of the experts and the feasibility test of the students, analyzed by calculating the value based on the predetermined scale of assessment; it was to modify the Likert scale with the maximum value of five. The success criteria became the interval-scale data to suit the needs of research in the field, as follows:

Table 2 – Success Criteria

SCORE	DESCRIPTION
5	Very good
4	Good
3	Fair
2	Bad
1	Very bad

The average score of the overall value of feasibility test of VISUALS card for science learning media on human musculoskeletal system was categorized into the outcome criteria in accordance with the data obtained in the field. Meanwhile, the comments given about the product were described to know the steps that must be conducted in improving the program or the research flow. Calculation of the data from each aspect was carried out by percentage descriptive method. Form percentage analysis is formulated as follows:

$$\text{Percentage} = \frac{\sum(\text{answer} \times \text{score for each answer}) \times 100\%}{(n \times \text{highest Score})}$$

Where:

Σ = Total;

n = Total of all item scores;

100% = Fixed number.

The references used to interpret quantitative data into qualitative data are as follows:

Table 3 – Value Criteria

SCORE	DESCRIPTION
80 – 100%	Very good
60 – 79%	Good
40 – 59%	Fair
20 – 39%	Bad
0 – 19%	Very bad

The data which had been obtained from the test were then analyzed by comparing the pre-test and post-test values of the students and see if there was a significant value. If the post-test results had an increase compared to the pre-test, so it could be concluded that the VISUALS card media was feasible and effectively used in the science learning process on human musculoskeletal system.

RESULTS AND DISCUSSION

The development stages of VISUALS card for science learning media in primary schools were conducted by developing the product by using computers and manuals. The digital step was creating a display design using Adobe Photoshop CS5 starting from sorting the card number to the printing process. Meanwhile, the manual step was sketching to how the product would be made. And the last one was post production in which making the card in digital printing.

The way to use the developed VISUALS card media was based on the needs. Visuals cards could be used for individuals, in pairs, small groups, and large groups. The ways to use the developed VISUALS card media are as follows:

- Individuals:

The teachers distribute the cards to the students with the same amount. Each student is given question by the teacher based on the card he/she has. Any students who can answer correctly will not be questioned again. Those who cannot answer will be given the cards again until they can answer the questions.

- In pairs:

The students play in pairs. The cards are divided into two equal shares. After the cards are divided, each student of two pairs will put the card they have. The partner will answer that card. If they can answer then the card is closed but if they cannot answer then it continues to the other couple to put the card. The winner of the game is the learner who runs out the card first.

- Small group:

The students are divided into several groups of 3 and 5 members. One student randomly arranges the cards and then distributes 5 cards to each participant and the rest was placed in the middle. The first member starts by taking one card and choosing the card they have to put in front. The card that is placed in front is a card that they expect their friends to not know the name of the image contained on the card. If they can answer, they continue to put the card and if they cannot answer, they take the closed card in front. It goes on until the cards run out.

- Large group:

The students are divided into 2 groups equally. Each group gathers in a circle. It starts with dividing the cards equally to each member of the group. One representative from the group takes the hint card to be prepared. The teacher prepares a paper containing the sequences that the learners must know which then can take the card. For each card mentioned by the teacher, each group must prepare that kind of card.

The next stage was a feasibility test which was conducted by material experts, linguists, and media experts. The feasibility test was performed to develop media that were properly feasible to use. The feasibility test was conducted by material experts, linguists, and media experts. In addition, the feasibility test was also conducted on the students by distributing the questionnaire during the one-to-one try-out, small group and field trial. Meanwhile, the effectiveness test of the use of VISUALS card of science learning media was tested to the students in one-to-one try-out, small group and field trial. From the expert test results, it was obtained that the material experts gave the value of 88.33%, the linguists gave the value of 86.67%, and media experts gave the value of 90% meaning that the VISUALS card media was in very good criteria in terms of feasibility.

The findings showed that the students' understanding had improved in which it was proven by the effectiveness test conducted to the learning outcome on individual scale test or one-to-one try-out, small-scale or small group test and large-scale test or field trial. All effectiveness tests were conducted at SDN Sukatani 4, MI Nurul Falah and SDIT Amal Mulia. One-to-one try-out trial was conducted on 4 students. This test was conducted to determine the effectiveness of the draft 1 model and to revise the need development draft 2. Small group trials were conducted on 12 students. This test was conducted to determine the effectiveness of draft 2 and to revise the development of the final draft. All trials were conducted to ascertain the effectiveness of the developed media at three different schools in Depok City.

The learning outcomes of 4 students using VISUAL card media in SDN Sukatani 4 obtained the feasibility of VISUAL card media as many as 96%, MI Nurul Falah as many as 94%, and SDIT Amal Mulia as many as 96%. The total percentage of feasibility test with a one-to-one try-out trial was 95.33% indicating that the VISUALS card media was worthy of use in individual learning. Meanwhile, the implementation to the learning of 12 students using VISUALS card media in SDN Sukatani 4 obtained the feasibility of VISUALS card media as many as 96.6%, MI Nurul Falah as many as 96.6%, and SDIT Amal Mulia as many as 96.8%. The total percentage of feasibility test with a small group was 96.67% indicating that the VISUALS card media was suitable for use in small-scale learning. Moreover, the implementation to one classroom learning using VISUALS card media in SDN Sukatani 4 obtained the feasibility of VISUALS card media as many as 98%, MI Nurul Falah as many as 98%, and SDIT Amal Mulia as many as 97.6%. The total percentage of feasibility test with a large group was 97.87% indicating that the VISUALS card media was suitable for use in large-scale learning.

Thus, it can be concluded that the VISUALS card media can improve students' understanding on human musculoskeletal system material conducted on several schools in Depok City.

The steps taken were indeed very systematic in which they were associated with the ability of the students in understanding the learning materials. The achieved results were quite satisfactory but there were still many factors inhibiting the process of media development. The factors included the limited time in terms of cost and other factors. In addition, the trial included three processes in which the students were numerous and varied. The result of the final research was a product in the form of VISUALS card learning media consisting of a collection of cards amounting to 57 pieces.

CONCLUSION AND SUGGESTIONS

Based on the findings of the research conducted on the development of VISUALS card media for science learning in elementary school on human musculoskeletal system material, it could be concluded that:

The need analysis carried out in initiating the research obtained information about the learning process of science in elementary school in Depok City. The teachers mentioned that there was no special media in overcoming the problem of science lesson on human musculoskeletal system material. Some of the existing media had not been fully used because of the obstacle of it. Science lesson is considered to be difficult by some students. The results of the tests showed that the understanding on human musculoskeletal system material was still relatively low. The teachers needed special instructional media in overcoming the low level of students' understanding of science lesson on human musculoskeletal system material while the students needed a fun learning that relates between learning and playing in the same time.

Developing the learning media is the right solution to overcome the problems of teachers and learners with reference to the research and development. Research and development of Dick and Carey model consists of 10 steps whose intent and purpose are very clear. Therefore, for the researcher who is carrying out the research and development, the model is suitable as a basis for conducting research of other models/ designs. The stages of the Dick and Carey model showed a very clear and uninterrupted link between one step and the others. In other words the system of the Dick and Carey model is very compact but the content is solid and clear from one component to the others.

The media development was in the form of a collection of cards arranged in sequence. The development of VISUALS card media, in the form of a collection of cards, was the result of a combination between augmented reality and flash card. VISUALS card is a learning media that was designed and developed through the process of deep theoretical studies with the attention to the characteristics of primary school students.

The steps of implementing VISUALS card were for the individual, in pairs, in small groups, and in large groups by distributing the cards to all students. The trial implementation of VISUALS card for science learning media in elementary schools was considered as valid by material experts, linguists, and media experts. Therefore, the developed media could be used in science learning on human musculoskeletal system material. The same result occurred after the media being tested to the students in individuals, small groups, or large groups by distributing the questionnaires.

The feasibility test was performed to produce a medium that was properly feasible to use. The feasibility test was conducted by material experts, linguists, and media experts. In addition, the feasibility test was also conducted on the students by distributing the questionnaire during the trial of one-to-one try-out, small group and field trial. Based on the results of feasibility test, it could be concluded that the VISUALS card media is feasible to be used on science lesson on human musculoskeletal system material in 5th grade of elementary school.

The effectiveness of using VISUALS card of science learning media was tested to the students. Based on the results of the pre-test and post-test, it was obtained that the

effectiveness test conducted in one-to-one try-out, small group and field trial had improved. Therefore, it could be concluded that the VISUALS card media was effectively used in the science lesson on human musculoskeletal system material.

The advantages of VISUALS card media included the availability of instructions sheet in using the media that allows teachers to understand and know how to use VISUALS card media. An interesting design can help learners to understand the material. This media is interactive in which it motivates learners to study independently. The right size and shape of the card make it easier for the students to play games and learn the material. VISUALS card media can be used individually or in groups. Meanwhile, the weakness is that it is more appropriate to be used for the students with visual learning style.

As a follow-up, the development of this VISUALS card media had some weaknesses or disadvantages. Therefore, the revision must continue to be carried out in order to develop the optimum product.

Regarding to the findings of the research, the teachers should use learning media that can improve the achievement and understanding of the students understanding during the learning process. For the students, it is expected that the media can be used as learning material to optimize the learning outcomes of science lesson. For the school, it is expected that the media can contribute scientifically in implementing the effectiveness of the learning process. Finally, the researchers are expected to conduct other research to find new innovations that can be used in improving the understanding of the students in mastering the material of the lesson.

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