Developing Adobe Flash-based mathematics learning media for 7th-grade students of junior high school

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Abstract. The purpose of this study was to develop Adobe Flash-based mathematics learning media for 7th-grade students of junior high school. This research was conducted at SMP N 191 Jakarta. It is a public junior high school in the capital city of Indonesia. We used the ADDIE model to develop the media, which stands for analysis, design, development, implementation, and evaluation. In this study, the media was verified by two material experts, two media experts, one expert on development studies. The product testing conducted towards 20 students of SMP N 191 Jakarta. The results of the trial through formative evaluation of media experts suggested improving economic aspects. The development expert suggested to give a short button and to add animation. Therefore, they have been improved so that Adobe Flash learning media is “decent and good” to be used and able to motivate students. Adobe Flash learning media is also an effective learning media that can be used by teachers as a tool in the process of teaching and learning activities in the classroom. The material published by the researcher is a one-year teaching media containing material, simulation, and evaluation so that it is very helpful for the teacher.

1. Introduction
Indonesia hopes the presence of the figure of the teacher who is capable of being an example model for learners. Teachers are educators who teach students. In the business of student learning, then the teacher should do the study, organizing the presentation of learning materials with specific learning approaches, and evaluate the results of the study [1]. The teacher is a prestige class. The teacher's roles in education. The quality of education and advanced education depends on the teacher. Therefore, teachers must meet the competency of teachers based on the competence of teachers referred to article 8 covers the pedagogy competence, social competence, personality, competencies, professional competence acquired through education profession [2]. The national education goals will be achieved if the teachers meet the competencies.

Within the framework of the competence of the 21st-century learner expected information literacy, media literacy, Technology Literacy, and Information communication (ICT). A curriculum 2013 based on the paradigm of instructional design in the 21st century, mentions that in a Junior High School computer curriculum structure will become a means in all subjects. Nowadays, there are many teachers who have not mastered the media and ICT for effective learning [3, 4]. Education has been offered in classes where students can interact directly with their teachers, making students’ physical presence very important. However, the wide distribution of computers and communication technologies has made the learning process easier [5].
The results of the interviews in junior high schools mathematics teacher at 197 Jakarta and 191 Jakarta showed that many teachers who have not yet ability operating ICT in learning and haven't been able to make interactive learning media. So in the teaching and learning activities are still learning to use out of date media in mathematics.

Many are found in schools teachers are not interested in creating and developing the learning media. Teachers lazy to make the learning media. Teachers only use conventional learning methods alone in delivering material without using media learning. Whereas media learning can enhance the learning interest of students. The lazy attitude and lack of a sense of responsibility in carrying out the duties charged to him also became the principal constraints in undertaking efforts to improve the quality of the learning process [6].

Mathematics is the science that is universal, underlying the development of modern technology, as well as having an important role in various disciplines and develop the human intellect. The rapid development in the field of information and communication technology is currently enshrined in the development of mathematics number theory, algebra, analysis, the theory of opportunities, and discrete mathematics. To master the technology and to create in the future required a mastery of math at early stages. Therefore in Indonesia education curriculum mathematics education is taught from primary school to high school.

Currently, there are still many learners who experience difficulties in solving math problems. The difficulties that almost happened on every level. Many students were reported facing difficulties in acquiring the knowledge and skills needed in mathematics [7]. One cause is the delivery of material that is monotone and the language used is less understandable. Can cause difficult learners to receive lessons given. Children might experience difficulties in thinking and learning when they demonstrated difficulty in giving attention, describing the orientation of shape and space, making perception by visual and auditory, memorizing simple things and understanding language [8].

Not a few students who have difficulty learning mathematics is experiencing anxiety while studying and working on problems of mathematics. This, can learners easily bored when learning math. Math anxiety could be caused by a number of things: unpleasant past experiences with math in the classroom, a parent conveying the message to their children that math is boring and useless, or from the attitudes of the teachers themselves. Boredom toward learning math also causes learners to experience the fear and resentment when confronted with math lessons. Many people have given up on math because they learned to fear it when they were young. This fear or loathing of math seems to make people unempowered to make decisions themselves.

The use of computers as one form of multimedia learning can be used to improve the understanding of students because through a multimedia computer can be shown the real picture of things that support and clarify mathematical material delivery in the form of graphic slides [9, 10]. So it is possible to quickly get bored and not students will be more interested in learning mathematics. Multimedia computers that are not easy to quickly get bored and interesting in learning mathematics are interactive learning media-based animation. Based on the analysis results, indicate that the animation-based instructional media is fit for use as a medium of learning in Engineering Mathematics courses. One example of multimedia learning media i.e. Adobe Flash CS6 application which is one of the makers of the animated fairly well known at this time.

Math flash-based learning media is very practical and effective in the manufacturing process or deployment. Used simulation in computers gives chances to learn interactively and personally [11]. The practicality of using test question form, observation learning implementation, then the media learning mathematics-based Macromedia flash on wake up space is expressed practically used in learning mathematics class. Math-based learning media development flash professional adobe cs6 eligibility test based on the results in testing on the material to paint a triangle is valid, practical and effective. Flash-based learning media can also raise the interest of students in learning and comprehension. The medium of an animated Macromedia flash against the interest and understanding of physics. Based on the above description, then the researchers study to development of Adobe flash-based mathematical learning
media for 7th-grade students. Learning media is expected to be used as a medium of learning for students and facilitate teachers in delivering the material.

2. Method
The stages of this research activity are based on the Model of development of ADDIE consisting of 5 stages that must be done. The first stage, i.e. the stage of analyzing is analyzed students, models, methods, and materials that will be developed. At this stage, the first activity to do is analyze the way students collect data through interviews and observations. Interviews and observations were carried out to experts in the field of education, especially teachers who teach mathematics grade VII and VIII, especially grade VII. The main objective of this needs analysis process is getting the full information about the learning media being used and the subchapter mathematical material anything which is considered difficult to be taught and understood by students of grade VIII, as well as things that need to be made or prepared to produce quality learning design. The results of the analysis of those needs are to formulate the general instructional objectives (TIU) which is the ultimate goal of the development process of instructional design. Instructional purposes were developed with ABCD principles, namely the Audience (who studied), Behavior (target competencies expected), Condition (terms that need to be filled), and Degree (the expected objectives). The second activity, conduct an analysis of instructional, that lays out the existing competence in general instructional objectives (TIU) renders sub-competence, competence base, smaller special competence, and identify the relationship between the sub competencies each other.

The second phase of design, i.e. the stage of designing the learning media begins with a gather reference material of mathematics grade VII from either the book, e-book, or internet on the end with the creation of storyboards for the media learning developed. The third stage of development, i.e. the stage of product development. At this stage, this is the learning media products began. The fourth stage of implementation, at this stage the created media tested to students who have previously been through the stages of validation experts. As for the experts, namely, media expert, expert content, development experts, and students. The fifth stage of the evaluation, the media has been tested later in the evaluation based on the advice of experts. Then if it is suitable then the media is worth to be used.

Then the media has been made to try to the students to be tested in the third Activity, identify the behaviors and characteristics of the students. In this step does is identify the behaviors and characteristics of the students by using the approach of accepting students for what they are and devise instructional systems on the basis of the circumstances of the student. Then the fourth activity, determining the specific Instructional Purposes (ICT). ICT must contain elements that can provide guidance to compilers in order to test elements that can measure the behavior contained in it.

3. Results and Discussion

3.1. Results
In this subchapter, we present the results of each step of this research.

3.1.1. Analyze stage. Needs analysis conducted by interview a teacher of mathematics at three schools. As well as 21 students for third grade VII in the schools. This interview aimed to find out how the learning of mathematics at the school, and the third subchapter mathematics material grade VII anything that is hard to be taught and understood by students. Below is the interview researcher between the teacher and students to analyze the need of media.

Researcher and Teacher 1
Researcher : What kinds of goals do you expect for mathematics in grade 7?
Teacher 1: Implementation of mathematics according to K13, giving IT system lesson, in order to enhance the student’s skill to be more complex. By it skill, it’s easier to implement the material given.

Researcher: What kinds of materials should be given and comprehended in learning mathematics for grade 7?

Teacher 1: Integers, algebra operation, linear equality, and inequality by one variable, comparison, social arithmetic, association, line and angle, triangle, square, data presentation.

Researcher: According to you, what materials are considered as difficult to be given?

Teacher 1: Linear equality and inequality by one variable. It’s hard to understand many signs, social arithmetic about interest calculation.

Researcher: What learning method used for math?

Teacher 1: Discovery learning and the same age tutor.

Researcher: Do you use learning media in the learning process?

Teacher 1: Yes

Researcher: Based on the answer of number 5, If yes, what challenges do you face?

Teacher 1: Nothing a big deal.

Researcher: What kind of source do you use in the learning process?

Teacher 1: Textbook from school and from the internet.

Researcher: Based on number 10. what is the weakness of the source you use in the learning process?

Teacher 1: Too much explanation and too detail.

Researcher: Do you know interactive learning media based on adobe flash?

Teacher 1: Yes.

Researcher: What do you know about interactive learning media based on adobe flash?

Teacher 1: Learning method in powerpoint and video forms.

Researcher: Do you use interactive learning media based on adobe flash?

Teacher 1: Yes

Researcher: Based on the answer of number 14, If Yes. What are the weakness and the benefit of using interactive learning media based on adobe flash?

Teacher 1: Weakness is too fast. The benefit is interesting.

Researcher: From the benefit above, what kinds of infrastructures needed to support this interactive learning media?

Teacher 1: We must prepare the powerpoint material forms matched with the curriculum, and the points are given must be synchronized, accomplished by exercises.

Interview researcher and teacher 2

Researcher: What kinds of goals do you expect for mathematics in grade 7?

Teacher 2: To make students understand mathematics

Researcher: What kinds of materials should be given and comprehended in learning mathematics for grade 7?

Teacher 2: Algebra operation, linear equality, and inequality by one variable, comparison, association.

Researcher: According to you, what materials are considered as difficult to be given?

Teacher 2: Linear equality and inequality by one variable. It’s hard to understand many signs, social arithmetic about interest calculation.

Researcher: What learning method used for math?

Teacher 2: Speech, discussion, and task.

Researcher: Do you use learning media in the learning process?

Teacher 2: Yes.

Researcher: Based on the answer of number 5
Teacher 2: Transfer the material.

Researcher: Based on the answer of number 5, if yes, what learning media is it?
Teacher 2: Powerpoint, learning tools, real example.

Researcher: Based on the answer of number 5. If yes, how often do you use the learning media in the learning process?
Teacher 2: Every time I teach.

Researcher: Based on the answer of number 10. What is the weakness of the source you use in learning process?
Teacher 2: From the textbook, it’s difficult to be understood by the students. The example in the book has huge numbers, so it’s difficult for the students.

Researcher: Do you know interactive learning media based on adobe flash?
Teacher 2: Yes.

Researcher: What do you know about interactive learning media based on adobe flash?
Teacher 2: Learning method in animation, powerpoint and video forms.

Researcher: Do you use interactive learning media based on adobe flash?
Teacher 2: Yes.

Researcher: Based on the answer of number 14, If Yes. What are the weakness and the benefit of using use interactive learning media based on adobe flash?
Teacher 2: Weakness is can’t be accepted by students yet, sometimes I have to explain more. Benefits interesting it is not easy to get tedious.

Researcher: From the benefit above, what kinds of infrastructures needed to support this interactive learning media?
Teacher 2: In the material, the steps are clearer and also attach the exercises.

Interview the researcher and students:
Researcher: What learning method does your teacher use in the mathematics learning process for grade 7?
Students: Speech, discussion, and task.
Researcher: Is the learning method used by your teacher already effective?
Students: Effective.
Researcher: What method do you think is more interesting for studying mathematics?
Students: Discussion and task.
Researcher: Does your teacher use learning media in the learning process?
Students: Yes.
Researcher: Based on the answer of number 4. If yes, What forms of learning media?
Students: Tools and power point.
Researcher: Based on the answer of number 4. If yes, How often does your teacher use the learning media in a month?
Students: Every day.
Researcher: Based on the answer of number 4. If yes, according to you, is the learning media effective?
Students: Not yet.
Researcher: Does your teacher use interactive learning media in teaching?
Students: Yes.
Researcher: Has your teacher ever used interactive learning media based on adobe flash?
Students: Yes.
Researcher : Based on the answer of number 9. If Yes, what kind of interactive learning media based on adobe flash does your teacher use?

Students : Power point.

Researcher : Based on the answer of number 10. if yes, What are the weakness and the benefit of using interactive learning media based on adobe flash used by your teacher?

Students : Weakness is uninteresting appearance, the benefit is incomplete material.

Furthermore, the activity of the now relied upon the formulation of the general instructional objectives (TIU). TIU who successfully formulated the author after doing a revision, namely: if given the problems of mathematics, the set number of shape, algebra, arithmetic, social comparison, lines and angles, rectangles and triangle, presentation of data grade VII students can complete at least 80% correct. The elaboration of basic competencies that are in General Instructional Objectives can be organized into the competency map, description and explanation of each of the following competencies.

After a stage of need analysis, researchers figure out what things are needed especially in whatever mathematical material that exists in grade VII, any material that is considered difficult, and what response given the students nor the teacher against the media learning to be made. Of that, we can then make the runway in entering the next stage namely design.

3.1.2. Design stage. Design learning is done with collecting references material math grade VII from either the book, e-book, or the internet. The collection is aimed at as a reference in creating material, simulation, and evaluation on media of instruction. After that, the next step is the creation of storyboards, which aims to display as a reference in the creation of learning media. Name The adobe flash based media named is Interactive Learning Media Math with Adobe Flash for 7th Junior High School.

In making these learning media, requires some equipment. The equipment used in the manufacture of media-based learning adobe flash, is the computer with adobe flash CS6 application, adobe illustrator, and Microsoft word. Microsoft Word is used to create the material and problem exercise. Adobe Flash CS6 application used to create the animation and Adobe illustrator application used to create the visual.

3.1.3. Development Stage. After going through the stage of designing the production process then conducted. In this case, the product is produced in the form of an application-based interactive learning media adobe flash. Before implementation of this application, the application of interactive learning media with adobe flash must be in check and validation by an expert. Following is the display of the interactive learning media with Adobe flash-based has been made, it has a 4 button i.e., biographies, material, simulation, and evaluation. The button on the menu content, simulation and evaluation consist of nine buttons because there is nine subchapter discussion.

![Image](media.png)

**Figure 1.** Overview of material, simulation, evaluation, and biography
In Figure 1, the display of media interactive math study for junior high school grade 7 which consists button menu simulation, button menu evaluation, button menu indicator, basic competence, and audio.

![Figure 1](image1.png)

**Figure 2. Overview of Content**

In Figure 2, the button on the menu material integers and fraction, sets, algebraic, linear equations and linear inequalities, proportion, social arithmetic, lines and angles, triangle plane and quadrilateral,
and presentation of data. The works are click menu algebraic it will show the material. And if you want to look for another material you can click the button on right side.

**Figure 3.** Overview of Simulation

In Figure 3, the button on the menu simulation integers and fraction, sets, algebraic, linear equations and linear inequalities, proportion, social arithmetic, lines and angles, triangle plane and quadrilateral, and presentation of data. The works are click menu linear equations and linear inequalities it will show the equation. In simulation part, you will find some questions, for example, Known equation $9x + 5 = 2x - 9$, value $x + 11$ is and then you must answer it, if your answer is correct it will show word “Correct” and its discussion.
Figure 4. Overview of Evaluation

In evaluating part Figure 5, it will have some questions and you must answer by clicking the answer option and the end of evaluation you will see your score. Display the adobe flash-based learning media has passed through several stages of testing content expert, media expert, development expert, and students. The results of the validation and revision of experts are shown in Table 1.

| Table 1. The result of content validity expert |
|-----------------------------------------------|
| Recommendation/comments                      |
| Interactive multimedia, in                  |
| General, has been very good and              |
| can already be used in learning              |
| Multimedia content created                  |
| already good advice in any                  |
| publishers so that in accordance            |
| with basic competencies                      |
| The result of the revision                  |
| Has been revision accordance                 |
| with basic competencies                      |
The results of validation and revision of testing content expert of experts are shown in table 1. Content expert gives two comments for media and has been revision accordance recommendation or comments.

| Recommendation/comments | The result of the revision |
|-------------------------|---------------------------|
| Its economic aspects to be | has been improved its |
| developed                | economic aspect           |

The results of validation and revision of testing media expert of experts are shown in table 2. Content expert comments for media and has been revision accordance recommendation or comments.

| Recommendation/comments | The result of the revision |
|-------------------------|---------------------------|
| Shorten your button, add | Fixed button shortened and the |
| material pictures       | material are given pictures |

The results of validation and revision of testing development expert, of experts are shown in table 3. Content expert comments for media and has been revision accordance recommendation or comments.

| Recommendation/comments | The result of the revision |
|-------------------------|---------------------------|
| Shorten your button, add | Fixed button shortened and the |
| material pictures       | material are given pictures |

3.1.4. Implementation Stage. After the media declared worthy of learning produced by media experts, content expert, and development experts, and media to be tested in field trials in small groups. At this stage of implementation is conducted trials of the product. Learning media trials conducted with the purpose of knowing every detail of the deficiencies and weaknesses of the media that have been so, to look at the effectiveness of the media when used by the intended student target.

Test of interactive learning media with adobe flash is done in the 7th grade at 191 Jakarta Junior High School to 20 students. At the time of trial products, researchers describe mathematical learning, media-based adobe flash to 20 students. After completion of this medium are described and given instructions on how to use them, researchers asked 20 people the students learning to perform by using media interactive learning math-based adobe flash.

3.1.5. Evaluation stage. The last stage of evaluation is to evaluate the interactive learning media with adobe flash that have been developed. This stage is the phase to find out the feasibility of the resulting product, in this case, is interactive learning media with adobe flash on mathematical subjects in 7th-grade junior high school. After going through the stages of implementation, then the students were given a sheet to assess the feasibility of the question form of media users. In addition to testing and assessment question form, students are asked to provide feedback regarding the use of the interactive learning media with adobe flash. Based on field trials of small groups which involve 20 students 7th grade 191 Jakarta Junior High School randomly selected obtained the results of the assessment that the media is very helpful, interesting and not boring the students in the learning process with the hope that in future there will be a version for the grade VIII and there is a summary at the end of each material.

3.2. Discussion

Development of mathematics learning media using adobe flash for the students 7th Junior High School aims to provide a comprehensive picture of how the process of developing media in learning mathematics, which in the end produce a product in the form of mathematical learning media for 7th Junior High School for one school year.

The program was created as a medium of instruction, to help teachers solve the problems of everyday life. By having this media, learners can understand the material presented and can motivate and foster interest learners in learning mathematics, as well as more effective in finding the science results of the multiplication. According to Holzinger multimedia is a new technology that can provide many of the benefits of developing world education namely providing learning more meaningful [12].
Flash learning media development is based on the limitations of flash-based media learning mathematics in junior high N 191 Jakarta, especially in mathematical material in grade VII. So researchers are interested in doing a flash-based learning media development in the schools. On the other hand, the existence of media of instruction is very important because the media learning has many benefits for students or for teachers themselves, namely: (1) as a tool in explaining the lessons teacher with interactive, (2) increase the motivation student learning, (3) improve the understanding of students against the material taught.

Suggested benefit learning media in the learning process of students which are: 1) the learning will further attract the attention of students so as to cultivate motivation of study, 2) learning materials It would be more instructive so that it can be better understood by the students and lets them overwhelm and achieve learning objectives, 3) would be more varied teaching methods, not merely verbal communication through the utterance of words, so that by the teacher students do not get bored and not run out of energy especially if teachers taught at any hour lesson.

The results of this research have generated media math learning flash based on the material of the odd semester and even semester for grade VII junior high school which consists of material, simulation, and evaluation on every subsection. From the results of the tests concluded that the media of multimedia-based learning is very effective if applied in daily life and can make it easy for learners in understanding the material presented.

Interesting menu, display colors colorful images make the learners are not easily bored and motivated learning math. Moving animation can also enhance the learning motivation of students. It is similar to the experts that an attractive appearance can enhance the interest and motivation of students. According to Garcia, Macromedia flash a tool that allows very small vectorial graphics files to be created, thus facilitating their electronic transmission to any user connected to the network. This media can interest the students in mathematics learning [13]. The students enjoy and easily understand easy to difficult material.

Simulations in learning media have potential to address critical weaknesses in current science education by meeting the individual learning needs of both low achieving and advanced science students, embedding science learning in the context of engaging real-world problems, and improving access to high-quality science learning experiences in formal and informal settings [14]. Simulations and animations can help clarify abstract relationships in mathematics and science, that might otherwise be difficult to understand and learn [15]. Often it isn't possible to explain complex connections in just a few words or with one drawing, but a dynamic simulation can easily display such models.

According to Sun, the rapid development of computer and internet technologies has made e-Learning become an important learning method. There has been a considerable increase in the needs for multimedia instructional material in e-Learning recently as such content has been shown to attract a learner’s attention and interests [16]. Multimedia-oriented learning, such as Macromedia flash, like many other problem-based learning solutions, can be used alternatively as an innovative and effective tool in a problem-based learning environment for the acquisition of problem-solving skills [17].

This research is significant with Buckley and Smith about multimedia can enhance the educational experience for online students by offering a variety of ways in which to learn and interact with content [18]. Adobe Flash can bridge the use of learning media in the classroom. The use of learning media can increase student motivation and learning outcomes. The students are more interested in learning with learning media because of their attractive appearance and interactive [13, 19].

4. Conclusion
From the results of research and discussion can be concluded that the use of media technologies through mathematics learning media with adobe flash can increase the motivation student learning and improve the understanding of students against the material taught. Student response to media flash as a learning tool that is included into the stable category. It shows that almost all the students loved the mathematics learning media with adobe flash. This media can affect student learning motivation while working on
evaluation questions. In further research needs to be further examined how the impact of using a media utilization to the performance of other learning.

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References

[1] Leonard L, 2018 Task and Forced Instructional Strategy : Instructional Strategy Based on Character and Culture of Indonesia Nation Form. J. Ilm. Pendidik. MIPA 8 51
[2] Bhakti Y B and Astuti I A D, 2018 The Influence Process of Science Skill and Motivation Learning with Creativity Learn J. Educ. Learn. 12 30
[3] Sulisworo D and Toifur M, 2016 The role of mobile learning on the learning environment shifting at high school in Indonesia Int. J. Mob. Learn. Organ. 10 159
[4] Dwianto A Wilujeng I Prasetyo Z K and Suryadarma I G P, 2017 The development of Science Domain Based Learning Tool Which is Integrated with Local Wisdom to Improve Science Process Skill and Scientific Attitude J. Pendidik. IPA Indones. 6 23
[5] Alqahtani M and Mohammad H, 2015 Mobile Applications ’ Impact on Student Performance and Satisfaction Turkish Online J. Educ. Technol. 14 102
[6] Astuti I A D and Bhakti Y B, 2018 Interactive Learning Multimedia Based Microsoft Excel on The Temperature and Heat Unnes Sci. Educ. J. 7 1
[7] Tambychik T Meerah T S M and Aziz Z, 2010 Mathematics Skills Difficulties : A Mixture of Intricacies Procedia - Soc. Behav. Sci. 7 171
[8] Vosniadou S and Verschaffel L, 2004 Extending the conceptual change approach to mathematics learning and teaching Learn. Instr. 14 445
[9] Taylor M J Pountney D C and Baskett M, 2008 Using animation to support the teaching of computer game development techniques Author links open overlay panel Comput. Educ. 50 1258
[10] Kashada A and Li H, 2018 Analysis Approach to Identify Factors Influence Digital Learning Technology Adoption and Utilization in Developing Countries Int. J. Emeeging Technol. Learn. 13 48
[11] Astra I M Nasbey H and Nugraha A, 2015 Development of and android application in the form of a simulation lab as learning media for senior high school students Eurasia J. Math. Sci. Technol. Educ. 11 1081
[12] Holzinger A Kickmeier-rust M and Albert D, 2008 Dynamic Media in Computer Science Education ; Content Complexity and Learning Performance : Is Less More ? J. Educ. Technol. Soc. 11 279
[13] Garcia R R Quiros J S Santiago R G S Samuel M G and Fernanz M, 2007 Interactive multimedia animation with Macromedia Flash in Descriptive Geometry teaching Com 49 615
[14] Wiana W Barliana M S and Riyanto A A, 2018 The Effectiveness of Using Interactive Multimedia Based on Motion Graphic in Concept Mastering Enhancement and Fashion Designing Skill in Digital Format Int. J. Emeeging Technol. Learn. 13 4
[15] Holzinger A and Ebner M, 2003 Interaction and Usability of Simulations & Animations : A case study of the Flash Technology Human-Computer Interact. INTERACT 1 777
[16] Sun P-C and Cheng H K, 2007 The design of instructional multimedia in e- Learning : A Media Richness Theory-based approach Comput. Educ. 49 662
[17] Neo M and Neo K T K, 2001 Innovative teaching : Using multimedia in a problem-based learning environment Jurnal Educ. Technol. Soc. 4 19
[18] Buckley W and Smith A, 2007 Application of Multimedia Technologies to Enhance Distance Learning RE-view 39 57
[19] Newby, T., Stepich, D., Lehman, J. & Russell J, 2000 Instructional Technology for Teaching and Learning: Designing Instruction, Integrating Computers, and Using Media *Educ. Technol. Soc.* **3** 106