



**EFFECTIVENESS OF ELEMENTS PERIODIC TABLE
INTERACTIVE MULTIMEDIA IN NGUYEN TAT
THANH HIGH SCHOOL**

a bachelor thesis

**submitted in a partial fulfilment of requirements
for *Sarjana Pendidikan* degree in Chemistry Education
Department of Chemistry**

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2017

DECLARATION OF ORIGINALITY

I, Fiki Kusuma Astuti hereby declare that this bachelor thesis entitled The Effectiveness of Utilizing Elements Periodic Table Interactive Multimedia in Nguyen Tat Thanh High School is my own work and has not been submitted in any form for another degree or diploma at any university or other institute of tertiary education. Information derived from the published and unpublished work of others has been acknowledged in the text and list of references is given in the bibliography.

Semarang, 2nd of August 2017



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in Nguyen Tat Thanh High School

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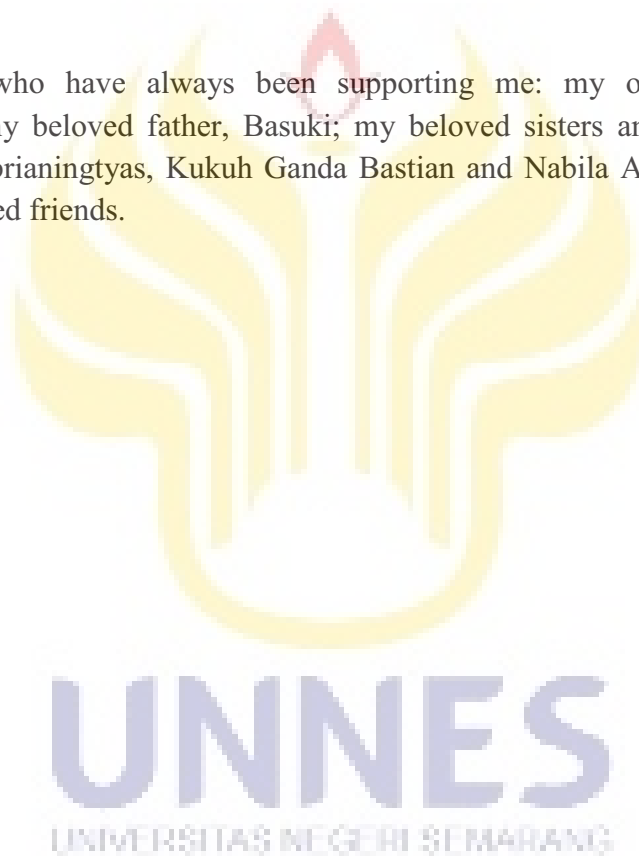
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MOTTO

Life is the most beautiful gift from God so that we have to be grateful and live with the best of life we can.

DEDICATION

For those who have always been supporting me: my outstanding mother, Kusriyati; my beloved father, Basuki; my beloved sisters and brother, Nungky Akusdya Fibrianingtyas, Kukuh Ganda Bastian and Nabila Ayuningtyas; and all of my beloved friends.



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Suggestions and criticisms are always needed for the betterment of this final project. Hope this final project will be useful for all readers.

Semarang, 2nd of August 2017



Fiki Kusuma Astuti

ABSTRAK

Astuti, Fiki Kusuma. 2017. Efektivitas Penggunaan Multimedia Interaktif Sistem Periodik Unsur di Nguyen Tat Thanh High School. Skripsi. Jurusan Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Semarang. Pembimbing Utama Prof. Dr. Edy Cahyono, M.Si. dan Pembimbing Pendamping Prof. Dr. Supartono, M.S.

Hasil observasi dan wawancara menunjukkan bahwa pembelajaran di Nguyen Tat Thanh High School sangat menyenangkan dengan setiap hari guru menggunakan metode yang berbeda, akan tetapi media yang digunakan tidak menunjukkan hubungan antara siswa, guru dan media. Ditemukan pula adanya gambar yang tidak diperlukan untuk proses pembelajaran dan kombinasi warna yang tidak sesuai antara teks dan latar. Tujuan dari penelitian ini adalah untuk mengembangkan media pembelajaran kimia dengan format multimedia interaktif, mengukur kelayakan dan keefektifannya serta mengetahui tanggapan siswa terhadap penggunaan multimedia interaktif pada proses pembelajaran. Manfaat penelitian ini adalah untuk memberikan alternatif media pembelajaran berbentuk permainan edukasi yang dapat meningkatkan motivasi siswa terhadap pembelajaran kimia sehingga mampu meningkatkan hasil belajar siswa. Penelitian ini menggunakan desain Research and Development (R & D) model ADDIE. Data yang diperoleh pada penelitian ini adalah hasil validasi ahli media dan ahli materi, tanggapan siswa pada uji coba skala kecil, hasil post test siswa dan tanggapan siswa pada uji coba skala besar.

Hasil validasi oleh ahli menunjukkan bahwa skor validasi ahli media mencapai skor 96 dengan kategori sangat layak dan skor 62 oleh ahli materi dengan kategori layak. Hasil uji coba skala kecil menunjukkan bahwa siswa memberi tanggapan sangat baik terhadap media pembelajaran yang dikembangkan dengan rerata tanggapan 69,97. Hasil post test siswa menunjukkan bahwa media pembelajaran yang dikembangkan efektif terhadap hasil belajar siswa dengan ketuntasan klasikal yang diperoleh adalah 61,76% dengan rerata tanggapan siswa 68,5 kategori respon sangat baik. Berdasarkan hasil analisis data dapat disimpulkan bahwa media pembelajaran yang dikembangkan layak dan efektif digunakan dalam proses pembelajaran dan mendapat tanggapan sangat baik dari siswa sebagai pengguna. Dalam penelitian ini ditemui kendala bahasa dikarenakan banyak siswa yang kurang mengetahui bahasa inggris dalam kimia sehingga saran untuk penelitian ini, dalam media pembelajaran yang dikembangkan dan soal post test berbentuk dua bahasa. Dikarenakan waktu penelitian yang sangat terbatas, terdapat beberapa bagian media yang kurang interaktif sehingga multimedia interaktif ini masih dapat lebih dikembangkan lagi untuk memperoleh proses pembelajaran yang lebih menyenangkan.

Kata Kunci: Pengembangan, Efektivitas, Media Pembelajaran, Multimedia Interaktif

ABSTRACT

Astuti, Fiki Kusuma. 2017. Effectiveness of Elements Periodic Table Interactive Multimedia in Nguyen Tat Thanh High School. Bachelor Thesis. Chemistry Department, Faculty of Mathematics and Natural Science, Universitas Negeri Semarang. Supervisor Prof. Dr. Edy Cahyono, M.Si. and Co-supervisor Prof. Dr. Supartono, M.S.

The result of observation and interview shows that the learning process in Nguyen Tat Thanh High School was going fun and everyday teacher used different method of learning, sometimes teacher also made a worksheet for students, but the power point presentation media that teacher used did not show the interaction between media, teacher and students. Also there were unnecessary picture in the power point presentation that could distract students focus and the colour combination was not suitable. This research aimed to develop an interactive multimedia and know its feasibility and effectiveness. This study has significance to develop an alternative instructional multimedia in an education game way so could increase students' motivation and learning outcome. This research used Research and Development design with ADDIE model. Obtained data in this research was validation result from media expert and instructional expert, students' response at small scale test, post test result and students' response at large scale test.

Validation result from the expert showed score from media expert was 96 with very feasible category and from instructional expert was 62 with feasible category. Small scale test result showed that students gave a very good response to the multimedia with 69.97 average score of students' response. Students' post test gave effective result with classical completeness 61.76%. Besides that, students also gave very good response to the multimedia that used at learning process with 68.5 average score. From the data analysis, it can be concluded that the elements periodic table interactive multimedia is feasible and effective to be used in learning process, and had very good response from the students as users. This study met language barrier because almost all students did not understand about English in chemistry. The suggestion to this study is giving bilingual language in multimedia so would be more effective for students. Because limited time of development, there were some part of media that did not interactive so this media can be more developed so the learning process will be more interesting.

Keywords: Interactive Multimedia, Elements Periodic Table, Effectiveness

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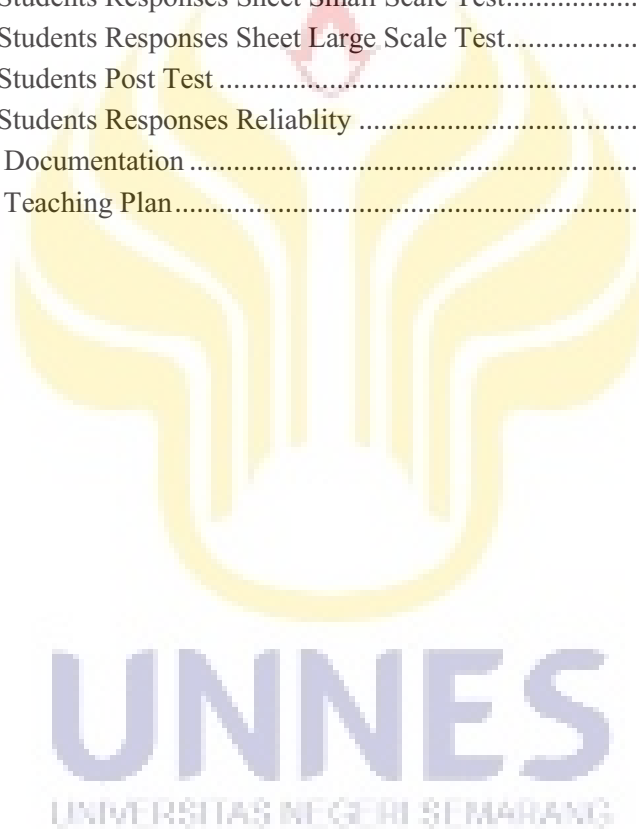
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CHAPTER I

INTRODUCTION

1.1 Background of the Study

Nguyen Tat Thanh High School is a Lower and Upper Secondary Education located in Ciau Giay, Hanoi, Viet Nam. It was established on 4th of July, 1998. Nguyen Tat Thanh High School has 158 teachers and staffs who 70% teachers are Masters and Doctors. This school is under Hanoi National University of Education and some teachers also become lecturers in there. Nguyen Tat Thanh High School has 51 classrooms with 2.132 students. It has a proper condition to study. Each class has LCD, projector, lockers, AC, fan, and seats for students; has two computer laboratories; a language laboratory; canteen; counselling office; teacher room in each floor; a meeting room; principal room; vice principal room; and also library. Nguyen Tat Thanh High School implements one day school. The lesson starts from 8 am until 5 pm, and then students join extra class. They have many extra classes to join based on their interest, some of them are (1) English Club, (2) Science Club, (3) Music Club, (4) Takwondo Club, (5) Basketball Club, (6) Flute Club, (7) Football Club, and etc. Besides club, students also join outdoor activities such as (1) Morning Assembly, (2) Science Research, (3) Overseas Immersion Programme, and (4) Charity Events.

According to the observation and interviews with students, the learning process in Nguyen Tat Thanh High School is going fun. In the learning process teacher not only teach the material, but also life skills both in extra classes or outdoor activities provided by school. It is in line with their missions to educate and train students to be future citizens with strength, understanding, rich spirit, life skills, self-study, sense of responsibility, and endless efforts for creativity. The innovative teachers make the students interest in chemistry, they always have something new to be given to the students for the learning process. Sometimes teachers use discussion, presentation, debate, question-answer, or experiment to learn Chemistry. Elements Periodic Table is one of Chemistry materials that students learn. It was learnt on October and in explaining the material, the teacher used power point as the media and discussion and question-answer as the method. However, the media that teacher used in elements periodic table chapter was still one way learning, had too much texts and the colour combination between texts and background was not suitable. The power point presentation only helped teacher to explain the material and the interaction between teacher, media and students was not visible. Nguyen Tat Thanh High School was the school where the writer had International Teaching Internship Program. Vietnamese language and culture are very different from the Indonesian have. Although students in Nguyen Tat Thanh High School are able to speak English, the language and culture problem encountered by the researcher when having International Teaching Internship Program.

Natural science is one of the lessons that are closely related to the technology. Chemistry is one of important science in natural sciences. According to Contents Standard for Base and Intermediate Education Unit, Chemistry learns everything about substance includes composition, structure and characteristic, change, dynamics, and energetics substance which involve skills and intellectual activity (Syifaunnur, 2015). Studying Chemistry cannot be separated from studying of science as well as learning the nature of science. Many people define science as a knowledge and collection of facts or laws. Models of science learning in creative and innovative will be able to improve the mastery of concepts at the same time enhance the activity of the students and one of them is cooperative learning. Cooperation is one of the most important human activities. Elephants have survived as a species because of their size, cheetahs because of their speed, human because of their ability to cooperate in the group. In the modern life, people who can organize their group well will be successful in the business, military, and in other endeavour.

Media is one of a factor that can make a learning process runs effectively. It can prevent misconception in the learning process. Supposing that teacher explain an atom theory, it needs a media to make a student understand enough the shape of an atom because it is impossible for the teacher to bring an atom to the class. Cone of Learning by Edgar Dale (Jacobs, 2008:3) showed that learning by doing the real thing, doing dramatic presentation, or simulating the real experience, make a student remember 90% of what they say and what they do rather than by

visual receiving only, they remember 50% from what they hear and see (Figure 1).

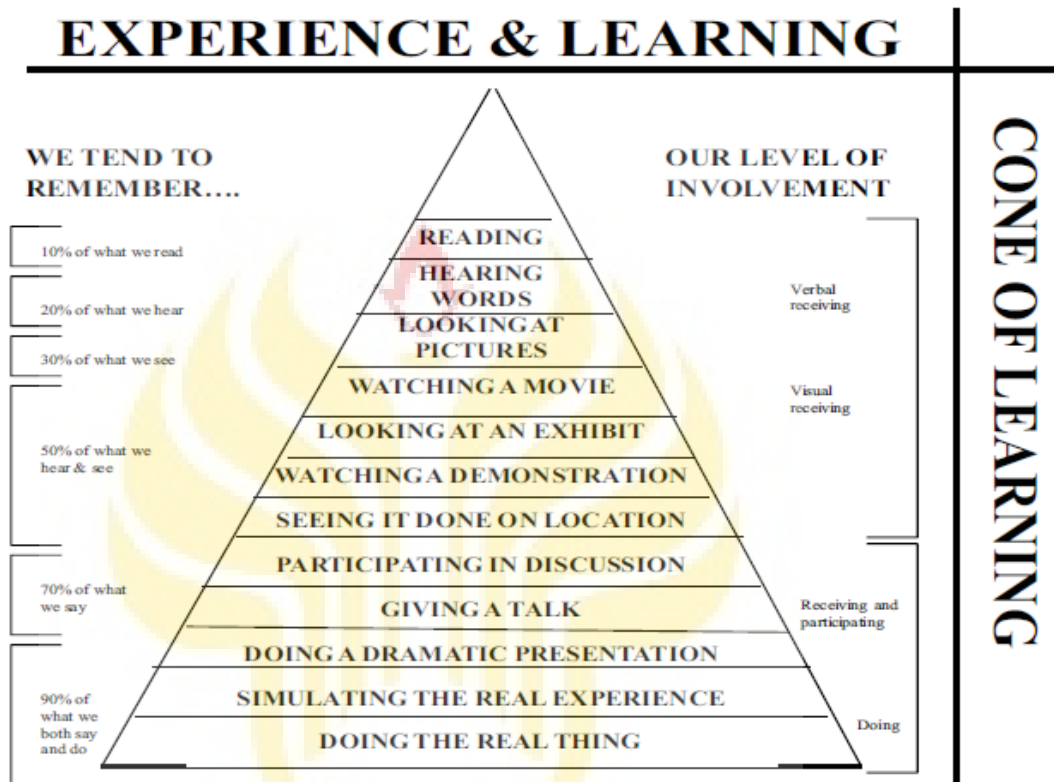


Figure 1.1 Edgar Dale's Cone Learning (Jacob, 2008:3).

One of media which can enhance learning process is animation media. Animation media is a computer based learning media in an animation form that visualize Chemistry concept (Mawarni, 2015) and can prevent student misconception (Fitriyah & Sukarmin, 2013). Other media which can be used in the learning process is interactive multimedia. An empirical research shows that using computer based media with multiple representatives effectively help students to understand chemical phenomenon deeply (Levy & Wilensky, 2009). Education game is also one of interactive multimedia that developed to interest

the students in learning process so that will increase students' motivation (Sari, 2014). Besides, game also makes students feel comfort and happy in the learning process so can increase learning outcome (Heriyanto, 2014).

Fathan research (2013) showed that the application of multimedia model could increase student learning output at average 54.27%. This increasing indicates of student concept comprehension and critical thinking skills. Abdillah's research (2015) also showed that students in experimental group who used interactive multimedia during learning process have higher motivation to learn Chemistry than students in control group who did not use any media. This motivation impacted on students' activity in the classroom.

Hence, in this study the writer wants to develop an interactive multimedia for elements periodic table learning process in Nguyen Tat Thanh High School. The writer also wants to analyse the feasibility of the medium which has been developed.

1.2 Reasons for Choosing Topic

According to the background of the study, some reasons that become the writer's concern in choosing Effectiveness of Elements Periodic Table Interactive Multimedia in Nguyen Tat Thanh High School as the topic are:

- (1) Teacher still use one way media for the learning process;
- (2) Language and culture barrier will hamper the writer and students' learning process.

1.3 Statements of the Problems

The problems investigated are stated as follows:

- (1) Is the interactive multimedia of elements periodic table feasible to be used in the learning process?
- (2) Is the interactive multimedia of elements periodic table effective to be used in the learning process?
- (3) How are students' responses to interactive multimedia of elements periodic table in the learning process?

1.4 Objectives of Study

The aims of this study are:

- (1) Know the feasibility of interactive multimedia of elements periodic table which has developed;
- (2) Know the affectivity of interactive multimedia of elements periodic table which has developed;
- (4) Know students' responses to interactive multimedia of elements periodic table in learning process.

1.5 Significances of Study

1.5.1 Theoretical Significance

This study is a development of interactive multimedia which has a game in it. If this media is used in the learning process, it will be going fun and has a potency to increase students' motivation and learning outcome will increase too.

1.5.2 Practical Significances

- (1) Give an alternative media for elements periodic table learning process;
- (2) For the school, give an important significance to integrate information technology to the curriculum as the learning process to increase students' understanding of Chemistry as Ministry of Education and Training has been directing;
- (3) For the students, interactive multimedia of elements periodic table can be used as new learning resource to increase students' interest in Chemistry;
- (4) For the teachers, interactive multimedia of elements periodic table can be used as an alternative media to explain elements periodic table material.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter covers definition of media, definition of interactive multimedia, the quality of interactive multimedia as learning media, development research, and framework of thinking.

2.1 Definition of Media

Buckingham (2007) said that medium as an intervening means, instrument or agency: it is a substance or a channel through which effects or information can be carried or transmitted. A medium is something we use when we want to communicate with people indirectly, rather than in person or by face to face contact. This dictionary definition tells us something fundamental about the media, which forms the basis of the media education curriculum. The media not offer a transparent window on the world. They provide channels through which representations and images of the world can be communicated indirectly. The media intervene: they provide us with selective versions of the world, rather than direct access to it.

Media technology is an integral part of children's lives in the twenty-first century. The world of electronic media is changing dramatically. Television which dominated the media world through the mid-1990s, now competes in an area crowded with cell-phones, iPods, video games, instant messaging, interactive

multiplayer video games, virtual reality sites, Web social networks, and email (Brooks-Gun & Donahue, 2008).

Yang *et al.* (2013) said that incorporated with some cognitive theories, Mayer and colleagues purposed the theory of multimedia leaning which emphasize the role of experience and ability in learning from various nonverbal representations including pictures, animations and narrations; also in addition, taking the idea from negative theory, Mayer further pointed out that meaningful learning in multimedia environments occurs when learners select relevant information, coherence principles, modality, individual differences, and so forth Mayer and these principles to date have become the major guidelines for designing multimedia instruction.

2.2 Interactive Multimedia

Development of computer technology allows packaging, assessment, and instructional media preparation contains elements of text, graphics, audio, and video in a single program. The combination of graphics, text, sound, video, and animation is defined as multimedia by Arsyad (2011: 171). Multimedia learning presents a teaching material in the form of instructions and narratives with interactive communication system stimulus responses, presented in a structured and systematic according applicable curriculum. If in the multimedia users, such as students, can manipulate or interact with the media, the multimedia is called interactive multimedia.

Learning by using interactive multimedia emerge and evolve based on problems that arise in the application of technology in the learning process and saturation and less communicative of the subject matter in the classroom to motivate students (Daryanto, 2010: 65).

Interaction in computer-based learning environment generally followed three elements: (1) The instructional sequence that can be customized; (2) Answer / response or the student's work; and (3) The feedback that can be adjusted (Arsyad, 2011: 100). The most important characteristic is the interactive multimedia users not only pay attention to the presentation or an object, but he was invited to interact during the course. When students use interactive multimedia, they were invited to engage in audio, visual and kinetic. Therefore, interactive multimedia equipped with a controller that lies fully exploiting its (Munadi, 2013: 152-153). According to Daryanto (2010: 56-57), there are five types of interactive multimedia learning format: tutorial, drill and practices, simulations, tests or experiments, and games.

According to Kustiono (2010) multimedia interactive learning has benefits in increasing the effectiveness of the learning process: (1) allows for direct interaction between the user and learning materials, (2) the learning process can take place individually in accordance with the abilities of students, (3) to enhance the students' interest and motivation, (4) provide feedback on a student's response, (5) create a continuous learning process.

2.3 Interactive Multimedia as Learning Media

Research in multimedia learning has been growing the past two decades due to the rapid development of educational technologies. Although numerous studies have shown many positive effect of multimedia instruction designed based on the theory of multimedia learning, many studies have also demonstrated exceptions to or concerns about factors affecting the results of multimedia instruction. For example, Dillon and Jobus (2005) in Yang *et al.* (2013) reviewed the literature on hypermedia learning since 1998 and found that the results were mixed. Recently, a study conducted by Change, Lie and Tseng (2011) found that between audio-visual and audio only presentations, the latter was beneficial for older students with prior knowledge of the topic to be learned, but younger students with no prior knowledge learned better from audio-visual form.

Newby *et al.* (2000) in Paaso (2013) said that the idea that technology helps teaching and learning raises a question: how should technology is used meaningfully? The answer is the meaningful use of ICT shall not be concentrating primarily on studying the technical applications only, although they form a greater part of traditional ICT teaching. Instead, the focus should be placed on the teaching processes of the contents. Kukulsha-Hulme & Traxler (2007) in Paaso (2013) also said that it shall have a clear impact on the curricula and pedagogical measures. It also makes teaching and learning more alive by integrating contents to relevant everyday functions.

To define traditional methods in ICT teaching, the description to e-learning uses the same pedagogical methods as previously. They do not take advantage of the chances of e-learning, but restrict the scope of pedagogy into the traditional area (Paaso, 2013).

2.4 Research and Development Study

Research and development study is a research direct to produce, design, and process. According to Sukmadinata (2009: 164), Research and Development (R & D) is a process to develop a new product or improve existing products, which can be accounted for. Sugiyono (2010: 407) defines research and development as a research method that is used to produce a particular product, and test the effectiveness of the product. Research and development is often referred to other name: Research-based Development.

In the world of education and learning, research and development study focus on the field of instructional design or planning, or instructional design models, as well as products such as teaching materials and learning media. Through research and development is expected to bridge the gap for more research to test the theory towards producing products that can be used directly by the user, especially in the field of education. The purpose of research development is not intended to test a theory, but is a research-oriented to produce or develop products and test (Sukmadinata, 2009: 166-168).

2.5 Research and Development Model

Research and development can be performed using several models: Borg and Gall model, Dick and Carey model, 4D model, ADDIE model, and Hannafin and Peck model. Research and development models can be grouped into five: class oriented model, system-oriented model, product-oriented model, procedural model and circular model. From the various models of research and development, the commonly used as a reference in research and development is Borg and Gall model, Dick and Carey model, 4-D model, and ADDIE model.

2.5.1 Borg and Gall Development Model

According to Borg and Gall's approach to Research and Development (R & D) in education includes ten steps. The steps are: (1) early researching and collecting information, (2) planning, (3) draft products developing, (4) field test, (5) revising the results of the test, (6) field test, (7) product enhancing from the result of field test, (8) implementing of the test field, (9) improving of the final product, and (10) disseminating and implementing (Sukmadinata, 2009: 169test-170).

2.5.2 Dick and Carey Development Model

Dick and Carey Model is a model of instructional design developed by Walter Dick, Lou Carey and James O 'Carey. This model is one of the procedural models, the model suggests that the application of the principles of instructional design adapted to the steps that must be travelled in order. Step-by-step instructional design by Dick and Carey are as follows: (1) identify the general purpose of learning; (2) conduct an analysis of learning; (3) identify the behaviour and

characteristics of the student input; (4) formulate the performance objectives; (5) develop test items benchmark; (6) develop learning strategies; (7) the develop and select the learning materials; (8) design and implement the formative evaluation; (9) revise instructional materials; and (10) design and implement summative evaluation.

2.5.3 4D Development Model

Research and development using 4D model development approach has several stages. The model was developed by Thiagarajan (Trianto, 2010). Stages of development model include defining, designing, developing, and disseminating.

2.5.4 ADDIE Development Model

ADDIE Research and Development Model is developed by Reiser and Mollenda in the 1990s. ADDIE Model is a common development model that can be used as a guide in levels high enough for the development of instructional design, software engineers and also the development of instructional media. ADDIE model is included in the model system-oriented, development that results in a system whose scope is quite broad.

Development steps in the model ADDIE consists of five steps (Welty, 2007): (1) analysis phase, (2) design phase, (3) development phase, (4) implementation phase, and (5) assessment phase.

(1) Analysis phase

Analysis is doing the needs assessment, identify problems and perform task analysis.

(2) Design phase

The design phase contains formulating SMAR (specific, measurable, applicable, and realistic) learning goals activities, devising a test that should be based on learning objectives, determining the strategy and appropriate media to achieve these objectives, accounting other support sources, such as relevant learning resources and learning environment (Welty, 2007).

(3) Development phase

Development is a making process of the design into a real product. One important step in the development stage is a test before it is implemented.

(4) Implementation phase

Implementation is a real step to implement a learning system developed. Implementation is done in order to determine the usefulness or effectiveness of what is developed (Welty, 2007).

(5) Evaluation phase

Evaluation is the last phase of the model ADDIE. This phase is a process undertaken to provide value to the products developed. Evaluation phase aims to find out a few things, the students' attitudes toward products developed, increasing competence in students, which is the impact of the use of products developed.

2.6 Framework of Thinking

This study has framework of thinking that is shown as Figure 2.

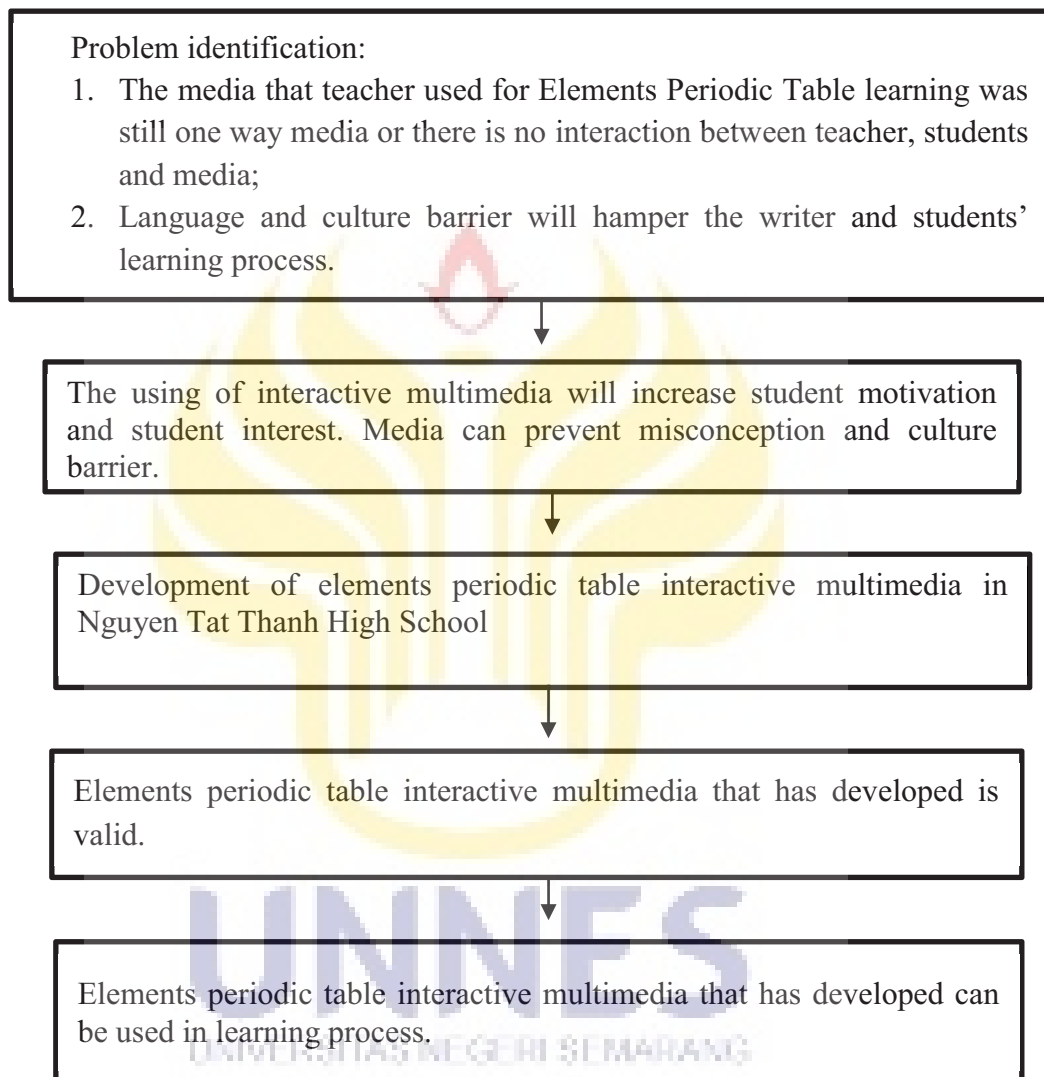


Figure 2. 1 Framework of Thinking Development and Feasibility Analysis of Elements Periodic Table Interactive Multimedia.

CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusion

Based on study result of elements periodic table interactive multimedia, can be concluded that based on validation result from the experts, elements periodic table interactive multimedia comply linguistic aspect, software engineering aspect, visual and audio aspect, and learning aspect. Elements periodic table interactive multimedia is effective as a learning media, shown by large scale test results that 21 of 34 students get ≥ 75 on the post test and students' response on small scale tests is 69.97 with very good response and on large scale test shows 68.5 with very good response.

5.2 Suggestion

Because the limited timing of development, elements periodic table interactive multimedia could not make all of the components inside interactive, this media can be more developed so will make learning process more interesting. Language barrier could be overcome if the media and post-test is present in bilingual, English and Vietnamese so student will more understand the material.

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