

## **The Experimental Research Design of Animation-Based Learning Research**

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### **Abstract**

As animation has been applied to many types of media to gain the attention from the target audiences such as in movie intro, music video and advertising, animation was also adapted to be the teaching media in various classes (Biography, Chemistry, Histology, Veterinary, Meteorology, etc.). Many researchers studied how effective animation-based learning was, and they created the different methods to study. Most of the researches in this area are quantitative, so this research headed to study the methods of the quantitative research in this area. The results of this research would help the people to know the way to study the benefits of animation-based learning, and to know the advantage and disadvantage of experimental research design. These results could be the direction to develop the way to work on the experimental research in this area in the future.

**Keywords :** Animation, Learning, Students, Instruction, Quantitative, Experimental

### **Introduction**

This research is to study the exist researches which discovered about how effective animation was in classroom or instruction. The reason that this research needed to be studied is that to know the best methodology to prove that using animation to teach is better than traditional lecture or traditional handout.

Animation is created from a set of pictures which is displayed one frame at a time. The animators are allowed to use material such paper, cel, photographing, or clay (Cohen, 2002). In the early 20<sup>th</sup> century, people believed that animation was only for children. Moreover, it was only entertainment media for them, and not about studying. Later in 1989, the total revenue of a famous movie called, "Who Framed Roger Rabbit" was over 200 million US dollars, which proved that animation was not limited to only children (Movie Macroeconomics and the financing of films). This situation proved how the elders watched animation, however animation still referred to one of the media for entertainment.

Animation has been adapted to other media as the end credit of some movie, full length animated music videos. Moreover the technique founded in the animation technology also got used in film, such as 3D animation which was used as the first time in the film called, "Futureworld" in 1976 (Carlson, 2003). These usages are useful to make the audience interested. Some audiences of the movie still sat and watched the end credit, if the end credit was made by animation.

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Animation also appears on advertising on both television and digital billboard. Zoetrope, the first technique of animation in the world (Ling, 1962) was also used to promote Sony's motion interpolation technology. It was a ten-meter wide zoetrope called, "BRAVIA-drome", and it is also the current world record of the biggest zoetrope (Largest zoetrope).

As we could see that animation has appeared in many media which is to gain the attention of the target audiences, animation should work the same way to gain the attention of the student, or to lead the student to the lesson easily. In early 21 century after the era of animation technique development, animation was used to create learning material, and many researches tried to prove how effective it was. Mayer (2002) described that using pictures and words are better than words alone; animation with narration is better than animation with words and Animation with narration only is better than animation with narration and words. However, most of the time, animation is often used with the intent to impress rather than to teach (Rieber, 1990). And some country like Thailand, people are still familiar that animation is for only children and they call it, "cartoon" (Tiranawadi, 2012). If that is true, the animated lesson must work well for the young students.

Generally, animation has been used in instruction to fulfill or assist one of three functions: attention-gaining, presentation, and practice (Rieber, 1990). A wide range of science related classes are currently using animation to explain the complex contents in their courses (Kehoe, Stasko & Taylor, 2001). Hwang, Tam, Shun and Lam described animation as “cognitive function” in the learning environment. This refers to the clear presentation of an abstract and difficult subject. Comparing with static picture and narrative contents, animations can show the steps of the scientific process in an easy way. In Brown University in the mid-1980s, the astronomy class was conducted with visualization, students often mentioned the way visualizations helped them understand how the changing process of the universe (Badre, Beranek, Morris & Stasko, 1991). Rieber (1990) also found that the student who worked with the animated graphic performed better than both the static graphic and no graphic group.

“Stand on the shoulders of giants” is Google Scholar's motto: “the phrase is our acknowledgement that much of scholarly research involves building on what others have already discovered.” (Franceschet, 2011) This shows that to do a research to find the way to do another research about using animation as the teaching and learning media is a good thing, because its results could benefits the future researches to develop the way to study about the effectiveness of animation-based learning and to develop the communication in animation-based lesson.

## **Objective**

1. To study the way to design the experimental research in the area of animation-based lecture and animation-based instruction
2. To analyze the advantage and disadvantage of the quantitative experimental research design used in selected studies.

3. To study animation-based lecture, animation-based instruction and the way to use animation as the learning and teaching media. Although this issue has been popular in the western countries more than 10 years ago, we could not see much animation-based lecture class in Thailand. Microsoft Office PowerPoint is often used as the teaching media combining with traditional lecture with blackboard or whiteboard. For the case of using Microsoft Office PowerPoint in lecture classroom, Microsoft Office PowerPoint has the option to create animation in slide show, but the animation in Microsoft Office PowerPoint is only for ordering the presentation and to make the slide more interesting. Its motion image does not much relate to the lesson. The places in Thailand which contain the animation-based learning are museums, where are the educational place for students to travel to. Animation using in museum could gain much attention from the student.

### **Inclusion Criteria**

- (1) The selected papers are quantitative research.
- (2) The samples were students studying in different classes.
- (3) From 2000-2010, one paper was selected in every two-year period.
- (4) The quantitative method needed to be experimental research design, often comparing between experimental group and control group.

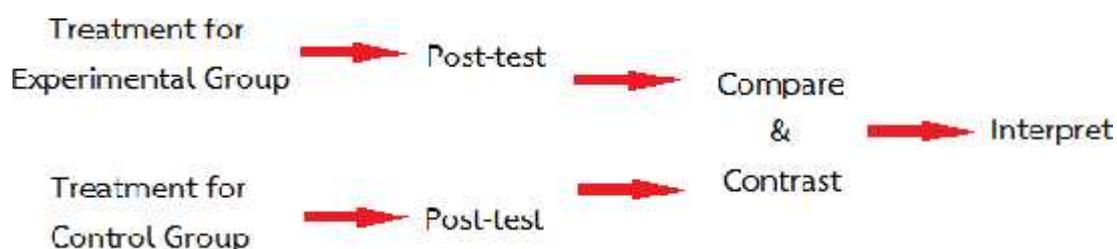
### **Research Questions**

- 1) How to select the participants for both experimental and control group?
- 2) What was the limitation in the selected studies?

### **Methodology**

According to the part of inclusion criteria, 6 papers were selected from the period of 2000-2010 which was the period, that experimental research design often was used to understand the effectiveness of animation-based lecture. The researcher heads to study the methodology and limitation of each selected study. This will help to understand the process of research, and also provide the direction for the future experimental research.

The common process of selected paper are (1) to give the treatments for both experimental and control groups, (2) to give the post-tests, (3) to compare and contrast the results of the tests, and (4) to interpret the results.



**Figure 1** The common process found in selected studies

## **Results**

### **I. Quantitative method is the rational choice to study animation-based lecture (ABL).**

The results of quantitative research are able to be used in the other groups of audiences. All the children and students should have a clear and understandable lecture. Animation-based lecture class is one of the ways to make a clear algorithm and pattern. If the researchers of the sample researches received results from a school which used animation-based lecture, this results could be applied to run the same kind of course in other schools. The assumption is that the level of understanding or the examination results of the students from other schools should be similar to the sample in the researches. The education is almost all around the world, so the quantitative research about this topic would be effective.

Students are target audiences of the educational animation. They are those who consume the media, so they are the most important factor to judge if the educational animation should be used in classes. Students are a big group of audiences, so the suitable method could be quantitative. Because students are the users, and they are not the expert of the communication by animation, to adjudge the gained knowledge with posttest was more appropriate comparing with interview or questionnaire.

Quantitative method in this area has more possibility comparing with qualitative method, which requires the experts to be interviewed. The expert in the education animation usage in class is hard to find. The teachers and the students are only the users of the media. Most of the experts in the area of animation are company's employees and the freelancers as we could see in Pixar Animation Studios, DreamWorks Animation, Kantana Animation Studios and other animation production studio company. They are expectedly not the expert in how to use animation to teach in school courses.

The researchers who worked in this topic might need to know the exact results of using animation to teach in class or in instruction. Their researches would benefits the wide-ranging of users. To find each student's perception might be useless.

### **II. To select the participants**

Almost all participants in selected studies are students. This might be the convenient way for the researchers who were the teachers/instructors. This shows how the first part of sample selection was not randomization. The second part was that half or one-third of the participants need to be selected to receive the treatment in experimental or control group. In this part, some studies randomly selected the students to receive the treatment in each group, but some study allowed the students to select to receive the treatment by themselves, which might affect the reliability of the results. Moreover, one of the selected studies did not give any treatment to the control group. This means the students in control group would lose an opportunity to review the lesson before taking the examination. Undoubtedly, in this study the students who watched animation could perform in the examination better than those who did not receive the treatment.

### III. The comparative of the method of the sample researches

The studies with the experimental group and the control group had a clear method, and it could give reliable results, if the samples were from randomization. The results of this type of method could be compared to see the contrast between using animation/visualization and not using.

For the research that had only one group of target users, the result could be also measured by pretest and posttest, but it could not be analyzed by comparing with the other. This type of method combined with examination results is still better than the alone questionnaire research, because the students could be the liars to say that they learned something from any kind of lesson.

Table 1 The conclusion of the selected studies

Year	Title	Results			Note
		Positive	Negative	Equal	
2000	Assessing the Benefits of Interactive Prediction Using Web-based Algorithm Animation Courseware				Overall posttest scores of students who used interactive courseware were lower than those who used no interactive courseware. For the difficult lessons which both experimental and controlled groups got the scores less than 50%, students who used interactive courseware performed better in the test. The interactive courseware might be suitable for the difficult lessons.
2002	Animation as an Aid to Multimedia Learning. Educational Psychology Review				This research was the study of effect sizes of other studies. The results also confirm that words and pictures could help the learners to understand the lesson better than words alone. Different animated lessons were effective unequally.
2004	Use of Animation in Teaching Cell Biology				The experimental group got an extra treatment which was to watch the animation before the quiz. They performed better than the group that did not watch the animation.

Year	Title	Results			Note
		Positive	Negative	Equal	
2006	Web-Based Animation or Static Graphics				This research was the only study in the six selected papers that the participants were volunteers. The overall test results of animation and static-graphic group were similar. This research added “level of prior knowledge” as a variable. Normally, high-prior-knowledge students would perform better than the low-prior-knowledge, but by using the animated lesson, both groups performed similarly. Animated lesson could help the low-prior-knowledge students to understand better.
2008	Visualizing the Molecular World - Design, Evaluation, and Use of Animations. Visualization: Theory and Practice in Science Education				Animation could help the students to understand the lesson better than static pictures. The suggestion was that this study needed a better measurement such to let the student create their own visualization to see how much the level of misconceptions could be reduced.
2010	Learning from animation enabled by collaboration				Students who studied from animated lessons perform better than the static-image group in the test. The addition variables were the learning setting (individual or collaborative), and type of question (transfer or retention). For transfer, only collaborative group of learners could be benefited from animated lesson better than static graphics.

### Discussion and Suggestion

The way to divide the samples into experimental group and control group might give an inexact result, if the samples are not selected by randomization. The no randomization cases found in selected papers are (1) the samples were the students in the class the researches are the instructors, (2) the samples were volunteers, and (3) the samples selected the treatment by themselves. For the last one that samples could select their preferred treatment would give an unreliable result. This is because, the different treatment selection could refer

to the different perception, lifestyle and also IQ. Those who select to watch the educational animation might have more creativity comparing with those who select the traditional lecture.

To solve these problems, the future research need to use true-experimental design, and one of the best experimental design is “Randomized Solomon four-group design” (Wiratchai, 2013). This experimental design will provide the results of both experimental and control groups with/without pretest. This way, the research could avoid the error effect created from pretest. Moreover, the samples need to be from randomization from whole school or university, and not from only one class.

Another way to study the effectiveness of animation-based learning is mix-method research. The research design could be embedded or nested design. Firstly, the samples would take a traditional text-only lecture. The researcher would look those who could not pass the examination or those who are considered as weak students. Secondly, these weak students need to attend the animation-based lecture, and take the examination again. Those who could pass the second examination would be the key informant who could tell the reason how the animation-based lecture helps them to understand the lesson better. The results might be used to improve the way the animation-based lesson communicates to the students.

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