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## Constructivism perspective on multimedia games for hearing impaired children

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### Abstract

The objectives of this research include: to ensure that the development of multimedia games according to Constructivism for hearing impaired children meets the standard criteria 90/90, to encourage a comparison between recall and retention of multimedia games before and after use, and to study the attitudes of hearing impaired students toward multimedia games activities. The sampling group was seven Prathom sukka I students. The instruments were multimedia games; an achievement test; and a questionnaire for students' opinions toward the developed multimedia games. Statistical procedures for data analysis included the E1/E2, mean, standard deviation, and t-test for dependence samples. The results reveal that the multimedia games had the efficiency at the 92.00/ 90.83 efficiency criteria, while the students' learning achievement had higher posttest than that of the pretest with a significant difference at the 0.01 level. The students' satisfaction in learning with the multimedia games gained the average of 4.47, which was on the high level.

Keywords: Constructivism theory, multimedia games, sign language for hearing impaired children.

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## 1. Introduction

Psychology of learning theory is an integral part of Constructivism theory, which aims at helping learners achieve learning objectives with effectiveness and efficiency, as well as helping them understand in a faster, and more stable way (Pimpan, 2001), which is in compliance with the National Education Act (B.E. 2542), Section 24, and which reads: "In organizing the learning process, educational institutions and agencies concerned shall provide training in thinking process, management, how to face various situations and application of knowledge for obviating and solving problems." This is a view of learning that sees learners as active participants who construct their own understanding of the world around them. Using past experience and knowledge, learners make sense of the new information that they are receiving. In addition to the active nature of the learners, constructivism theory also asserts that meaningful learning occurs within an authentic situation with authentic learning tasks. In constructivism theory, learning is facilitated through social interaction, shared thought, and decision making". This is to make Thai learners capable of developing themselves, and competing with the world's knowledge-based economy. Moreover, Section 66 also reads "learners shall have the right to develop their capabilities for utilization of technologies for education as soon as feasible, so that they shall have sufficient knowledge and skills in using these technologies for acquiring knowledge themselves on a continual lifelong basis." This is to make Thai learners capable of using technology for the purpose of seeking knowledge.

Therefore, the researcher would like to examine the development of multimedia games according to Constructivism theory, in using sign language for hearing impaired children based on the synthesized psychology theory mentioned above by using Delphi technique, so that experts could express their own opinions on what they agree on, in order to create an instruction model that complies with psychological principles.

### 1.1. Objective of the Study

- To ensure the development of multimedia games according to Constructivism theory in using sign language for hearing impaired children, in order to meet the standard criteria 90/90.
- To encourage a comparison between recall and retention of multimedia games, according to Constructivism theory before and after using sign language for hearing impaired children.
- To study the attitudes of hearing impaired students toward multimedia games activity.

### 1.2. Expected Outcomes of the Study

- Instructors can apply the results of this research as a way of transferring instruction forms, which comply with Constructivism theory, through technological media and learning process to enhance learners' ability to create their own knowledge.
- Multimedia games developers can apply the results to the development of e-Learning material which complies with 21<sup>st</sup> Century Educational Technology and Learning with appropriateness and efficiency.
- Learners who learn the materials created from Constructivism theory can create knowledge by themselves with efficiency and effectiveness.

## **2. Research Methodology**

### **2.1. Sample**

The sampling group was made up of seven Prathom sukka I students, who were placed in one classroom at Sodsukka Prathumthane province, Thailand, in the 2014 academic year. They were purposively selected based on their hearing levels of 78-100+ decibels.

### **2.2. Instrument for Data Collection**

The instruments were multimedia games, used according to Constructivism theory in sign language for hearing impaired children. An achievement test; and a questionnaire to assess students' opinions toward the developed educational media.

### **2.3. Data Collection**

The research was conducted in the following steps:

Review the literature in regards to selected psychology theories as it is done in Constructivism. Develop a semi-questionnaire regarding how to designed step by steps Constructivism theory. Collect data and interview using the questionnaire that was developed.

Analyze the data and conclude the results.

### **2.4. Data Analysis**

Statistical procedures for data analysis included, the  $E_1/E_2$ , mean, standard deviation, and t-test for dependence samples.

## **3. Results of the study**

The results of the study were to:

Synthesize the instructional design model of the development of multimedia games according to Constructivism theory, in using sign language for hearing impaired children based on the data that were collected from 17 Thai experts. Content validity was verified (.97), and data were analyzed by content analysis.

Results revealed that the Constructivism theory should be managed by following these four steps: *First*, activate prior-knowledge; inform expected outcomes of learners; manipulate the condition for inspiring a thinking process, and provide learning guidelines. *Second*, fine question; learning control techniques are comprised of the following three steps:

Search for answers and adapt or change their thinking process.

Reflect their thinking by memorizing, analyzing, and application. This second move can be made through three levels of control: (1) program control, (2) learner control.

Combination control. *Third*, judge discovery; learning control techniques refer to learners discovering their own learning. and *Fourth*, transfer knowledge; these techniques include task-based learning, learning contracts, lecture, discussion, self-directed learning, mentorship, small group work, project, collaborative learning, case study, and forum. The process of model synthesis as well as operant conditioning and learning control techniques which are keys of the new model will be explained and discussed. The development of multimedia games according to Constructivism theory in using sign language for hearing impaired children is the systematic development of instructional specifications, using learning and instructional theory to ensure the quality of instruction. It is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs. It includes development of instructional materials and activities; and tries out an evaluation of all instruction and learner activities. (Carl & Kam, 1996). The multimedia games according to Constructivism theory in using sign language for hearing impaired children should facilitate Self-Discovery Learning (SDL), because of these reasons, based on experts' opinions of selected psychology theories as in Constructivism theory and as shown in the following four steps:

Step I: Activate prior-knowledge. Inform expected outcomes of learners; manipulate condition for inspiring a thinking process, and provide learning guidelines.

**Table 1. Step I: Activate prior-knowledge**

The Self-Discovery Learning (SDL) can help Instructors to:	The Self-Discovery Learning (SDL) can help learners to:
Creating situations, organization and knowledge from experience.	Construct, store, recall, and use their knowledge when they want.
Encouraging learners to originate learning.	Manage and monitor their own learning.
Creating atmosphere for exchanging opinions.	Motivation and volition are achieved.
Linking learners' ideas	Motivate themselves to participate in learning, and to put their efforts into it.
Creating experience of learning new things.	Learning tasks continuously until they reach their learning goals.

Step II: Fine question; learning control techniques are comprised of the following three steps: search for answers and adapt or change their thinking process, and reflect their thinking by memorizing, analyzing, and application. This second move can be made through three levels of control: (1) program control, (2) learner control, and (3) combination control.

**Table 2. Step II: Fine question.**

Activities and tasks are designed to build up and frame their knowledge.	The competence and performance are developed and learners choose to use them on their own and according to the target situations
➤ Skills.	<p>Activate pre-knowledge on one's own.</p> <ol style="list-style-type: none"> <li>1. Search for answers and adapt or change their thinking process.</li> <li>2. Reflect their thinking by memorizing, analyzing, and application.</li> </ol>
	<p>Stages of teaching-learning activities</p> <ol style="list-style-type: none"> <li>1. Program control.</li> <li>2. Learner control.</li> <li>3. Combination control.</li> </ol>
➤ Experience.	<p>Exchange ideas and improving mistakes.</p> <p>Building organization knowledge by ways of understanding, memorizing, analyzing and transfer.</p>
➤ Strategies carried out constructively.	<p>Creating ideas, reflexive thinking and initiate thinking.</p>

Step III: Judge Discovery; Learning control techniques refer to how learners discover their own learning.

**Table 3. Step III: Judge Discovery**

The SDL maximizes collaboration among learners, peers, and teachers.	
Components of teaching-learning management:	Operant conditioning includes five steps which are:
<ol style="list-style-type: none"> <li>1. Learners</li> <li>2. Instructors</li> <li>3. Stimulates</li> <li>4. Respond behaviors</li> <li>5. Surroundings</li> <li>6. Tools or equipment</li> </ol>	<ol style="list-style-type: none"> <li>1. Stimulate attention</li> <li>2. Activate prior-knowledge</li> <li>3. Inform expected outcomes of learners</li> <li>4. Manipulate condition for inspiring a thinking process.</li> <li>5. Provide learning guidelines.</li> </ol>
<p>Learning control techniques are comprised of the following three steps:</p> <ol style="list-style-type: none"> <li>1. Search for answers and adapt or change their thinking process.</li> <li>2. Reflect their thinking by memorizing, analyzing, and application. This Second move can be done through three levels of control: (1) program control, (2) learner control.</li> <li>3. Self discovery (SDL)/combination control.</li> </ol>	

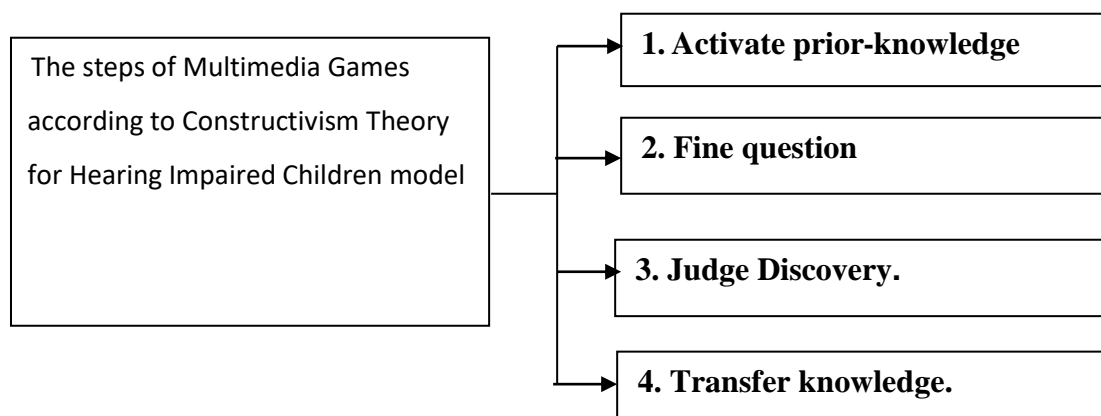
Step IV: Transfer knowledge; these techniques include task-based learning, learning contracts, lecture, discussion, self-directed learning, mentorship, small group work, project, collaborative learning, case study, and form.

**Table 4. Step IV: Transfer knowledge**

Transfer knowledge techniques	Task-based learning
Develop their specific-knowledge and transfer their competence to a new situation because they learn from real-life situations.	learning contracts, lecture, discussion, self-directed learning, mentorship, small group work, project, collaborative learning, case study, Forum.
Offer guidance for learning object design, but methodological tools for testing their efficacy are lacking.	
Assess their learning in activities and ensure that it is widely acknowledged.	

The process of Multimedia Games according to Constructivism Theory in Using Sign language for Hearing Impaired Children model should be managed, by following these four steps as shown in Figure 1:

SDL: Self Discovery/Combination control.



**Figure 1. The process of Multimedia Games according to Constructivism Theory For Hearing Impaired Children model**

The example of Multimedia Games according to Constructivism Theory, in Using Sign language for Hearing Impaired Children as shown in Figure 2:



Figure 2. The Multimedia Games according to Constructivism Theory

#### 4. Discussion

From the results of this research titled, *Constructivism Perspective on Multimedia Games for Hearing Impaired Children*, developers as well as instructors can apply the Constructivism Theory to the development of Multimedia Games. This is also proposed by Chaitip (1999). However, the researcher emphasized on principles which share similarity; therefore, items which differ would be left out.

Although there are differences in principles, elements, steps in organizing instruction, and instruction forms, it does not mean that those differences are insignificant (Wantipa, 1997). Further studies should aim at examining the differences found in the development of Multimedia Games for Hearing Impaired Children, which is capable of enhancing the learner's capability and skill as well (Cove & Love, 1996).

Teaching styles such as “the stable focus, orientation, or intent underlying the entire pattern of teaching behaviors” (Dale, 2007). Based on theories of teaching styles and learning styles are focused on Self-Directed Learning. This is the educational goal of self-regulation theories which are developed through student-directed instruction where the students' guide, have made some input into their own learning process. “A self-directed person can be described as being self-managing in a situation where you have student-centered instructions.” (Dale, 2007). Following this definition, and since as all instruction focuses on students, Ormrod suggested that students'-direction replace the misnomer of student-centered, Student-Directed Teachers. Student-directed teachers are educators who employ student-directed instruction during classes or rehearsals more frequently than teacher-directed instruction. Students' Self-Assessment- Students' self-assessment is when students are asked in group, or individually, informally or formally to gather data about their own progress. Teaching and Learning Strategies- Silver, Hanson, Strong, and Schwartz (1996), defined teaching strategies as, “the particular set of steps to evoke from learners a specific set of desired behaviors” (Dale, 2007) Teaching and learning strategies include the activities used in the classroom through which students can learn. These activities are directly related to the subject and/or curriculum, and may be traced to instructional objectives. Whereas, teaching strategies address what teachers do to cause learning, learning strategies are what students may do to cause their own learning. Synonyms used for teaching and learning strategies include: instructional strategies, instructional activities, teaching techniques, teaching practices, and learning activities. Teacher-Directed Instruction-Ormrod (2004), described teacher-directed instruction as instruction “in which the instructor directly presents the material to be learned – for instance, through lectures, explanations, textbooks, and

educational videos” (Dale Edward Bazan, 2007). As all instruction centers on students, Ormrod suggested that teacher-directed replace the misnomer teacher-centered, in order to properly describe the instruction process, where teachers direct students’ learning and activities. Teaching Style- Silver et. al. (1996) differentiated teaching style from teaching strategies, and defined teaching style as, “a reflection of the individual’s value system which represents a conscious (or unconscious) enacting of the ways one prefers to learn and to remember being taught. It is exhibited in preferred or repeated behaviors” (Dale, 2007), by the teacher within the learning environment. Teaching style is a long-term pattern of teaching strategies although “environmental, cultural, and inherited characteristics invariably modify an individual’s behavior” (Dale, 2007).

The SDL learning process is widely utilized in most universities and in numerous forms, for example, multimedia education. In order to provide students with effective instruction, there must be a good environment which stimulates learner’s motivation. Jonassen, Davidson, Collins, Campbell and Haag (1995) proposed that online learning must promote learner’s action by him/herself. Nevertheless, learning process which connects to other digital media does not mean a complete learning since it is just a presentation of data and additional information. From this reason, learning sometimes is considered by learners as data and information instead of knowledge. This causes misunderstanding and uncertainty to learners, especially when the instruction has changed itself into an instruction without instructors. Although there were new media to provide students with modern technology, it seems that students did not know much of the content inside the media they perceived via online learning. Thus, Gagging and Morrow (1997) raised the following questions: Which learning strategies are to be used for online learning in accordance with the course instruction? Do students have originality in thinking via online learning? What content is suitable for what age and what grade of learners for online learning? How could instructors improve learning environments for online learning after pretest and posttest? The researchers, therefore, decided to find out students’ self-appraisal for online learning. The results will be applied in developing online learning by using psychological principles via multimedia so that learners are able to integrate ideas, and build up body of knowledge by themselves. Moreover, the instructors will apply the results in preparing the suitable content for online learning so that learners can learn by themselves with the advantage of new technology. Then, educational institutions could apply the results of this research in designing the approach for online learning which suits learners most, and also apply the results for the purpose of understanding the problems which arises from online learning.

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