Using Video Modeling in Virtual Learning Environment to Develop some of Mathematical Skills among Children with Down Syndrome in the State of Kuwait

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Abstract—The objective of this research is to investigate the effect of Using Video Modeling in a Virtual Learning Environment to Develop some of Mathematical Skills among children with Down syndrome in some primary stage schools in the State of Kuwait. The measuring tool for the research was an achievement test and interview with the parents to assess their satisfaction. The sample was of 16 children. They were aged between 7 -13 years, in the scholastic year 2012-2013. The research designed semi-experimental, pre-test/post-test control group.

Keywords—: video modeling - Mathematics - Virtual Learning Environment - Down Syndrome  - Kuwait.

i. Introduction

E-Learning is the use of technology to enable people to learn anytime and anywhere. E-Learning can include training, the delivery of just-in-time information and guidance from experts. It enables people to learn in many different ways and at different times. To support these different learning needs, you will need different e-learning delivery methods. Additionally, you will need a way to develop and manage e-learning (Lucas,L. , 2013).

A virtual Learning Environment (VLE), is an e-learning education system based on the web that models conventional in-person education by providing equivalent virtual access to classes, class content, tests, homework, grades, assessments, and other external resources such as academic or museum website links. It is also a social space where students and teacher can interact through threaded discussions or chat (Wikipedia,2013).

Many theories were applied in e-learning and one of them is the Social Learning Theory. Social Learning Theory proposed that learning can occur through simple passive observation of behavior (Bandura, 1971). Recent evidence suggested that passive observational learning may be more effective than interactive modeling as an instructional technique (Biederman, Davey, Ryder &Franchi, 1994; Biederman, Ryder, Davey & Gibson, 1991). His theory added a social element, arguing that people can learn new information and behaviors by watching other people. Known as observational learning(or modeling), this type of learning can be used to explain a wide variety of behaviors and knowledge (Cherry).

The Modeling Process

Not all observed behaviors are effectively learned. Factors involving both the model and the learner can play a role in whether social learning is successful. Certain requirements and steps must also be followed. The following steps are involved in the observational learning and modeling process:

Attention:
In order to learn, you need to be paying attention. Anything that detracts your attention is going to have a negative effect on observational learning. If the model interesting or there is a novel aspect to the situation, you are far more likely to dedicate your full attention to learning.
Retention:
The ability to store information is also an important part of the learning process. Retention can be affected by a number of factors, but the ability to pull up information later and act on it is vital to observational learning.

Reproduction:
Once you have paid attention to the model and retained the information, it is time to actually perform the behavior you observed. Further practice of the learned behavior leads to improvement and skill advancement.

Motivation:
Finally, in order for observational learning to be successful, you have to be motivated to imitate the behavior that has been modeled. Reinforcement and punishment play an important role in motivation. While experiencing these motivators can be highly effective, so can observing other experience some type of reinforcement or punishment. For example, if you see another student rewarded with extra credit for being to class on time, you might start to show up a few minutes early each day (Cherry).

A. Types of modeling for children with special needs
Nikopoulos & Keenan (2006) mentioned the types of the educational modeling for children with special needs.
- Exact and behavior-feature imitation
- Generalized imitation
- Peer modeling
- Self-modeling
- Video modeling.

In this research we focused on video modeling. Dowrick (1991) defined the video modeling as a type of modeling, where the modeling person is distant from the learner but is seen on video to change or teach a target skill. Video modeling is defined as a form of observational learning in which desired behaviors are learned by watching a video demonstration and then imitating the behavior of the model. (Ellis & Marietta, 2011).

A. Possible skills to improve via video modeling
Has your child struggled with a task or behavior that might be easily demonstrated on a video? Here are some modeling ideas to get you thinking:
- Self-help skills, including brushing teeth, getting dressed, tying shoes or making a sandwich;
- Fine motor skills such as tracing and coloring;
- Gross motor skills, like jumping or catching a ball;
- Academic skills, such as object recognition, yes/no questions and even long division; Social skills in clips such as a dentist visit, meeting and greeting people or playing board games. (Ellis & Marietta, 2011).One type of the special needs who gets benefit from video modeling is Down’s syndrome.

B. Down Syndrome
The National Association for Down Syndrome (NADS) described Down syndrome as “… a well known genetic disorder … caused by a chromosome abnormality that occurs before birth. Typically babies have 46 chromosomes, but those with Down Syndrome are born with 47 chromosomes, which causes abnormal changes in the development of the child’s body and brain” (NADS, 2010: in Becker).
- Children with Down Syndrome are visual learners and should be involved in topic work and curriculum on the same subject- at their own level- with individual targets within the subject.

- Break down reading, numeracy and social skills to the pre-reading and pre-number level
- Present tasks that will help develop the problems with short term memory and poor co-ordination.
- Develop reading in order to develop speech.
- Develop a whole word visual sight vocabulary before breaking words down phonically.
- Use flash cards even before speech has developed.
- Use signing as a conceptual bridge to motivate communication and encourage productive speech (Black 1998).

The specialized needs and skills of children with Down Syndrome demand software specifically designed to meet those needs and skills. The benefits that instructional technologies offer students with Down Syndrome convincingly reinforce that demand. Present tasks that will help develop the problems with short term memory and poor co-ordination. (backer,2010) Ellis & Marietta (2011) found out that they could teach a child with Down syndrome how to write letters by video modeling. They recorded a video of how the teacher can write the /C/ with song for the letter C. The boy Rayan who is with down syndrome liked the song then tried to write the letter after observing his teacher in the video.

As a matter of fact the research team knew there was no usage of virtual learning environment or e-learning in teaching or in training via video modeling, though e-learning had significant benefits for children with Down syndrome.

C. Benefits of computer-assisted learning for people with Down Syndrome.
The instructional technologies and e-learning can be more appropriate and effective than other approaches for students.
with Down syndrome due to their numerous benefits that were suggested by a variety of authors and compiled by Black as listed below:

• Improving motivation: The learning experience was enhanced with pictures, sounds and animation which may increase a child's interest and attention.

• Multi-sensory experience: Computers provided both visual and auditory input. Children with Down syndrome are ‘visual learners’ who learn best through visual means and find audio means more difficult. ICT is particularly well suited to this learning style.

• Non-verbal mode of response: Children were able to give non-verbal responses, which enabled them to demonstrate their understanding without having to produce a spoken response, which may be particularly difficult for them due to their troubles with articulation, word finding and intelligibility.

• Being in control: Children began to understand that they can have an effect on their surroundings through ‘cause and effect' software; this sense of being in control developed further as children started to use familiar programs unassisted; self-esteem developed as they became more independent in their learning thus their presentation skills were improved.

• Immediate feedback: Children are rewarded for their successes immediately, e.g. with pictures, sound effects or music, or prompted if they need to try again. The computer never gets impatient or frustrated by the repeated errors, feedback is non-threatening and non-judgmental.

• Errorless learning: Software can be designed in such a way that the child is supported in order to achieve repeated success. The child is supported at each step as necessary, before they commit a mistake. This allowed the child to learn a sequence of steps to achieve success every time

• Opportunities for practice: Children with Down syndrome need much more practice to acquire new skills and ICT can provide as many opportunities as necessary to repeat the same objective in exactly the same way

• Self-paced learning: The child was able to proceed as fast or as slow as he or she wishes; the computer will 'wait' for the child to respond without prompting them before they have had time to fully process the information and construct their response

• Clutter free working environment: Computer programs provided a highly organized and predictable working environment which focused the child on specific learning targets. (Black, 1998).

D. children with Down syndrome and Mathematics.

Hughes (2006) mentioned that numeracy system is a system of logic. Considering the characteristics of children with Down syndrome, there must be an indication of how to help them learn Mathematics effectively where:

• They learn better when mixed with normal healthy children.

• Solving Mathematical problems came in a later stage after getting the skills of reading and writing. The cause is not known so far.

• Children with Down syndrome can be taught as ordinary healthy children only with a slower process.

• They have a short memory below their age which made them need longer time to solve problems and participate in the class.

• Teaching Mathematics depends on visual support. Teaching process should be organized, divided into small steps. Students should be given enough time to practice more in order to develop and improve new skills.

ii. The Research

A. Research Problem.

E-learning has been demonstrated to be effective with students with special needs. This method is specifically appropriate for use with the children with Down Syndrome. Therefore, depending on the difficulties of learning mathematics for Down's syndrome due to their cognitive characteristics, we considered the significant advantages of video modeling that can address pervasive difficulties in educating and training students with special needs. Accordingly, the research addressed: Using Video Modeling in Virtual Learning Environment to Develop some Mathematical Skills among Children with Down Syndrome in The State of Kuwait.

B. The design of the research

Using semi-experimental, pre-test/post-test control group.

C. Participants

1. Control group included seven children (4 males, 3 females; 9-10 years of age, mean 10) from schools in The State of Kuwait.

2. Experimental group included nine children (2 males, 7 females; 7-13 years of age, mean 9,78) from schools in the states of Kuwait.

3. The sample of people with Down syndrome, with Mild Intellectual Disability, IQ55-70, and any susceptible to education. The research team had the approval of the Ministry of Education and parents to implement the strategy of video modeling in virtual learning environment in order to develop the Mathematical skills among these children.
D. Research Hypothesis

1. There were no statistically significant differences in the mean average between the experimental group and the control group in the post achievement test due to the use of video modeling.
2. There were no statistically significant differences in the mean average of the learners in the experimental group between the pre and the post achievement test scores.
3. There were no statistically significant differences in the mean average of the learners in the experimental group between the post and the achievement test scores.

iii. Instructional design (ADDIE)

The generic term for the five-phase instructional design model consists of Analysis, Design, Development, Implementation, and Evaluation. Each step had an outcome that feeds into the next step in the sequence. There were probably over 100+ different variations of the generic ADDIE model (learning-theories.com, 2013).

A. Analysis

The research team analyzed the following:
1. Needs Analysis: It was carried out by interviewing a group of Down's syndrome mathematics teachers and reaching to the difficulties in combining skills.
2. The personal characteristics of the learners: It was carried out by considering literature, observing children with Down syndrome, and survey teachers' opinion; it was noticed that they like imitation, music, and games.
3. Content Analysis: This process was formulated after reviewing the mathematics curriculum for second-grade Down's syndrome children in The State of Kuwait and selecting "addition number seven" lesson; moreover.
4. Analyzing the educational environment: It was carried out by reviewing schools, and checking the availability of the internet access. Finally, the research team provided the experimental group with computer and internet in order to apply the video modeling strategy in virtual learning.

B. Design

The research team designed the program by Formulating educational objectives: Setting objectives after viewing the curriculum and analyzing the educational content. The objectives were defined according to Bloom's Taxonomy of Educational Objectives, and were included as knowledge, comprehension, and application.

1. Describing the script of the educational content: Preparing the script for video modeling in virtual learning was designed after writing the video recorded Clips, the most important thing to be considered is that the clips must be identical to the child's reality, such as using household tools or shopping at vegetables and fruit store and the similar child experiences.
   - Determining the educational strategy: Identifying the educational strategy as a four basic stages applied at the video modeling; observation, application, re-production, and motivation.
   - The content was divided into five lessons.
   - The strategy was commenced by an acting model who explained the first lesson's targeted skill "how to count seven items"; count the red flowers and replaces them at the appropriate place.
   - The educational video was controllable as it can be stopped or restarted.
   - The process of modeling started through observing the clip as the student observed during applying the targeted skill.
   - The student pressed the orange icon (next) down the video that contrast the page color.
   - The following screen displayed a text of the activities and simple instructions about the lesson accompanied by a recorded voice that read the text in accordance with the cognitive characteristics of the learners.
   - The student continued the modeling activity. As for the feedback, it started during the performance of the video modeling.
   - After modeling, the feedback appeared as music to reward the student for the completion of the task, and then appeared the text and the accompanied voice that confirmed the performance of the targeted skill.
   - After completing the targeted skills, the evaluation process started as the student applied hard applications and simple e-test through the virtual learning environment.

Specifying the standards for the design of the educational site as befits the characteristics of Down's syndrome: Identifying the standards for the educational design of the site according the characteristics of Down's syndrome.

When designing the educational website, the research team considered identifying the most necessary standards that are qualified for the characteristics of the Down's syndrome and their needs.

1- The educational objectives of the curriculum fit their mental and academic abilities.
2- The website content was modeled slowly and clearly and is presented in attractive way identical to the educational objectives.
3- To increase interaction and integration; colors were comfortable and icons were big, clear and the background was contrasted. Depending on the needs of Down's syndrome children, the site contained few texts read by accompanied voice to help them understand their tasks or get the feedback. Additionally, the movement items seemed to be easy by using the mouse.

4- Page design was focusing on the constancy of the size and the place of the videos and the icons in all screens.

5- The website contained the four stages of observing and modeling.

6- Integrally, there was a great use of multimedia (text, image, sound, video, color)

7- Video modeling (electronic activities) is a video-based intervention involving feedback during and after the modeling. Time designation was not required at that process because it is based on the child's abilities and the other characteristics.

8- The variety of the feedbacks on the website were considered.

2. Preparing the script for the educational web to create video modeling in the virtual environment learning.

C. Development

The third level in the instructional design, the research team developed the website by:

1. Compilation of media (video production and video modeling in virtual learning environment).

   a- They gathered the appropriate images and tools applied at the modeling and videotaped the model while performing the targeted mathematical skills by using Canon EOS 550D, up to 30 fps shooting, so that the videos were created with more flexibility besides the multi frames. Moreover, the external microphones socket was used in order to add an additional microphone for better quality sound.

   b- The model recorded the sound for all the Clips of home page, instructions, final page and feedbacks. These sounds were connected by using Free Sound Recorder, free available software on the internet, due to its ability to record sound from a microphone, line-in, and just about any media program. Additionally, sound recorder, is offering professional recording features with full mp3, wma, and wav support.

   c- Prior to performing the modeling, the e- activities were created identical to the educational video by using Adobe Flash program due to its high quality in producing stunning media experiences and delivering console-quality games and content to the browser.

2. Compilation of video screens inside the program and arranged.

   To design the storyboard and develop Clips, the researchers used Photoshop Program to create the banner of the educational website and the other pages. Depending on the needs of Down's syndrome children, icons were modified to be big, clear, and contrastive the background. Designing the home page that contained a picture of a train moving on one direction accompanied by its sound that was displayed for once time. The lesson's name appeared on the train's carriages. To exit the lesson and back to the home page, the student pressed the small familiar train image set as the exit icon. Accordingly, selecting the lessons was interesting to the Down's syndrome children who like and interact with colors and sounds.

3. Determine the interactions within the environment.

   To increase the impact of the visually-based interventions, the researchers considered stimuli such as connecting the voice with texts, activities, and feedbacks. In addition, the constancy of their size and place. Consequently, the researchers used the easy available Adobe Dreamweaver program in order to provide intuitive visual interface to address the needs of the Down's syndrome children.

D. Implementation

1. Prior to learning the target mathematical skills, the researchers applied the pre-test on the experimental and the control group.

2. Researchers corrected the tests and monitored the grades.

3. The control group studied some mathematical skills traditionally.
4. To acquire the targeted mathematical skills, the experimental group was studied via video modeling strategy in virtual learning environment.
5. After the implementation of the research, the children in both experimental and control group were set for post-test to evaluate the acquisition of some mathematical skills.
6. The test has been corrected and the grades had been monitored for each sample.
7. After applying the electronic processing, a followed test was applied to evaluate the learning acquisition of the experimental group.
7. Non parametric statistic test Mann-Whitne, and Wilcoxon was used for data analysis.

E. Evaluation
there were three levels of the evaluation:
1. Formative assessment.
2. Summative assessment.
3. Satisfaction of the parents.

iv. Research results
The findings from this research included the following:

1. There were statistically significant difference at the significant level 0.05 between the experimental and control group , favor the experimental group.
2. There were statistically significant differences at the significant level 0.05 between the pre and post test in the experimental group.
3. There were no significant difference at the significant level 0.05 between post and followed test in the experimental group.

The researcher obtained feedback from parents through phone calls. Collected feedback was classified into descriptive and coded.

The researcher founded the following:
1- Parents of the participating students were satisfied with the application of the modeling video strategy in the virtual learning environment and thought it made the students interested in learning.
2- Parents expressed finding the strategy applied serving all subjects and can help educate and train pupils with Down Syndrome.
3- Parents cleared that the students' relatives and siblings were impressed with the educational website and the application of the virtual learning environment.
4- Parents showed that interaction with the teacher and communication among each other has encouraged them to continue logging into the virtual learning environment.
5- Parents assured that using video modeling in a virtual learning environment had a significant positive impact on learning mathematical skills.

v. Final conclusions and recommendations
1) School administration and supervision departments are recommended to give more care for this technique and its requirements to be applied at the schools of special needs on pupils with qualifying abilities to deal with it.
2) Holding training courses for teachers of Mathematics, especially for Down’s syndrome teachers to enable them of using this technique appropriately.
3) Utilizing visually based interventions with students with special needs, especially Down syndrome, is highly recommended as it has been demonstrated to be effective with their needs.

Recommendation
Accordingly, the researchers recommend the following:

1- Due to the effectiveness of the virtual learning for students with special needs, their teachers should be trained to use this method properly.
2- To address the needs of Down's syndrome children as a visually- based learners, mathematics teachers should be trained to apply video modeling in virtual learning environment.
3- To increase interaction and communication, Down's syndrome parents should be trained to use virtual learning environment.

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