Abstract

This paper describes the design of a multimedia courseware for learning multiplication tables using accelerated learning techniques. Techniques that fall under Associate, Visualize, Verbalize, and Repeat categories are used in the design.

Keywords: accelerated learning, memory improvement technique, mental journey, multiplication tables, courseware, multimedia

1. Introduction

The idea for developing this application came out when the author faced difficulty in teaching her daughter of age 6 to memorise times tables 4 to 9. Since then, she keeps on finding the best way that can help children to remember times tables. It is frustrating that on one day a child may have remembered a times table, but he/she tends to forget the table again on the next day. The author search ends up with a few tools and techniques that are put up on the Web such as multiplication.com, Project Happychild, and cartoonmath.com. Her search also found a computer game that is purposely developed to assist children in memorising multiplication tables called TimezAttack, and an electronic flashcard device called FlashMaster that is developed to help children master multiplication tables. She tried to practice all the free teaching aids that she found in teaching her children, unfortunately the tools provided are not suitable to be used for the children environment especially in her country. While, the multiplication game is not easy to play.

This area has become one of her interests, and she is also attracted to accelerated learning techniques described by Sheridan 2006a, Tipper 2006, and Rose 2006 that outline techniques that assist our memory to memorise things faster. In this paper, the author presents her research findings in applying some of the accelerated learning techniques in designing a multimedia courseware to accelerate children in memorizing multiplication tables.

2. Background

2.1 Existing System

Flash Cards

Picture flash cards linked by stories that apply some accelerated learning techniques to teach multiplication tables are available at multiplication.com [8], and cartoonmath.com [7]. Both approach, use pictures to represent numbers and use story to link the numbers being multiplied with its results. The same idea by Robin Hughes [4] is presented on HappyChild Project website. The difference is that Robin’s idea does not use picture flashcards but use actual children picture imagination or visualization in practicing the accelerated learning techniques for memorizing times tables.

The following tables compare the two websites that provide times table flashcards and describe why the tool is not applicable for teaching times table in the author’s environment.

<table>
<thead>
<tr>
<th>Website</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>multiplication.com</td>
<td>Many of the words or names used to represent numbers in this tool are not familiar words and not easy to memorise especially for children whom are not grown in English speaking environment. Examples of such words include Elf, Aching, Surfin’, Denty Sun, Denty Chef’s Van, Denty Dive, Fort E Zoo, Fort E Twine, and Ate a Ton.</td>
</tr>
</tbody>
</table>
This tool is a teaching aid for teachers. Children cannot use it by themselves.

cartoonmath.com

Although not all, many familiar words or names are used in representing numbers in this tool. But, the story that links the numbers uses many unfamiliar terms, and therefore, the story is not easy to understand especially for children whom are not grown in English speaking environment. Examples of such terms/words include demure, veil, dapper, buddy, dude, Arbor Day, comfy, and fervent.

This tool is also a teaching aid for teachers. It is not readily usable by children.

Flashcard Device

An example of this device is FlashMaster [9]. It does not apply accelerated learning techniques but drill and practice. It provides six learning activity or modes: 1) Table: In Order, 2) Table: No Order, 3) Practice, 4) Test, 5) Flashcard, and 6) Special Problems.

All the activities except Test and Flashcard will repeat each missed problems until it is correctly answered, and it will display the correct answer for any problem missed twice in a row. By performing the drill and practice activities, it is hoped that children will be able to memorise the times tables. The device is readily usable by children, but the price is not at an affordable rate.

Video Game

TimezAttack is an educational math game that applies drill and practice techniques. It is promoted as high-tech and entertaining as top “real” video games [10] that any child whom gets it will play it. TimezAttack also is claimed as a synonym to “Total Multiplication Tables Mastery”. It is claimed to be able to gauge the multiplication mastery level of a child in real-time, and create a customized strategy to teach the child. Despite the claims, the author found out that the game is not easy to play. A child may get trapped figuring out how to get out from the dungeon rather than performing a drill and practice of multiplication tables. This is because the door or way to get out from it is not easily seen. Although it has advantages over FlashMaster in term of affordability, TimezAttack is still not the solution for children to memorise times tables.

2.2 Accelerated Learning Techniques

Accelerated Learning is also called brain-based learning [5]. The techniques exploit what the brain naturally does best. It makes learning more interesting and engaging. It makes people learn faster and remember more.

In Sheridan 2006b, Dominic O’Brien, the eight-time World Memory Champion, claims that anybody can develop their memory by regularly practicing a variety of exercises. One of his memory improvement techniques is the story method that strings together a list of items to be memorized into an easy-to-remember story. The story must be interesting, added with colour, suspense and movement that tie the items together.

Besides using O’Brien’s story method, for this multiplication courseware, the author will mainly follow guidelines for using mnemonics and memory techniques from memetics [5] in producing the design of the courseware. The memetics techniques are grouped into six categories: Associate, Visualize, Verbalize, Simulate, Perform, and Repeat.

3. Preliminary Design

After analyzing the suitability of the available techniques for memorizing the times tables, the following table shows the list of techniques selected for this courseware.

<table>
<thead>
<tr>
<th>Category</th>
<th>Selected Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate</td>
<td>1) General Association Principles</td>
</tr>
<tr>
<td></td>
<td>2) First Letter Mnemonics</td>
</tr>
<tr>
<td></td>
<td>3) Mental Journey or Story</td>
</tr>
<tr>
<td>Visualize</td>
<td>1) General Visualization</td>
</tr>
<tr>
<td>Verbalize</td>
<td>1) General Verbalization</td>
</tr>
<tr>
<td>Repeat</td>
<td>1) Rote Learning</td>
</tr>
</tbody>
</table>

Techniques in Associate category are the most important memorizing techniques that contribute towards the effectiveness of this product. The Visualize, Verbalize, and Repeat techniques are all supportive techniques to strengthen the results.

3.1 General Association Principles

Our brain learns by associating new information with existing information [5]. So, we will follow the brain nature to get its best results. The existing information must be things that the learners already know or familiar with. In this case, objects and names that are familiar to the children of age 5 to 7 will be used as key words and target images. Happy and Comedy are chosen to be the attributes of memories that would help
longer retention in the association process. A primary attribute link and a secondary link are stories that are used to link or associate the multiplication facts with its results. Another important factor of this technique is simple. The association must be done in a short and simple process.

3.2 Basic Mnemonics

Normally, first letters are used in this mnemonics technique. But, here an image that looks like a number is used to represent the number. 10 numbers from 0 to 9 are represented with a unique image or picture. Table 3.2 shows the numbers and its associative image that are used in this experiment. In this design, the general name for a representative image is called the number character. For example, the number character for two times table is duck.

![Table 3.2: Numbers 0 to 3 and its representative image](image)

3.3 Mental Journey or Story

In this technique, items are associated along a path, journey, or story. For this design, happy and comedy stories are used to associate the multiplication facts with its results. For each times table, a main character and a theme are chosen in creating stories for each fact. For example, in two times tables, number two is represented with a duck, the duck is the main character, and the theme is “Duck Stories Along A River Bay”.

The following images are 5 main scenes of the “2 x 3 = 6” story. 2D animation is used to present the multiplication fact short story. The script for the story is as follows:

A duck and a butterfly were very good friends. One day, while they were playing, the duck invited the butterfly to go for a swim in the river.

The duck then made fun of the butterfly because it cannot swim. The butterfly felt very sad.

Since that day, they were not friendly to each other. A snail, who used to see them playing together, felt very surprised when seeing them were not playing with each other anymore.

After knowing the true story behind it, the snail advised his friends. He said, “A duck and a butterfly each has its own specialty. A duck can swim, but a butterfly can fly”.

The duck felt guilty for making fun of the butterfly and apologized for his actions. Since that day, they were friendly again and didn’t quarrel to each other. They thanked the snail for his advice.
3.4 General Visualization

In this technique, the learners are guided to see their lessons in their mind’s eyes. Visualization is a powerful way to strengthen the association techniques. It works because some parts in our mind cannot differentiate between things we really see with our eyes and things we only see in our mind’s eyes. [5] Younger children seem to do imagination or visualization well [5] than adults, so incorporating this technique in this design must be carefully done to take advantage of the technique.

There are three steps for visualizing: prepare, visualize, and finish. Designing the Prepare step include giving simple instruction to set the learners in good state (including informing the learners what they will be doing, giving introduction to the times facts, characters and title of the story, and setting the learners to concentrate and relax). There are other factors that may disrupt visualization. These are conveyed to the learners at the beginning of each times table session. The factors include suitable position/environment, time requirements, and away from distractions.

Designing the Visualize step include giving simple guidance to visualize each times fact. This includes instructions to close and open their eyes, imagine and verbalize the story by following the narrator voice. In the Finish step, learners are presented with the story that they have just visualized. Then, a simple explanation of the current times facts and its story is given to the learners. Learners are encouraged to follow the narrator’s voice to strengthen their memorization.

3.5 General Verbalization

Verbalization is also a technique to strengthen the memorization process using the association technique. In this design, this technique is used in the Visualize and Finish steps explained in section 3.4.

3.6 Rote Learning

Rote learning is a technique to lock in contents by repeated review. It is a popular technique used in traditional way of learning new things. In this design, this technique is used at a minimum and as a support to strengthen the memorization process. The learners are given an option to repeat review certain parts in the introduction, and visualization process. This includes introduction to number characters, introduction section in the Prepare step, the whole section in a Visualize step, and the whole section in a Finish step.

4. System Architecture

Figure 4 shows the system architecture of the multiplication courseware. The courseware is composed of three main modules: 1) Introduction to Times Tables Number Character, 2) Times Tables Tutorial, and 3) Times Tables Exercises.

Figure 4 shows the architecture of the multiplication courseware.
4.1 Introduction to Number Characters

In this module, learners are introduced to all the number characters that are used in teaching the multiplication tables. Some of the characters and the numbers are shown in Figure 3.2. Each character is introduced in an interesting situation to match the happy and comedy feature. The purpose of this module is to let the learners remember all the characters as its numbers. In other words, if the learners see a duck he/she will remember it as number two.

4.2 Times Table Tutorial

This is the important module in this courseware. This is where learners can learn or memorise all times tables. For the first version of the courseware, only 36 multiplication facts are available. Figure 4.2 lists all the 36 multiplication facts available in the courseware.

<table>
<thead>
<tr>
<th>Times Table</th>
<th>Times Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2 x 2, 2 x 3, 2 x 4, 2 x 5, 2 x 6, 2 x 7, 2 x 8, 2 x 9</td>
</tr>
<tr>
<td>3</td>
<td>3 x 3, 3 x 4, 3 x 5, 3 x 6, 3 x 7, 3 x 8, 3 x 9</td>
</tr>
<tr>
<td>4</td>
<td>4 x 4, 4 x 5, 4 x 6, 4 x 7, 4 x 8, 4 x 9</td>
</tr>
<tr>
<td>5</td>
<td>5 x 5, 5 x 6, 5 x 7, 5 x 8, 5 x 9</td>
</tr>
<tr>
<td>6</td>
<td>6 x 6, 6 x 7, 6 x 8, 6 x 9</td>
</tr>
<tr>
<td>7</td>
<td>7 x 7, 7 x 8, 7 x 9</td>
</tr>
<tr>
<td>8</td>
<td>8 x 8, 8 x 9</td>
</tr>
<tr>
<td>9</td>
<td>9 x 9</td>
</tr>
</tbody>
</table>

Table 4.2 A list of multiplication facts available in this courseware.

REFERENCES