# The influence of digital storybooks to the learning attitudes of students with reading disabilities

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**Abstract:** In this study, the researcher used multi-sensory teaching methods to design three digital story books as teaching materials in order to enhance the reading abilities of children with reading disabilities. The content of digital storybooks focused on the differentiation of word sounds, word forms, use of punctuation marks, and reading comprehensions. It is hoped that through the interactive reading practices, students with reading difficulties can be improved in those aspects. The results showed that digital story books teaching for dyslexic children learning attitude has improved significantly. All students gave the teaching with digital storybooks positive feedbacks and said that they like such learning method. They all hope to apply it to other subjects.

**Keywords:** Digital Storybook, Reading Disabled, Multi-Sensory teaching

## 1. Introduction

Reading is the spirit of education, and fundamental for a country's development. Reading is the means for gathering information and developing knowledge. According to The Program for International Student Assessment (PISA), those with higher reading ability have higher ability to gather, comprehend, and judge information to achieve personal goal and discover potential. They can effectively use information to participate in the complex mechanism of the modern society. Taiwan is also promoting reading exercises hoping the young students can have good reading habit and interests and enhance their creative thinking ability. Since it is the basic ability for lifelong learning, it is essential to foster good reading habits since childhood.

However, many children have learning disabilities. They might have normal intelligence, but with reading disabilities (RD), they grow to dislike learning and even against learning. Reading disability is a common learning disability. In Taiwan, 7.5% of children have the symptoms (Stevenson, Stigler, Lucker, Lee, Hsu, & Kitamura, 1982). Among them, more than 80% have reading difficulties which refers to the difficulties in reading words, spellings, and writing.

In order to foster reading motivations of those RD students, it is important to design reading materials that can enhance their interests. One of the best ways is to use multi-sensory stimulations to strengthen their memory and comprehension abilities. Multimedia has the function to allow the interaction between readers and the interface that can stimulate multiple sensories. At the same time, adding in stories to attract their attentions is one way to intrigue their reading motivations. Simmons (2002) stated that story is one of the ancient communication tools which have great power. Therefore, this research tries to create digital

storybooks for RD students. The digital storybooks are designed to have text, graphics, animations, and audio narrations to stimulate children's multi-sensory learning purported to increase the effectiveness of their learning outcome, and encourage positive learning attitude.

## 2. Literature Review

Story is the first and most used text for every child before going to school. Everyone likes stories since stories allow readers to be involved in a scene outside of their everyday life, and be moved with the plot. Using multimedia and interactive designs to tell stories can help readers to participate the stories. Multimedia can stimulate learning connections with texts, sounds, graphics, and videos. Therefore, the design, production, and creation of digital storybooks become innovative challenges for teachers.

However, reading is not easy and interesting for everyone. For those with reading disabilities, reading is rather difficult and uninteresting. According to Lerner and Kline (2006), 80% of students have reading difficulties; not only their GPAs are low, they cannot fluently read or comprehend reading materials. Reading difficulties include word recognition, reading speed, word sound memory, word combination, phrase recognition, recitation, and find implications. According to Perfetti (1992), reading difficulties also include reading comprehension, oral presentation, letter recognition, phonetic activation, and semantic encoding. Children with reading disabilities (RD) can have sympons such as writing words upside down, mix words, or prunounce them wrongly.

These difficulties cannot be attributed to mental ages, sight problems, or learning environment. When children have such reading problems, they not only have learning problems, they would also have problems on motivation and ability to adapt to social situations. When children have reading problems, they would often feel anxious, have poor self concept, and low self identity problems. In order to eliminate those reading difficulties, multi-senrory instructions can act as remedies by adding sound stimulation and visual impressions.

Sensory learning refers to using different sensory to enhance learning process. Since the human body use visual, audio, physical sensories to learn, it is natural to combine these stimulations to strenghthen learning effects. Nevertheless, everyone has different sensibilities to those sensories so that everyone needs different ways of learning. For children with special needs, they can use their stronger senses to support weak ones so that they can conquer learning difficulties they meet.

## 3. Content and design of storybooks

### 3.1. Instructional Design

The design of digital storybooks has various criteria including story plots, scripts, narration tones, caption displays, music selections, and the combination of texts, graphics, animations

and special effects. But the most important is whether the overall design can achieve the instructional goals. The stories created in this research have their educational implications such as bravity, confidence, and happiness respectively. All are surrounded with circumstances of family, friends, and love.

In each story, word recognitions, phonetic distinction, and reading comprehension are placed. For Chinese words, word sounds, word looks, and punctuations were important parts of texts which are all considered in the design of storybooks. The content is targeted to third to six grade primary school RD students. Words in the storybooks were specially chosen from the official word frequency report published by the Ministry of Education. The range was defined in the first 1000 frequently used words by primary school students. The corresponding design principles of storybooks for multi-sensory learning are as Table 1.

Table 1 Design principles for multi-sensory learning

| | |
|---|---|
| Visual | Using flash cards with graphics and text explanations |
| | Disassemble words into components (Chinese words are graphical that every word is combined with roots and parts) |
| | Using animations to increase learning motivations |
| Audio | Using captions and narrations |
| | Provide oral hints for contents that require memories |
| Oral | Require to point out components of words |
| | Require to repeat learning content heard |
| Motor Skills | Require to write out words with fingers |
| | Require to show meanings of words and phrases with body movements |

*3.2 Story and system design*

The three digital storybooks are: Mouse Dinky Got Lost; Beauty Pageant of Angel Whity; Green Light Legend of Alligator Ganga. These stories were created for this research, edited by primary school teachers, and proofed by professors in Chinese department. Besides reading abilities, students can reflect on their own life about family, friends, and love through the story content. The detail descriptions are as follows.

Unit 1：Mouse Dinky Got Lost

Plot：Mouse Dinky is an absent-minded little mouse. He always wants to go into town to take adventure. One day he sneak out when mommy is out, but encounter bad guys. He hided in an old temple when he got lost in town until was found by his family. He finally understand that family is the warmest place in the world.

Story Word Count：76

Unit 2：Beauty Pageant of Angel Whity

Plot：Nurse Whity is a kind and tender pig. When her hospital is holding the beauty pageant, she has no confidence to participate. She then finds out that she can help people when she is full of love, and understands that beauty comes from inside.

Story Word Count：75

Unit 3：Green Light Legend of Alligator Ganga

Plot：Alligator Ganga hears from the swallow about the green light legend that whoever has it can have happiness. He decides to take the trip to find the green light. When he reached the destination, he realizes that the real happiness is home.

Story Word Count：82

The characters, scenes, and objects in the storybooks were all graphed with Adobe Illustrator CS4, and then imported into Adobe Flash CS4 to make animations. The main functions of the storybooks include four parts: story monopoly (upper left), story content (upper right), Q&A (lower left), tests (lower right)(See Figure 1). All scenes have functional buttons to allow human-computer interactions and guide students through the learning tasks.



Figure 1 Screenshots of digital storybooks

## 4. Methods

This research uses pre- and post-tests to understand students' learning achievements. The process is as Figure 2. The tests used have the same content but the questions were given in different order.

Research subjects include five students (Anonymous as Adam, Brian, Colin, David, and Edison) from three primary schools in Tainan. They are students identified with medical

evaluations as RD students. They have various degrees of reading difficulties in word recognitions and reading comprehensions.

The research collects both quantitative and qualitative data. The pre-, post-, and postponed-tests are self-made questionnaires that are evaluated by specialists of special education. The evaluation includes four parts: pronunciation, word sound recognitions, word shape recognition, and reading comprehension. Most questions were to be answered by choosing the right answer. There were 25 questions about word sounds and shapes, and 4 questions about reading comprehension; the two parts were graded seperately. During the storybook reading sessions, observation is conducted to record students' learning process. The section was followed with interviews to know students' thoughts and feelings toward the overall learning process.
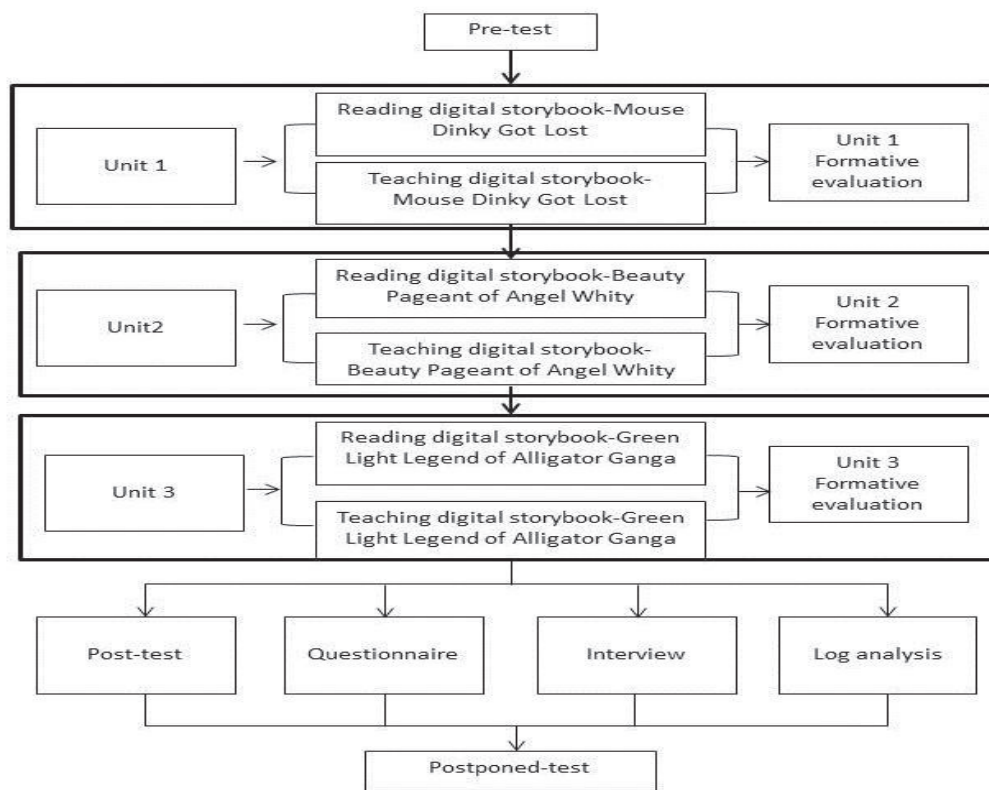
Figure 2 Research Flowchart

## 5. Results

Students' learning achievement was evaluated by the tests. The results show that the average scores of the post- and postponed-tests do not reach significant differences with the pre-test although both tests were obviously higher than the pre-test.

On the other hand, the questionnaire has positive results on learning attitudes. The questionnaire consisted of three aspects: the content of digital storybooks, the instruction of digital storybooks, and the intrinsic motivation of users. 4-point scale was used in the questionnaire. It shows that all children accept the teaching method of digital storybooks and favor them.

In terms of the content comprehension, the averages of all items were above 3.2 (Table 2). In "I carefully read every line in the storybooks" (t=-0.316, p=0.768), Edison expressed in the interview that he cannot pay attention to every line because he has very short attention span. (sq-20110322-stu05.doc). It shows that showing reading materials in small pieces is every important. Stories should be told in short sentences and the language delivery should be more concise and clearly stated especially for RD students. In "I pay attention to the content of storybooks" (t=-0.224, p=0.834), Edison said that he sometimes cannot think of the correct answers, and when he hesitated, he cannot pay close attention to the following content of the storybooks (sq-20110322-stu05.doc). Other possibilities include the interference of researchers sitting next to them during the testing sections. This can bring some level of pressure to push them to proceed to the next question without paying much attention to the teaching content.

Table 2 T-test results of the content of digital storybooks aspect (N=5)

| Item | M | S.D. | t | p |
|---|---|---|---|---|
| 1. I can understand the implied content in the stories | 3.60 | 0.837 | 0.267 | 0.802 |
| 2. I carefully read every line in the storybooks | 3.40 | 0.707 | -0.316 | 0.768 |
| 3. I pay attention to the content of storybooks | 3.20 | 1.000 | -0.224 | 0.834 |
| 4. I can understand the animation with text explanations in the storybooks. | 3.20 | 0.447 | 3.500* | 0.025 |
| 5. I can understand the animation with oral explanations in the storybooks. | 3.20 | 0.548 | 1.225 | 0.288 |

* $p<0.05$

In the question "I can understand the animation with text explanations in the storybooks" (t=3.500, p=0.025), Brian thought that the presentation of digital storybooks can help him to comprehend more of the learning content, and the animation attract his attention to the screen which leads him to learn the content in the stories (si-20110315-stu02.doc). Lai (2000) said that animation with texts can assist students to obsorb learning content and many studies also proved multimedia materials have better effects than pure text materials.

In the instruction of digital storybooks, students were all agree on "I can fluently read the words in the storybooks". Since the digital storybooks were designed to help students to distinguish word sounds and shapes, students can read more fluently after the learning tasks. It proves that developing the ability to distinguish words can enhance reading comprehensions proved by Calfee and Piontkowski (1981). In the question "I can accurately read the words in the storybooks" (t=3.500, p=0.025), students can read accurate pronunciations especially with words that have various sounds when in different situations.

Table 3 T-test results of the instruction of digital storybooks aspect (N=5)

| Item | M | S.D. | t | p |
|---|---|---|---|---|
| 1. I can fluently read the words in the storybooks | 4.00 | 0.000 | -- | -- |
| 2. I can accurately distinguish the phonetic sound of the words in the storybooks | 3.20 | 0.447 | 0.500 | 0.643 |
| 3. I can accurately read the words in the storybooks | 3.80 | 0.447 | 3.500* | 0.025 |
| 4. I can accurately distinguish the shape and strokes of the words in the storybooks | 3.40 | 0.548 | 1.225 | 0.288 |
| 5. I can accurately distinguish the punctuations in the sentences in the storybooks | 3.20 | 0.837 | 0.267 | 0.802 |

* $p < 0.05$

Last, in the intrinsic motivation aspect, students were very agreed about "The storybooks provide me a lot of learning opportunities", ". Learning with digital storybooks is much more interesting than reading traditional books", and "I would suggest my friends to read these digital storybooks". That shows they have very high acceptance rate to digital storybooks, and believe they have more opportunities to practice with digital storybooks. In traditional classrooms, multimedia were seldom used. For RD students, they need more stimulation to multiple sensory. Animations with stories not only can increase learning motivation, they generally feel the digital storybooks to be interesting. Therefore, the result of the question "Learning with digital storybooks is much more interesting than reading traditional books" ($t=3.500$, $p=0.025$) reached significant level. Through the digital storybooks and in the near future to have gaming learning tasks can students obtain knowledge or restore the false knowledge in the learning process.

However, in "I would suggest my friends to read these digital storybooks" ($t=-0.612$, $p=0.573$), the average is 2.8 because one of the students answer "very disagree"; reversely, he answer "very agree" to the question "The storybooks are attractive to me." In the interview, he stated that because some students said these stories were not true stories so he would not want to recommend them to read these storybooks (sq-20110315-stu01.doc); but for those friends who like stories, he would suggest them to try these digital storybooks.

Table 4 T-test results of intrinsic motivation of users (N=5)

| Item | M | S.D. | t | p |
|---|---|---|---|---|
| 1.The storybooks give me a lot of fun. | 3.80 | 0.447 | 3.500* | 0.025 |
| 2. The storybooks are attractive to me. | 3.60 | 0.548 | 2.041 | 0.111 |
| 3. The storybooks can increase my reading motivation | 3.40 | 0.548 | 1.225 | 0.288 |
| 4. The storybooks provide me a lot of learning opportunities | 4.00 | 0.000 | -- | -- |
| 5. Learning with digital storybooks is much more interesting than reading traditional books. | 4.00 | 0.000 | -- | -- |
| 6. I would suggest my friends to read these digital storybooks | 2.80 | 1.095 | -0.612 | 0.573 |
| 7. I like reading more than before after reading these storybooks | 4.00 | 0.000 | -- | -- |

\* p<0.05

In the Pearson Correlation analysis to see the correction level between the four aspects (Table 5), it shows significant correlation between "storybooks" and "intrinsic motivation". The more the students like the storybooks, the more intrinsic motivation they have. Not only they would actively attend to reading, they start to show positive attitude to overall learning.

Table 5 Correlation between factors of digital storybooks

| | | Digital Storybooks | Content of Storybooks | Instruction of Storybooks | Intrinsic Motivation |
|---|---|---|---|---|---|
| Storybooks | Pearson Correlation | 1 | | | |
| | Sig. (2-tails) | | | | |
| Content of storybooks | Pearson Correlation | .515 | 1 | | |
| | Sig. (2-tails) | .374 | | | |
| Instruction of storybooks | Pearson Correlation | .553 | .704 | 1 | |
| | Sig. (2-tails) | .334 | .185 | | |
| Intrinsic motivation | Pearson Correlation | .924* | .742 | .804 | 1 |
| | Sig. (2-tails) | .025 | .151 | .101 | |

\* p<0.05

The students have positive attitude to reading digital storybooks can be attributed to the story-based reading materials. They accept more arrangements of learning tasks when reading stories, and can show positive improvement of learning effects.

## 6. Conclusion

Electronic books have become the trend today. But most of them are traditional text presented digitally on the digital book readers without much human-computer interaction. Especially for RD students, learning without appropriate instructional design can make learning more difficult for them. Using multi-sensory instructional design in the digital storybooks has proved by this research to help RD students to increase learning motivation. By completing the learning tasks in the storybooks, students can enhance their recognition of word sounds, shapes, use of punctuations and content comprehension.

It is suggested to let more children with or without special needs to test these digital storybooks to know how much such instructional design can help for enhancing reading abilities. Various difficulty levels of reading materials can be developed for different learning needs. It can also be considered to add more materials to enhance reading abilities such as writing and voice recognition since we have gained positive results from this research.

## Acknowledgements

## References

[1]  Calfee, R. C., & Piontkowski, D. C. (1981). The reading diary: Acquisition of decoding. Reading Research Quarterly, 16, 346-373.

[2]  Lerner, J., & Kline, F. (2006). Learning disabilities and related disorders: Characteristics and teaching strategies. Boston: Houghton Mifflin.

[3]  Perfetti, C. A. (1992). The representation problem in reading acquisition. In P.B. Gough , L.C. Ehri, & R. Treiman (Eds.), Reading acquisition (pp. 145-174).

[4]  Stevenson, H., Stigler, J., Lucker, G., Lee, S., Hsu, C., & Kitamura, S. (1982). Reading disabilities: The case of Chinese, Japanese and English. Child Development, 53, 1164-1181.

[5]  Simmons, A. (2002). The story factor: Inspiration, influence and persuasion through the art of storytelling. Cambridge, MA: Perseus Publishing.