# Learner Needs Analysis for Mobile Learning Comic Application among Dyslexic Children

Ronaldi Saleh, and Nor Aziah Alias

***Abstract*—**This research was reported as a partial process of the development on mobile learning comic application. Design and Developmental Research (DDR) six phase model was used in the development which involved (1) Identify the problem, (2) Describe the objectives, (3) Design & develop the artifact, (4) Test the artifact, (5) Evaluate testing result, and (6) Communicate the testing results. The focus of this research was only on phase one; identify the problem, where the researchers conducted Learner Need Analysis. Content Needs Analysis needs to be done later to complete the phase one. To get the data, a qualitative approach was used encompassing a triangulation of techniques and participant data. Dyslexic children were interviewed to find out their motivation in using mobile comic application, teacher was interviewed to obtain opinions about dyslexic children's acceptance in using mobile learning comic application, and drawing test was performed among the dyslexic children to find out the dyslexic children's preferences in certain comic style. The findings generated some guidelines to consider for the next phase of the development. These guidelines can be very useful for reference of any other similar developmental research for dyslexic children.

***Keywords*—**Mobile learning, mobile comic, developmental research, dyslexic children

## I. INTRODUCTION

Research revealed that comic can be used as learning tool, even if the comic is in multimedia format. According to Tilley (as cited by Alleyne, 2009), comics are just as sophisticated as other forms of literature, and children benefit from reading them as much as they do from reading other types of books. (Vassilikopoulou et al, 2007.) supports this belief and suggests that digital hypermedia comic has educational strengths. Through their research Vassilikopoulou reported that the feelings about the use of digital hypermedia comics as learning tool were positive. Most of the student-teachers thought that using comics helped them to think differently about the learning situations and to begin the process of restructuring their understanding, and it was easy to use too (Vassilikopoulou et al, 2007)

Comic can be beneficial in an interactive format too. Neil Cohn (2005) states that interactive comic plays an important role as a social interactivity for a further visual language. Interactive comic was believed to be "modality holistic", where real-time narratives combine all three "modalities" in which language can manifest: spoken, gestured, and drawn. Spoken language was used for various communicative purposes, gestured language provides a wealth of information in addition to speech and drawn language, and the visual that support the two languages. Interactive comic was suggested possible to provide personal preferences too. Pesonen (2001) report that Interactive comic is technology-based learning environment that provides an opportunity for personal differentiation in the learning material. It supports different learners and different learning styles. The personal feedback which is offered to the learners in the interactive comics motivates and guides their learning processes. Through his research, Pesonen further adds that interactive comics as a form of the learning material is an excellent way to inform learners about energy saving. This was based on the opinion of 60 % of the learners who took part to the learning experiment. 40 % of the learners thought that the comics were adequate for explaining energy issues.

Comic is also showcased in mobile device. In 2010, the author mobile comic application prototype showed on PDA (Personal Digital Assistance) named D-Mic and tested among dyslexic children. It was revealed that the dyslexic children were comfortable using the application on a PDA, although it was their first time using such technology. They were found to be very enthusiastic in learning the Malay language on D-Mic; they managed to interact with the application smoothly, and were able to perform the task with very little supervision (Ronaldi, 2010).

Dyslexia is a type of specific learning disability. Children suffers from dyslexia have certain difficulties in learning. There is no exact definition about dyslexia as it has been defined with different specific terms. According to Critchley (1970), dyslexia is a disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence, and socio-cultural opportunity. Constantinos *et al* (2004) found deficit specifically confined to cognitive processing and this may be due to sensory processing deficit. Some dyslexics were also stated slower or different in the conscious categorisation of auditory stimuli, that is, the conscious recognition and selection of stimuli for the purposes of a response.

Multimedia has been used as intervention program for special needs. Onintra (2007) found that educational software enhanced deaf students in their learning. Using multimedia is believed to be able to assist dyslexic learners too. Alty and Beacham (2006) suggested using words and pictures as well as auditory and narration without corresponding on-screen text.

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However, the focus of current research is not about curing dyslexia. It is about understanding the use of mobile comic application elements in the context of dyslexic children through a process of needs analysis. Need Analysis is part of developmental research. According to Richey & Klein (2007), developmental research is the systematic study of design, development and evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products and tools and new or enhanced models that govern their development. They also added that the design and development of instructional products and program is considered by many to be the heart of the instructional design and technology field.

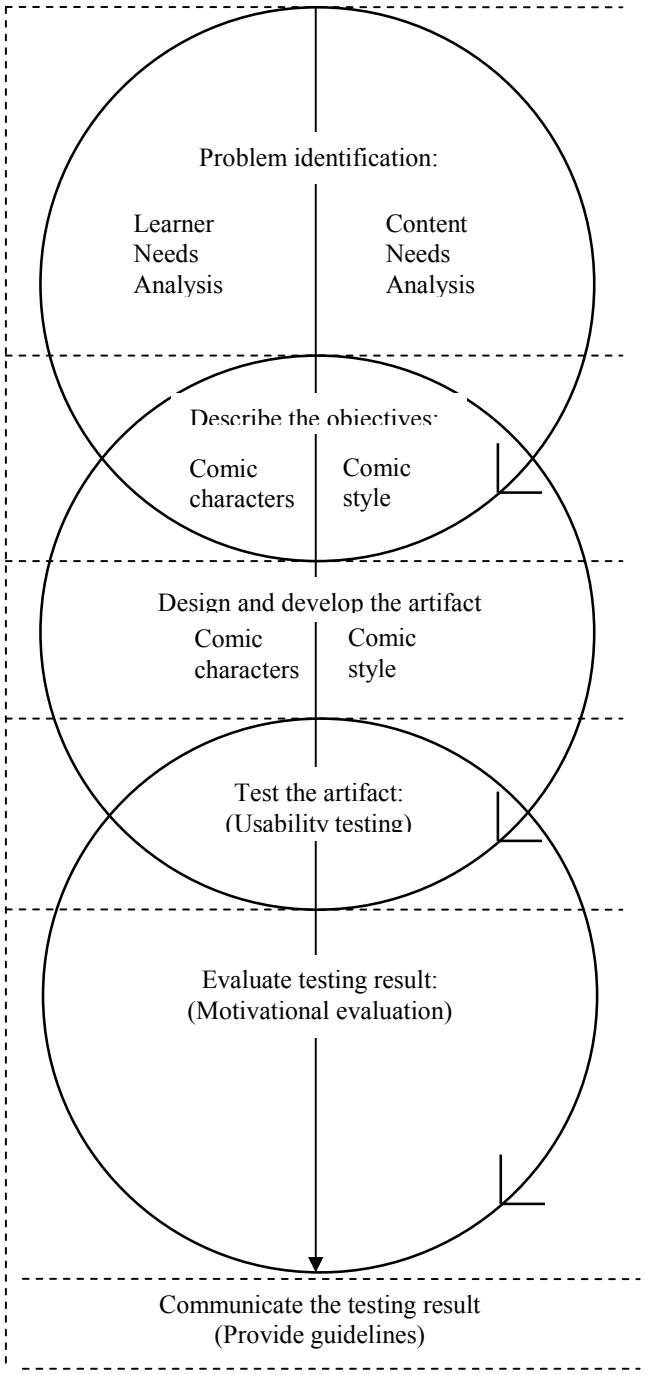


Fig.1: Conceptual framework of the overall research showing six phases top down. They are categorized based on three cycles of processes; Analysis cycle, Development cycle, and Evaluation cycle. This research focuses only on the Learner Needs Analysis part of the Analysis cycle.

In design and development research, research problems can come from problems related to emerging technology, where issues arise on how we can best take advantage of the potential new technologies. The aim of this research is to systematically collect and analyse all information necessary for the development of mobile learning comic application. Mobile technology is not a new area for dyselxics. Dimitar and Margarita (2004) revealed that soft computing mobile agent based service architecture solution has been developed as solution of remote learning problems for dyslexics.

## II. BACKGROUND OF STUDY

Preliminary research was done in identifying the need of developing mobile learning comic application. Fadilahwati et al (2010) has developed and tested an Interactive Multimedia Learning Object (IMLO) prototype version 1. One of the recommended future research was using animated character to create more interest amongst the dyslexic children. Ronaldi et al (2011) in his research about animation in special instruction for dyslexic children put forward recommendations that include the consideration of the dyslexic children's characteristics, and identification of topic problem and specific learning strategy. The two research was done using the same research sample; dyslexic children second year level at two dyslexia primary schools in Klang Valley, Malaysia. The points taken here is that animated character could create more interest amongst these dyslexic children and further needs analysis needs to be conducted in order to develop a special instructions for them.

Spafford and Grosser (1996, p.17), recommended that structured lesson activities that incorporate a multi-sensory interactive approach be used for the full benefit of enrichment for the students of dyslexia. Multisensory involving sound, animation, or video might create interest them. Many dyslexics have trouble paying attention, their mind tends to wander and they can't focus reading or other tasks for very long (Goldish, 2001). A particular animated characters and story might be the approach. Fadilahwati *et al* (2012) identified Amir cartoon character as one of the motivational components in her IMLO multimedia instructions for the dyslexic children. They also suggested comic approach because of potentiality of story elements. Thus, sample has been chosen and comic approach might be needed.

Mobile learning comic application may also be motivating and concurrently helping the dyslexic children in learning the content. School syllabus may be specially designed with instruction based on comic advantages. Shedroff (1994) suggested that data can be transformed to wisdom through certain steps.

In his Unified Field Theory of Design, Shedroff (Figure 1) states that knowledge is built through Interaction Design and the creation of experiences. The theory further explains stages how data can be transformed to become information (stage1), information to become knowledge (stage 2) and knowledge to become wisdom (stage3). It requires successful implementation at every stage to get meaningful wisdom. The researchers suggest further investigation in applying this theory in creating the instructional strategy using comic style.

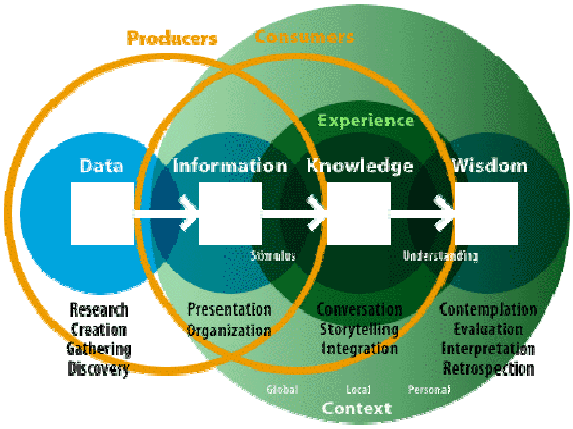


Fig.1: Unified Field Theory of Design describes the way to transform data into information. Information then can be consumed via experiences that generate knowledge. Experiences can then eventually generate wisdom.

To find out more about the potentiality, the dyslexic children were introduced to a mobile comic application which was downloaded from android market, namely: Annual Haircut Day. The application showed some comic style features such as visual storyboarding techniques; where illustrations are made with certain composition techniques, framing techniques (Figure 2) in a storyline to convey certain messages. Story characters were established and text was also placed explaining some important points. To use the application, the dyslexic children need to tab the application icon, select the menu, and read the story by navigating the next and back button.

Fig.2: Illustration on the left side shows the composition of situation where the main character influenced by the other four characters. The illustration on the right side shows the framing technique, where the jumping tiger is viewed from the bottom view and the diagonal lines represented the dynamic actions.

Such comic approaches are identified as viable to assist the dyslexic children. Everatt et al (1999) expound that attentional processes play vital part in reading. Comic might be approached through motivational factors. Melor *et al* (2011) has proven that digital comics can attract and encourage low achiever language learners to write in English.

According to Cognitive Evaluation Theory (CET), intrinsic motivation happens because of external consequences. The basic premise of CET is that if children feel they have some control over activities, have a sense of relatedness to the activity, and feel good about themselves when they participate, they will be intrinsically motivated to participate (Deci & Ryan, 1985). Mandigo (1999) explained four main propositions in CET;

- Preposition 1 was described as a moment when individuals participate in an activity in which they feel they have some choice and control over the process to reach personal goals, intrinsic motivation will be enhanced. Using mobile comic application, dyslexic students can be intrinsically motivated to experience the story with their own control. In this case, the mobile comic application might need to provide relevant story and certain visualization techniques (such as composition and framing) that give influence on the intrinsic motivation.
- Proposition 2 was described in a situation when that intrinsic motivation is enhanced by feelings of competence and optimal challenge. When the dyslexic students read story more, they can be challenged to understand the story more.
- Proposition 3 was described as the functional significance of extrinsic and intrinsic factors which can be viewed along a continuum as to their impact on intrinsic motivation. When the dyslexic students attached to the story, they can remain motivated and get used to the content materials.
- Proposition 4 was described as that individuals' motivational states towards the activity influence their intrinsic motivation. With the 3 prepositions achieved, The dyslexic students can be instructed to participate in activities such as test/assessment.

The above mentioned theories are considered when looking at possibilities of implementing the mobile learning comic application. But first, the researchers must conduct the Learner Needs Analysis would be utmost importance. The method of doing so is discussed next.

## III. RESEARCH METHOD

To obtain the data, the researchers used qualitative method with triangulation evidence. According to Denscombe (1998), in qualitative research, whether the data are in form of words or images, they are the product of a process of interpretation.

They have advantages such the data is that the analysis is grounded, there is richness and detail to the data, there is tolerance of ambiguity and contradictions, and there is the prospect of alternative explanations. Data was interpreted based on

1) Interview with teacher
   The outcomes identified useful opinions about dyslexic children acceptance in using mobile learning comic application and its possible approaches. An experienced teacher from a dyslexia school; SK Bukit Cherakah (one of primary school with dyslexia program in Malaysia) was interviewed. He has fifteen years of experiences teaching dyslexic students and actively involved in dyslexia workshops and seminars with the Malaysian Ministry of Education. He was interviewed on 12th January 2012. The feedbacks obtained were audiotaped and transcribed by two researchers.
2) Interview with the dyslexic children.
   Seven dyslexic students, three females, four males, age 9 to 10 years old from SK TTDI 2 (Dyslexia Pilot School in Malaysia) participated in the event. They were interviewed and observed on 2nd March 2012. The dyslexic children were introduced to a mobile comic application which was downloaded from android market, namely: Annual Haircut Day, and asked with fourteen closed ended questions from Fun Questionnaire (Donker, 2005). Majority agreements from the questions were obtained to find out whether the mobile comic application was motivating or not.
   The feedbacks obtained were recorded and played back for confirmation.
3) Cartoon preferences drawing test.
   All seven dyslexic children were asked to draw cartoon characters they like. The outcomes were reviewed and interpreted by two cartoon drawing lecturers from Malaysian universities. The lecturers have Master's Degree in Art. One with 5 years working experience, and one with 20 years working experience

Using triangulation in qualitative research has been proven useful by Gall et al (2005), where using simple multiple methods to collect data about the same phenomenon can enhance the soundness of the findings.

## IV. RESULTS AND DISCUSSION

The teacher was explained about the concept of mobile comic application and feedbacks were obtained. The interview with teacher has revealed some important points:

1) Dyslexic children need motivation while learning. They usually have short term attention span. Comic might help to overcome this problem since it provides attractive images in steps that could remain their attention.
   Referring to this point, the researchers look at similar approach of CET. Motivation can remain and learning process will sustain longer. Reid (2005) also believed that small steps in one task at a time are suggested for the content presentation. This feedback can be taken into consideration to plan the content structure
2) The best teaching strategies for the dyslexic children are using images and story that relates to the children's life. Such approaches can help the dyslexic children to form understanding on content. Comic can be a very good approach as teachers can tailor the visual based instructional strategies.
   It is believed to be important to have association of the text to other materials in teaching the dyslexic children Reid & Green (2007) stated that placing words together that have a common link will help dyslexic children remember more information and be able to recall in more organized and structure manner. This feedback was considered for designing the comic strip style.
3) Multimedia application is the area where dyslexic children never fail. They are very good using it. Mobile comic application can make them feel motivated, fun, and learning is personalized.
   At this point maybe it would be significant to found the specific type of multimedia application. In respond to multimedia technology evolution that becomes portable, Smythe (2010) stated that the issue in the future for dyslexic user is to discern how the functionality can be optimized and made dyslexia-friendly without a loss of functionality or portability.

In addition to these, the teacher also added that dyslexic children need a lot of practices. We may provide strategy to make them understand content better, but they need a lot of exercise. Similar feedback received when the researchers discussed about teaching approaches to dyslexic children to one professor of special education in Malaysian university, one professor of instructional design in United State of America. According to Goldish (2001), Gavin Reid (2005) and Gavin Reid & Shannon Green) also thought that variety of exercises as dyslexics need repetition of skill taught in different situation.

On the other hand, the dyslexic children were asked with fourteen closed ended questions using Fun Questionnaire adapted from Donker (2005).

For question number one, all seven dyslexic children admitted that they worked the mobile comic application without someone telling them to.

For question number two, majority of the dyslexic children admitted that they would like to work with the program when other children can decide for themselves what to do.

For question number three, majority of the dyslexic children admitted that they did not bored with the program.

For question number four, all seven dyslexic children admitted that they wanted to continue working with the mobile comic application when they started working with it. This finding is important to apply Cognitive Evaluation Theory, where in the beginning (at preposition one), intrinsic motivation should be enhanced and individuals should feel having some choice and control. Perhaps the cartoon characters and the comic style on the first screen have increased their intrinsic motivation.

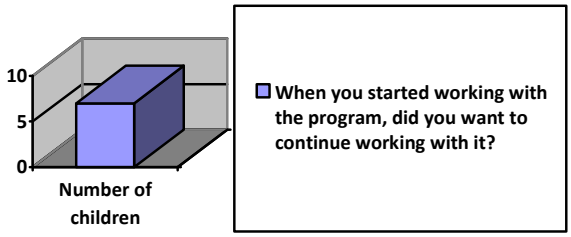


Fig.4: All seven dyslexic children might have their intrinsic motivation increased when they started using mobile comic application.

The first screen of the mobile comic application showed main cartoon character, hands of the supporting cartoon character, composition showing the main character with long hair and contrast colors on background (see Figure 5)

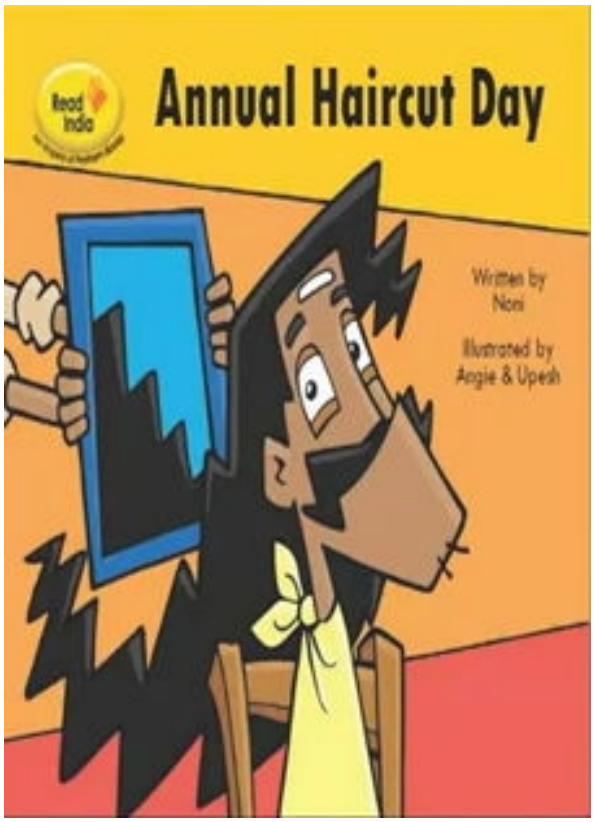


Fig.5: First screen of the mobile comic application was believed having some elements that increased the dyslexic children intrinsic motivation.

For question number five, all seven dyslexic children admitted that they thought their friends would like the mobile comic application.

For question number six, majority of the dyslexic children admitted that they thought the mobile comic application was childish.

For question number seven, majority of the dyslexic children admitted that the mobile comic application was not too difficult to play with.

For question number eight, majority of the dyslexic children admitted that when they have worked with the mobile comic application once, it remained fun (Figure 6).

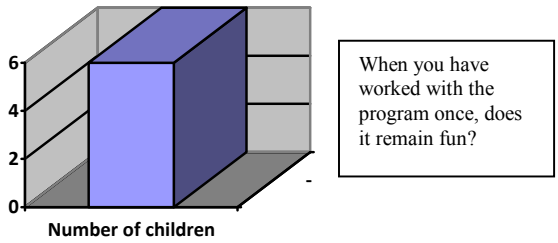


Fig.6: Majority dyslexic children remained fun as the used the mobile comic application.

What happened in the mid of the comic story, there were provocative situations in the storyline that question the dyslexic children's mind for what will happen next. Visually, the main character looked sad and more supporting characters were introduced (see Figure 7). According to CET, at preposition two level, intrinsic motivation is enhanced by feelings of competence and optimal challenge. Dyslexic children might feel optimal challenge and wanted to know more by watching the next scene.


Fig.6. The middle of the story showing the main character having problem. The situation created curiosity and made feeling of optimal challenge.

For question number nine, all seven dyslexic children admitted that they enjoyed themselves whey were working with the mobile comic application.

For question number ten, majority of the dyslexic children admitted that the mobile comic application contained many surprises

For question number eleven, all dyslexic children admitted that they would like to work with the mobile comic application more often.

For question number twelve, majority of the dyslexic children admitted that they performed well on the exercises in the program

For question number thirteen, majority of the dyslexic children admitted that they would to have the mobile comic application at home.

For question number fourteen, majority of the dyslexic children admitted that they made many mistakes while they were working with the program

Thirteen questions received with positive feedbacks, and one question received negative feedbacks. By meaning, majority motivational factors on the mobile comic application were accepted by the dyslexic children. Question number fourteen revealed that majority dyslexic children made many mistakes while working with the program. Further investigation was done through playback video record of the situation when the dyslexic children using the mobile comic application. The video observation generated the following results:

1. The whole experience from starting, using and closing the mobile comic application has been observed. It can be stated that the dyslexic children can use mobile comic application.
2. It was found that the mobile comic content was too long (5 minutes). The dyslexic children might have short term attention span as majority of them approximately retain their attention up to two minutes only.
3. Some of students were noticed to be confused with the navigation. They might need more obvious visual to indicate the navigation button.
4. Few students were impatience in finishing the story. They looked at the comic strip and were trying to find ways to complete the story by clicking around the screen.
5. All seven dyslexic children were very interested with elements that trigger their sensory such as hearing the sound effects and attractive visuals (see Figure 3).
6. All seven dyslexic children were also found spending time in observing the illustration and reading the text at the same time.
7. All seven dyslexic children understood the story and able to tell the story back using details such as situations, words used by the voice over as well as recalling the statement written on the screen.

Benefits of story in a form of multimedia has been proven. Peng *et al* (2009) revealed that computer assisted instruction in teaching Malay children folk tale found to have advantage there were no in storybook, namely have the audio and visual effect, behave interactive and student centre with have screen shot story, exercises and games.

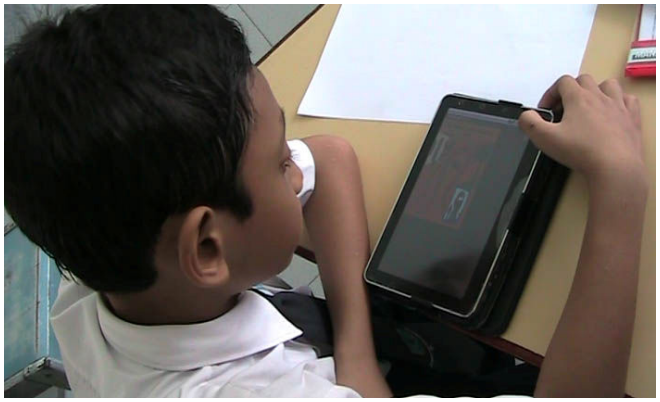

Fig.3: Dyslexic child was looking interested with the mobile comic application. His body gesture and facial expression showed that he was paying attention to it.

Further questions on demographic data revealed as follows:

1. Majority liked to read comic such as Ben 10, Cars, Boboiboy, Doraemon and Upin & Ipin. They also admitted that they like comic that has lots of actions.
2. All seven dyslexic children were motivated to use mobile comic application.
3. Majority have used tablet before. They are iPad and Galaxy Tab. (Fig.4)
4. Majority also confessed that they wished to have such mobile comic application for their school subjects such as Bahasa Malaysia, English, Math and Science (Fig. 5).

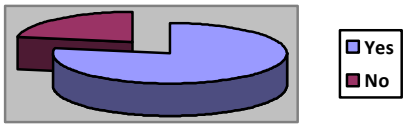


Fig.4: Majority dyslexic students wished to have such mobile comic application for their school subjects.

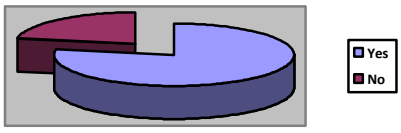


Fig.5: Majority dyslexic used iPad/Galaxy Tab before.

While using the application, the dyslexic children were observed on their behavior based on Fun Questionnaire questions. The moment was videotaped, played back and reviewed by second observer. The finding confirmed the previous interview results.

After using the application, the dyslexic children were also observed in terms of the words used while they retell the story with details. Majority of the students were found able to repeat the text written in the story.

All seven dyslexic children were also asked to draw cartoon character they preferred, revealing some popular cartoon characters such as Angry Birds, Upin & Ipin, Boboiboy, Spiderman, Mickey Mouse and Mini Mouse (Figure 6). Through a review by experts it was found out that majority of the dyslexic children preferred cute characters showing big head, smiling, with soft and contrast colors. Preferences were also noted in terms of actions with a lot of supporting picture elements such as background, visual effects and as well as supporting characters. Situations preferred were believed cheerful and adventurous. Possible stories were believed to be friendship, teamwork and happiness. Contrast colors were also noticed. Majority colors used were yellow, orange, yellow, brown, purple, red, and green.


Fig.6: Example of cartoon drawing done by a dyslexic child showing boboiboy cartoon character with some additional elements such as butterfly, clouds, and few animals. Colors used were contrast combination orange, yellow, green, purple, red and brown.

## V. CONCLUSION

Positive feedbacks obtained from three resources. The teacher believed that comic has potentiality of visual instructions, the dyslexic children were motivated using mobile comic application, and also showed positive feedbacks on comic preferences.

Based on the teacher's opinions, mobile comic application can be a good approach to teach dyslexic children as it provides tailored visuals, story that relates to their lives and multisensory engagement. These benefits can help the dyslexic children to overcome their difficulties in learning.

Based on the student interview, the dyslexic children were found to be motivated using mobile comic application. Comic style features composition techniques, framing techniques, story characters and contrast colors were found to be relevant and useful.

Based on the observation, the experience of dyslexic children using mobile comic application was found to be positive. Dyslexic children also need to be motivated consistently to retain their attention span.

Based on cartoon preferences drawing tests by the dyslexic children, approaches using stories about teamwork, friendship, and happiness with cheerful or adventurous situation were found viable. In terms of cartoon characters, dyslexic children preferred cute characters showing some actions with visual effects. In terms of colors used, they preferred contrast colors.

The researchers concluded that using mobile interactive comic could have its own benefit for dyslexic students as it is personal. The personal feedback which is offered to the learners in mobile comics might motivate and guides their learning processes.

The findings above generated a set of guidelines that could be used to design instructional materials for dyslexic children. Following this study, the researchers will proceed to Content Needs Analysis.

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