



Guidelines on the use of vocabulary flashcard applications to develop reading skills of children with learning disabilities

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Abstract

Flashcard production requires a multi-step process, which takes time and requires resources. Ready-made Flashcards that the instructor produced may not communicate the intended objectives. The researcher used the idea to combine technology with traditional teaching media to make the teaching and learning of children with special needs more effective. The present research aimed to study the guidelines on the use of vocabulary flashcard applications towards reading skills of children with learning disabilities. A qualitative methodology was applied in the research. A literature review was conducted to study documents and research papers related to writing and developing vocabulary applications for children with learning disabilities, vocabulary learning and evaluation of reading skills. An interview form was designed based on the results of the literature review and used to collect data from 3 groups of informants: experts in learning applications and experts in children with learning disabilities, guardians of children with learning disabilities and teachers of students with learning disabilities. Each group consisted of 3 informants. The results show that the informants have no experience using learning applications for children with learning disabilities. However, they have positive attitudes towards learning applications because they think that learning applications are useful tools that will help to encourage children's interest in vocabulary learning. In their opinion, a flashcard application is an alternative way of teaching, that can be used with regular teaching, especially for young children who love to touch things, look at pictures and watch cartoons.

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Introduction

According to the National Education Act (No. 3) B.E. 2553 Chapter 4 Section 22, education shall be based on the principle that every student is capable of learning and developing and places students as the main priority. Therefore, education must encourage students to develop naturally to their full potential. Educational institutions and related organizations must provide learning content and activities that are consistent with students' interests and aptitudes and take account of individual differences and support teachers in creating a learning environment with

facilities provided and conducting research as a part of the development of a learning process. Teachers and students can learn from teaching and learning materials and different types of technology resources together. Learning should happen anytime and anywhere with a collaboration between parents, guardians and community members (Office of the National Education Council [ONEC], 2017), which is consistent with the 3rd development plan of Thailand Digital Economy and Society Development Plan (Ministry of Digital Economy and Society, 2017), which aims at building a quality society in which every population group, especially people with disabilities and disadvantaged people, can access and benefit from digital technology in order to increase the opportunity for every age group to receive standard education anywhere and anytime.

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Nowadays, technology plays a more important role in education. There are web-based instruction (WBI), online learning and computer-assisted instruction (CAI), etc. Portable computing devices such as smartphones and tablet computers are used for conducting education, known as mobile learning, which is an innovation that is likely to become widespread in the 21st century. Research has been conducted on mobile learning in foreign countries lately. The results show that mobile learning is an effective way of teaching and learning, and the design of learning environments by portable communication technology provides the greatest benefit to students' learning (Churchill, King, & Fox, 2013). This is consistent with Monchai Tiantong's research study titled M-Learning: A New Paradigm of E-Learning (Tiantong, 2004) which found that students' knowledge levels were higher when studying via m-learning than studying in regular classrooms at a significant level of 0.05 and that students had a high level of overall satisfaction towards m-learning. The study also found that m-learning could meet students' individual differences.

An application is a computer software designed for portable computing devices. Applications designed for desktop computers and laptops are called desktop applications while applications designed for portable computing devices are called mobile applications. Today, the use of applications in operating systems on portable computing devices is a technology advance that plays a role in human lives and can be easily accessed. Therefore, applications have been developed to maximize the capabilities of applications related to work, education, and entertainment, etc. Education applications are playing a major role in the development of students' learning. They are considered as education innovations which are consistent with the government's promotion policies on the use of modern technology, which allows education personnel to access data, prepare teaching materials or manage education management systems easily and efficiently, conforming to the goal of Thailand 4.0 Model that focuses on technology development, creativity, innovation, science and technology in different fields (Tesarin, 2017). In addition, the use of applications on portable wireless devices in classrooms will increase the participation of teachers and students in learning because they allow teachers and students to share information, ask and answer questions and exchange feedback in a quick and convenient way (Ratto, Shapiro, Truong, & Griswold, 2003).

The use of applications in teaching vocabulary to children is an extremely important education innovation because vocabulary is a basic factor of language learning in children. Since their intelligence is not fully developed and language has abstract characteristics, symbols such as pictures are thus used to convey meaning. Children learn new vocabulary by listening to their parents and close people's conversations. They imitate the sounds they hear from other people and try to speak by using the words they learn. Children gradually expand their vocabulary and combine words to make sentences, following the steps of children's language development. However, ways to enhance children's language learning should vary according to their individual differences to help them achieve effective language learning. Vocabulary teaching should have 4 key elements: 1) encouraging children to learn age-appropriate vocabulary used in everyday life, 2) stimulating children's

interest in vocabulary learning through rewards, fun games and activities and vocabulary mapping to broaden their vocabulary, 3) teaching vocabulary in creative and fun ways and allowing children to participate or practice to boost vocabulary memorization and 4) testing, reviewing and using vocabulary in real life.

Children with special needs refer to children who need special support due to their physical, mental or intellectual disabilities and children with special educational needs (SEN) which vary according to their conditions (Churchill and Wang, 2014). This is consistent with Suriwong (2016), who said that children with learning disabilities have special cognitive characteristics that are different from other children. Parents should know in what way children have defects. Therefore, media that are specific to children should be designed whereby specialized medium will help the child develop faster because in the children's reading media, there are not only letters but also various art images as an element, which can affect the mood of children. Therefore, children's books for learning disabilities should use fewer texts and focus more on pictures. Instead of using letters to tell stories, children have to understand the images they see and use their imagination and create stories themselves. These results in learning and imagination processes, which lead to the development of other skills such as listening, speaking, writing and critical thinking. The objective of this research is to increase vocabulary in children with learning disabilities because their conditions negatively impact their perception and learning, resulting in slow progress in reading and writing, which makes them unable to keep up with their classes. The basic factor of children's language development is vocabulary. To help children learn sufficient vocabulary and help them read and spell words, popular materials for teaching vocabulary are flashcards which display words, pictures or numbers. Flashcards are usually made of paper. There are also flashcard software and DVDs, but typically, teachers will make their own flashcards that are suitable for their teaching content and each student's capability. However, the process of making flashcards consists of a lot of steps, wastes resources and only a small number of flashcards, which can be used in classrooms only, can be produced. Students cannot take them to study at home. Moreover, ready-made flashcards may not be able to convey the meanings as intended.

Accordingly, the researcher used the idea of integrating technology into existing vocabulary teaching materials to enhance the effectiveness of vocabulary teaching in children with special needs and help teachers create flashcards more easily by developing vocabulary flashcard applications that allow users to create their own flashcards by taking pictures with their portable computing devices, such as smartphones and tablet computers, or using any image files they want. Some pictures that appear on flashcards in the applications may be taken from children's real-life experiences, which helps them to connect ideas. Vocabulary words and pronunciations can be added to help children learn vocabulary by seeing and hearing at the same time. Children can review vocabulary and do vocabulary exercises. The results will be sent to their teachers, parents and guardians to inform them about their children's reading levels.

Methodology

A study of guidelines for using vocabulary learning applications through flashcards on reading and writing skills for children with learning disabilities was undertaken. The researcher studied research papers related to writing and application development, vocabulary teaching for children with special needs, vocabulary learning and assessing reading and writing skills. Qualitative data were collected by creating an interview form with the interview questions divided into 6 sections, namely 1) experience in using the application, 2) attitude, concept, or organization of activities related to the application of the application, 3) the necessity of use of applications, 4) benefits of applications, 5) guidelines for the development and use of applications, and 6) factors that play an important role in the development and use of vocabulary flashcard applications to develop reading and writing skills of children with learning disabilities. In order to find quality before going to collect data, quality inspection of research tools by the method of content validity check of 5 experts in terms of content coverage was carried out. The correctness and appropriateness of the language, suitability of variable measurement methods, the appropriateness of the measurement proportions in each variable and other additional suggestions by the quality of tools in content straightness of each question must have an IOC value of between 0.60–1.00 to show that the quality of the research tools in terms of content validity meets the criteria set by the researcher.

The interview form was used to collect data from the data providers, consisting of 3 groups, 3 informants per group which were 1) experts on learning applications and experts with children with learning disabilities, 2) parents of children with learning disabilities and 3) teachers of children with learning disabilities. Data obtained through interview forms were analyzed using content analysis. Flow of Methods is shown in the Figure 1.

Results

The researcher presented the analysis results of the study of guidelines on the use of vocabulary flashcard applications to develop reading skills of children with learning disabilities

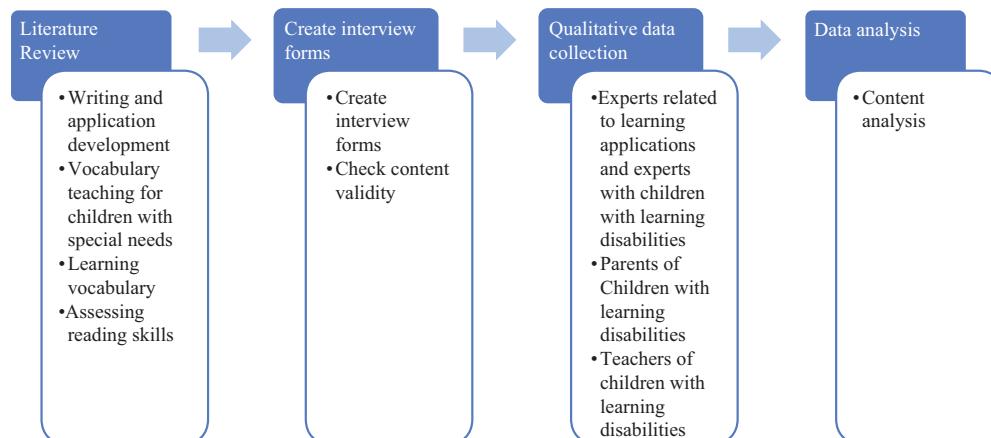


Figure 1 Flow of Methods

according to the research objectives based on the main points obtained from the interviews with teachers, psychology experts, technology experts and children's guardians regarding guidelines on the use of vocabulary flashcard applications towards reading and writing skills of children with learning disabilities. The results were divided into 6 main points according to the interview questions.

Point 1 Experiences of Using Vocabulary Flashcard Applications for Children with Learning Disabilities

According to the results, teachers, psychology experts, technology experts and guardians have no direct experience using vocabulary flashcard applications for children with learning disabilities to improve reading and writing skills of children with learning disabilities due to their unawareness of vocabulary flashcard applications specifically developed for children with learning disabilities. However, they have experiences with applications for improving reading and writing skills for normal children. Most of them are ready to use applications because they are familiar with social media applications on smartphones, tablet computers and laptops.

Point 2 Attitudes, Ideas or Organizing Activities Related to the Use of Vocabulary Flashcard Applications to Assist, Enhance and Support Learning in Children with Learning Disabilities

The results show that teachers, psychology experts, technology experts and guardians have positive attitudes towards vocabulary flashcard applications because they think that vocabulary flashcard applications are useful tools that will help encourage interest in vocabulary learning in children with learning disabilities. However, there are things that need to be considered when using vocabulary flashcard applications which are as follows.

1. Individual differences of children with learning disabilities need to be taken into account because children like different things and have different interests. Therefore, children's readiness should be assessed before using vocabulary flashcard applications to help children prepare for learning, which will enhance the effectiveness of vocabulary flashcard applications.

2. Children's interest should be encouraged, which will lead to attention in learning and good vocabulary memorization. Vocabulary flashcard applications help to develop children's attention in learning and create short-term memory. Teachers or guardians need to help children connect new information to their prior knowledge to create long-term memory, which is meaningful learning according to Ausubel's theory.

3. Appropriate time limits for using vocabulary flashcard applications need to be set to prevent smartphone addiction in children. Teachers or guardians should stay with children while they are using vocabulary flashcard applications or use vocabulary flashcard applications with them. Not only will it help control time spent on vocabulary flashcard applications, but it will also make teachers or guardians aware of learning problems or development of children with learning disabilities.

Point 3 Necessity of Vocabulary Flashcard Applications towards Reading and Writing Skills of Children with Learning Disabilities

According to the results, teachers, psychology experts, technology experts and guardians think that vocabulary flashcard applications are not really necessary for developing reading and writing skills of children with learning disabilities. However, they think that a vocabulary flashcard application is an alternative way of teaching that can be used with regular teaching, especially for young children who love to touch things, look at pictures and watch cartoons.

Point 4 Benefits of Vocabulary Flashcard Applications towards Reading and Writing Skills of Children with Learning Disabilities

The results show that teachers, psychology experts, technology experts and guardians think that vocabulary flashcard applications are useful for vocabulary learning in children with learning disabilities in many aspects. Vocabulary flashcard applications can attract children's attention to learning for a longer period of time unlike regular teaching that makes children lose their attention quickly. Learning vocabulary through flashcard applications is like playing games with pictures and sounds, which is suitable for children who love to play and have fun and never get tired of learning due to their nature, leading to their better development of vocabulary reading and writing skills. Moreover, this learning method allows children to create vocabulary words from their surroundings. They will connect vocabulary words to their surroundings, leading to better memorization. There are many ways to use vocabulary flashcard applications for teaching. Teachers' readiness needs to be taken into account. To use vocabulary flashcard applications in computer classes or other classes, teachers should integrate vocabulary flashcard applications with their course syllabuses as extra tools that will help students learn and memorize vocabulary better by developing them so that they can give feedback to students and using various types of reinforcement during learning.

Point 5 Guidelines on Developing and Using Vocabulary Flashcard Applications towards Reading and Writing Skills of Children with Learning Disabilities

To develop and use vocabulary flashcard applications for maximum effectiveness, the application developers should consider the appropriateness of the application usage of

learners who are children with learning disabilities and have individual differences. Learners should be evaluated and divided into groups before using vocabulary flashcard applications and learning should be divided into levels to match each group of learners' readiness. For the development of application content, the important thing is to encourage learners' interest in learning by presenting teaching content in the form of stories with both actual photos and cartoon images which may be categorized into groups of things that are connected with them such as body parts, nearby places and signs and allowing them to draw story pictures because most of the children love drawing and can remember pictures better than words. Picture and font sizes appropriate for children's vision should be set. There should also be sounds or messages that compliment and cheer up learners during learning to motivate them to work harder. Learning through flashcard applications can be integrated into various classes other than vocabulary teaching to make regular classes such as science, math and art become more interesting.

Point 6 Significant Factors Affecting the Development and Use of Vocabulary Flashcard Applications towards Reading and Writing Skills of Children with Learning Disabilities

Significant factors affecting the development and use of vocabulary flashcard applications can be divided into 2 groups: application factors and human factors. Application factors cover devices used for applications and design of learning content that is appropriate for learners with learning disabilities, easily accessed and interesting. Human factors are connected with people who significantly influence learners' learning consisting of school administrators, who play a major role in determining policies and supporting the use of devices and applications, teachers, who assist students in using applications and provide teaching to students and need to receive training to understand how to use applications and be able to teach students, and guardians, who need to be ready to use applications for teaching children in terms of knowledge and understanding of how to use applications and have time to learn with children to ensure their understanding of learning content and appropriate time limits. Details of the results are summarized in Table 1.

Discussion

The results show that teachers and guardians have no experience using vocabulary flashcard applications for children with learning disabilities for teaching vocabulary to children but have positive attitudes towards the applications because they think that the applications are useful tools that will help encourage children's interest in vocabulary learning. Applications have been developed to use on portable computing devices to facilitate daily life and have been used as teaching and learning materials that learners can access anywhere and anytime as well as extra teaching tools for teachers (Whattananarong, 2017). Most people have positive attitudes towards applications and are willing to learn to use new applications if they know how the applications can benefit them. However, teachers, psychology experts, technology experts and guardians think that vocabulary flashcard applications are not really necessary for developing reading

Table 1 Summarization of the results collected with key-informants

Theme	Results of the key-informants
Experience of using VFA	Key-informants reported no experience of using VFA since they are unaware. However, they are ready to start.
Attitude toward VFA	Key-informants reported that VFA makes learning more interesting, makes children more interested in playing than normal, gets attention and is meaningful, but should be used with parents. Has the need to think about children becoming addicted to the phone.
Necessity of VFA	Key-informants reported that VFA is necessary because children like to touch, however, some believe that VFA is not very necessary, but see it as an alternative way to learn.
Benefit of VFA	Key-informants reported that VFA helps children to develop, be interested in learning, helps children to understand words more easily by creating words themselves and as a vocabulary around children. Helps to build interest and remember vocabulary.
Guideline development for VFA	Key-informants reported that VFA can create stories, have a library of both real pictures and cartoons, can also draw pictures, categorize learning levels according to children's abilities, sounds or illustrations, compliments and gives encouragement, sizing alphabet pictures suitable for children, can be used to integrate knowledge in many subjects both the knowledge and readiness of children.
Significant factors affecting VFA	Factors that play an important role can be divided into 2 factors, which are <ol style="list-style-type: none"> Application factors for which the device and the application are very important. Personnel factors, such as school administrators must be used as an alternative to teaching and to support the device in use, the teacher acts as a facilitator and organizer, parents are ready to use. There is a manual and video demonstration.

and writing skills of children with learning disabilities. They think of a flashcard application as an alternative way of teaching that can be used with regular teaching.

The major benefit of vocabulary flashcard applications towards vocabulary learning in children with learning disabilities is that they attract children's attention to learning and keep them entertained and interested in learning because learning vocabulary through flashcard applications is like playing games with pictures and sounds, leading to better development of vocabulary, reading and writing skills. It is consistent with Office of the Education Council (2014)'s mobile learning benefits. According to them, mobile learning enhances self-learning because learners can learn anywhere and anytime and expands opportunities for people to gain access to learning sources and education resources. This is consistent with Gulatee and Combes (2018) who said that the multifunctional nature of mobile phones means that students can access information for their subjects, communicate with their lecturers and the university, and even upload assignments, from anywhere, and at any time. It is also consistent with Chen, Sager, Corbitt, and Kent (2008) who found that the use of applications on portable wireless devices as teaching materials enhances various ways of learning and increases learners' interaction with different learning methods if used appropriately. Additionally, learning environments where teachers and students interact with each other via wireless devices can help enhance the effectiveness of teaching better than traditional teacher-centered learning environments (Enriquez, 2010).

The major guideline on developing and using vocabulary flashcard applications is that the application developers should take account of learners with learning disabilities and their individual differences. The development of application content should encourage learners' interest in learning by presenting stories with pictures and sounds or messages that compliment and cheer up learners, which is consistent with Abdul Rahman, Mokhtar, Alias, and Saleh (2012) and his colleagues. They studied the elements of learning materials for children with learning disabilities and found that the use of cartoon images, graphics, background and button design and sounds and the use of feedback in the forms of musical sounds, texts and animated graphics can make teaching and learning more interesting and encourage children's interaction with teaching and learning methods, which will lead to effective

learning. People who have significant influences on learning in children with learning disabilities consist of school administrators, who play a major role in determining policies and supporting the use of devices and applications, teachers, who assist students in using applications and provide teaching to students, and guardians, who need to be ready to use applications for teaching their children. Therefore, clear handbooks and instructional videos should be provided to people related to children before the use of applications.

Conclusion

The study of guidelines on the use of vocabulary flashcard applications to develop reading skills of children with learning disabilities was conducted using a qualitative methodology by using an interview form designed based on the results of a literature review on writing and developing vocabulary applications for children with special needs, vocabulary learning and evaluation of reading skills to collect data from experts in learning applications and experts in children with learning disabilities, guardians of children with learning disabilities and teachers of students with learning disabilities. The results show that vocabulary flashcard applications for children with learning disabilities have not yet been widely developed for teaching vocabulary to children with learning disabilities. Accordingly, related people have no direct experience using the applications. However, they have positive attitudes towards the use of vocabulary flashcard applications as extra tools for encouraging children's interest or teaching and learning vocabulary in children with learning disabilities. In their opinion, vocabulary flashcard applications significantly benefit vocabulary learning and reading and writing skills of children with learning disabilities because they help attract children's attention to learning. Moreover, learning vocabulary through flashcard applications is like playing games with pictures and sounds, which is suitable for children who love to play and have fun and never get tired of learning in their nature, leading to their better development of vocabulary reading and writing skills. This learning method allows children to create vocabulary words from their surroundings. They will connect vocabulary words to their surroundings, leading to better memorization. To use vocabulary flashcard applications for teaching, teachers' readiness needs to be taken into account.

Significant factors affecting the development and use of vocabulary flashcard applications are application factors which cover devices used for applications and design of learning content that is appropriate for learners with learning disabilities, easily accessed and interesting, and human factors which consist of school administrators, who determine policies and support the use of devices and applications, teachers, who use applications and provide teaching to students and guardians, who need to be ready to use applications for teaching children in terms of knowledge and understanding of how to use applications and have time to learn with children to ensure their understanding of learning content and appropriate time limits.

Examples of applications and functions of LD Cards are shown in Figure 2.

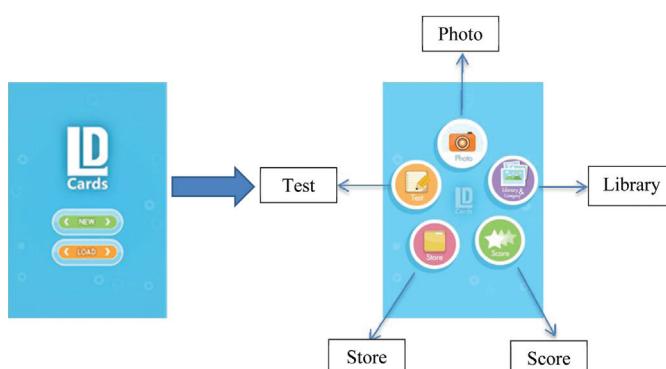


Figure 2 Applications and functions of LD Cards

Implications

Related organizations and educational institutions can apply the results of this study to their operations as follows:

1. There should be policies on promoting the development of education innovations to enhance reading skills of children with learning disabilities that can be used for developing teachers' teaching and research which will benefit both teachers and students. Related organizations should work in collaboration on developing and encouraging the use of innovations on a wide scale.

2. To use vocabulary flashcard applications, individual differences of children with learning disabilities need to be taken into account. Accordingly, children need to be evaluated and prepared before using the applications to encourage their interest and focus on learning. Teachers or guardians should stay with children while they are using the applications so they can be aware of their learning problems and development and ensure appropriate time limits.

3. To design and develop vocabulary flashcard applications, the application developers should consider the appropriateness of the application usage of learners who are children with learning disabilities and have individual differences. Therefore, learning should be divided into levels to match each group of learners' readiness. For the development of application content, it should encourage learners' interest in learning by presenting stories with both actual photos and cartoon images or allowing learners to draw story pictures by themselves because learners who are children love drawing and can

remember pictures better than words. There should also be sounds or messages that compliment and cheer up learners during learning to motivate them to work harder.

Recommendations

1. Extend the results by conducting in-depth research which may be a case study or a group discussion to explore guidelines on developing education innovations that can be used for enhancing the effectiveness of learning processes in students with learning disabilities.

2. Study methods of developing teachers so that they can effectively use vocabulary flashcard applications as teaching and learning materials for children with learning disabilities with existing teaching and learning methods.

3. Study ways of stimulating children's interest in using vocabulary flashcard applications such as interesting rewards for children, reward point collection and clapping or complimenting sounds to encourage children's interest and intention of continuous learning.

Conflict of Interest

There is no conflict of interest.

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