Effectiveness Studies ThinkAloud Against Autistic Students

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Abstract

This study aims to help autistic students who face problems in learning English subjects through the development of the ThinkAloud application. In addition, this study aimed to examine the effectiveness of ThinkAloud on English mastery among autistic students. ThinkAloud is an application that uses drag-and-drop operation techniques that focus on positive stimuli to maintain student motivation, momentum, and attention to continue using the software until the end. The application uses Adobe Captivate 9 as its platform, and the development methodology used is the ADDIE model. This descriptive study used a sample of 10 autistic students from SMK Paya Besar, Kuantan, Pahang. A comparative analysis using Microsoft Excel showed that 7 out of 10 samples showed a positive increase in mastery of English subjects. It is hoped that ThinkAloud can help and stimulate autistic students in Malaysia to master English skills better.

Keywords: Autism; ThinkAloud; Game-Based Learning

1.0 Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder. It is a developmental disorder where children experience disturbances in social interaction, communication, and behavioural and cognitive problems. It causes autistic individuals to struggle to master the knowledge teachers teach (Chodidjah & Kusumasari, 2018). Autism can be identified through the lack of effort in communicating or social interaction experienced by an individual, in addition to exhibiting different interests and behaviours (APA, 2013). This disability has various characteristics, including difficulties in social interaction, communication, and repetitive behaviour patterns. The National Association of Autism Malaysia (NASOM) explains that autism is a complex developmental disability that usually appears within the first three years of life due to a neurological disorder that affects brain function. Individuals with autism have difficulty communicating directly.

The use of Game-Based Learning (GBL) for special students is seen as supporting and enhancing the effectiveness of the country's special education system. It aligns with the education-for-all goals set by SEAMEO (The

Southeast Asian Ministers of Education Organization) in 2015. This target also aligns with the 2015 Millennium Development Goals program set by UNESCO (United Nations Educational, Scientific and Cultural Organization). In addition, this is also in line with the goals of Quality Education outlined by the Sustainable Development Goal (SDG) set by the United Nations (UN) in 2015.

The construction of English GBL for autistic students is also a step toward realizing the government's dream of providing this group the best access to education through OKU policy strategies, especially in accessibility and education (JKMM Disability Policy, 2007). This policy encourages access to information and communication technology (ICT) facilities. In contrast, in the education aspect, it aims to increase OIC's access to comprehensive education, including lifelong education (PSH). In addition, this effort aligns with the National Education Philosophy, which suggests continuous efforts to optimize individual potential, including special education students.

This study was conducted to develop Game-Based Learning (GBL) known as ThinkAloud. ThinkAloud is an application that uses drag-and-drop operation techniques that emphasize stimulation to students to keep their motivation momentum and focus on continuing to use the software to completion. This software uses a touchscreen device as its platform. This app is specifically designed for basic English subjects and focuses on helping students with autism problems to better master basic English.

2.0 Objectives

The main objective of the study is:

Testing the effectiveness of ThinkAloud through mastery of English subjects on autistic learners.

3.0 Literature Review

Autism is a well-known developmental disorder characterized by an inability to communicate, limited social interaction, and repetitive behaviour. According to Ghaziuddin & Ghaziuddin (2020), autism is a neurodevelopmental condition that significantly impacts individual development and learning, including in the context of English language learning.

Students with autism often face challenges learning English due to their distinctive characteristics. According to Shaari & Yusof (2019), they may experience difficulties in understanding spoken language and expressing themselves in English. It can cause them to feel frustrated and lack confidence in learning this language.

In addition, autistic students also tend to have difficulty understanding social cues and non-verbal communication, which are important in language learning. According to Zhagan & Hui (2021)., the inability to interpret facial

expressions, tone of voice, and body cues can hinder understanding English in real communication situations.

In this context, it is important to understand that autistic students need appropriate learning approaches and additional support to master English. Apps like ThinkAloud may be able to help overcome some of these challenges by providing support focused on their specific needs.

Previous studies on the use of interactive applications in autism education have yielded valuable findings regarding the app's potential to improve the learning and communication skills of autistic students. In research by Ahmad and Tan (2018), it was found that the creative use of interactive applications can provide an effective platform to improve the verbal and non-verbal communication skills of autistic students.

Wong et al. (2020) have conducted a study on the impact of using interactive applications in the context of English language teaching. Their study showed a significant increase in autistic students' understanding of the English language. These results align with the findings obtained in this study, which showed a positive increase in English mastery among autistic students.

Moreover, a study by Mohd Ali et al. (2019) explained that interactive applications can be useful for engaging autistic students in teaching and learning activities. Its ability to provide continuous positive stimulation may make it an appropriate tool for building learning abilities among autistic students. Rashidah Lip et al. (2018) stated that the delivery of multimedia teaching and learning is more attractive to students because it is fun and easy to practice.

Therefore, previous studies have shown that the use of ThinkAloud in autism education, including in the context of English language learning, has gained recognition for improving autistic students' skills and communication. These findings support the use of ThinkAloud in this study as a relevant approach to improving English proficiency among autistic students.

The importance of using GBL in learning and teaching sessions involving autistic students has also been supported through previous studies. According to a study conducted by Williams C. et al. (2007), there are differences in reading learning between autistic students who are guided by textbooks compared to autistic students who are guided by computers. According to him, these autistic students are more likely to use computers for their learning sessions than textbooks. This finding is supported by Intan & Hariz (2021), that the use of assistive technology can allow an individual with disabilities to compensate for his or her disability or be able to overcome the disabilities faced completely.

In the e-learning context, GBL can be applied and provide opportunities for students to control learning sessions. This finding aligns with Simamora, L. (2002) and Muzafar & Hasmadi (2019), who stated that e-learning is

important because it allows students to choose the time and place to follow learning. Therefore, this proves that computer-based GBLs such as ThinkAloud can help these special students master knowledge in the classroom.

However, according to Nor (2021), some teachers feel that children with special needs do not need a sophisticated teaching approach, considering their potential and achievement are very low compared to normal children. It will cause these special students to be recited (Mohd Fikri & Aliza Alias, 2020) and will cause them not to be independent on their own. To ensure that the teaching process is more interesting and effective, Special Education teachers need to be knowledgeable and proficient in diversifying teaching methods (Siti Muhibah & Zetty Nurzuliana, 2018).

In this regard, a sophisticated teaching approach is needed to help them master the knowledge to enable them to be independent in the future. It can be overcome if applications such as ThinkAloud are developed to help teachers, especially English subjects, to attract students in the classroom while helping them master knowledge and be independent in the future. Therefore, applications like ThinkAloud must be developed and tested for effectiveness to be used in real educational fields.

4.0 Methodology

This ThinkAloud Effectiveness Study on Autistic student uses descriptive quantitative study methods. This study used 10 Special Education students studying at SMK Paya Besar, Kuantan, Pahang, as a sample. The sample was selected using a selection technique based on criteria, namely autistic students, with the help of Special Education teachers. The sample size was also selected based on the Krejci & Morgan (1970) sample size determination table. According to this table, if the study population involves 10 people, the sample size should be the same amount.

This application uses *Adobe Captivate 9* as a development platform. ThinkAloud's coaching methodology also uses the ADDIE Model. This model has 5 phases of development of a product. The phases are the Analyse, Design, Development, Implement, and Evaluation phases. According to Roger Smith & Lacey Edwards (2006), the ADDIE Model is an instructional approach used in strengthening or developmental exercises.

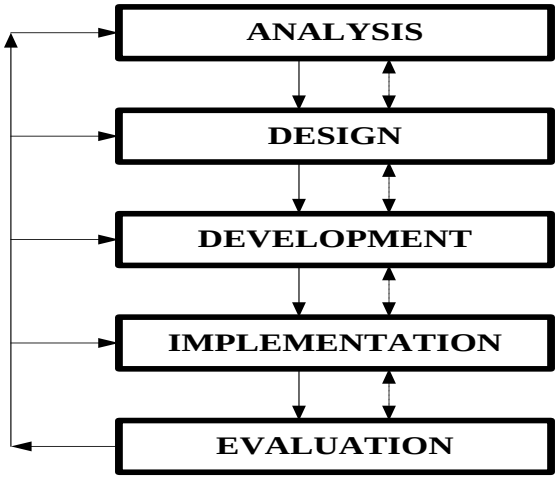

Figure 1: *ADDIE* Model

ThinkAloud has gone through five phases of development as suggested by the ADDIE model, as shown in Figure 1. Here is a phase-out of ThinkAloud's development process:

4.1 Analysis Phase

Based on Strickland et al (2013), problems related to instructional are stated and explained in the analysis phase, and goals and objectives are also built. It is to get a comprehensive picture of the activities that will be carried out during the construction process later. In this study, the research team visited the study site to understand and review the learning atmosphere and the characteristics and characteristics of the students. It is important to identify what approach is most suitable to be applied in the application that is built so that students who use it can achieve the learning objectives to be delivered.

4.2 Design Phase

In this design phase, an instructional strategy is comprehensively analysed, designed, and engineered. Three English modules have been selected for inclusion in this application. These modules are *numbers, colours,* and *greetings*. Each module will contain 5 elements: videos, teaching, training, quizzes, and games. In addition, the selection of suitable media is also made to ensure that appropriate and effective delivery mediums are used during the construction of this application. The discussion results have determined the use of Adobe Captivate 9 because of its ability to apply good audio and visual elements and be user-friendly.

4.3 Development Phase

Adobe Captivate 9 software was used in this phase, where the video elements, quiz training, and games were put in the order set in the design phase. The research team has used an iPad device to support the operation of all elements defined in this software. The software prototype is then tested on teachers and students before being fully deployed in phase four. Figure 1 shows the ThinkAloud interface.

Figure 2: ThinkAloud Interface.

4.4 Implementation Phase

This implementation phase is the pre-run test phase. Students were given 3 sets of English questions containing three selected topics to determine the mastery level score before using ThinkAloud. After the Pre-Test is completed, the Post-test is carried out. At this stage, students have used the ThinkAloud software for 4 sessions over 16 hours with the help of trained teachers. Upon completion of each session, the scores obtained by the students will be recorded for analysis. An analysis of the overall scores for the 4 sessions will also be recorded to assess their level of mastery after using ThinkAloud.

4.5 Evaluation Phase

The evaluation phase is where pre-use and post-use test scores of ThinkAloud have been made in comparative analysis using Microsoft Excel software. It is crucial to make a comparative analysis before and after students use ThinkAloud to evaluate its effectiveness against autistic students. Comparative analysis will be analysed using Microsoft Excel software.

5.0 Study and Discussion Results

The results of the analysis conducted Table 1 shows an analysis of English test results obtained after the ThinkAloud pre-test and post-test made on 10 selected samples. Figure 3 also shows a comparison graph of the score before and after they used ThinkAloud. The analysis results indicate that all students or respondents can use this software well and effectively.

Table 1: Analysis Of English Test Results

SAMPLE	PRE-TEST SCORES	POST-TEST																POST-AVERAGE
		TEST 1				TEST 2				TEST 3				TEST 4				
		SET 1	SET 2	SET 3	TEST 1 SCORES	SET 1	SET 2	SET 3	TEST 2 SCORES	SET 1	SET 2	SET 3	TEST 3 SCORES	SET 1	SET 2	SET 3	TEST 4 SCORES	
STUDENT 1	2	2	3	4	3	3	3	3	3	2	3	4	3	2	3	4	3	3
STUDENT 2	2	3	3	3	3	5	5	5	5	3	4	5	4	3	4	5	4	4
STUDENT 3	2	2	4	3	3	4	3	5	4	2	5	5	4	2	5	5	4	4
STUDENT 4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
STUDENT 5	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
STUDENT 6	2	3	3	3	3	3	4	2	3	2	3	4	3	2	3	4	3	3
STUDENT 7	3	3	1	5	3	4	3	5	4	2	5	5	4	2	5	5	4	4
STUDENT 8	3	1	2	3	2	3	3	3	3	2	3	4	3	2	3	4	3	3
STUDENT 9	2	1	1	1	1	3	2	1	2	2	3	1	2	2	3	1	2	2
STUDENT 10	2	1	4	4	3	3	5	1	3	3	3	3	3	3	3	3	3	3

Based on the comparative graph analysis in Figure 3, 7 out of 10 samplers, namely Student 1, Student 2, Student 3, Student 5, Student 6, Student 7, and Student 10, have shown improved scores after using ThinkAloud compared to before using the software. The remaining 3 samples, Student 4, Student 8, and Student 9, showed no improvement. Therefore, this analysis found that 70% of the sample, or 7 out of 10 selected samples, managed to record an improvement in English subjects after using ThinkAloud.

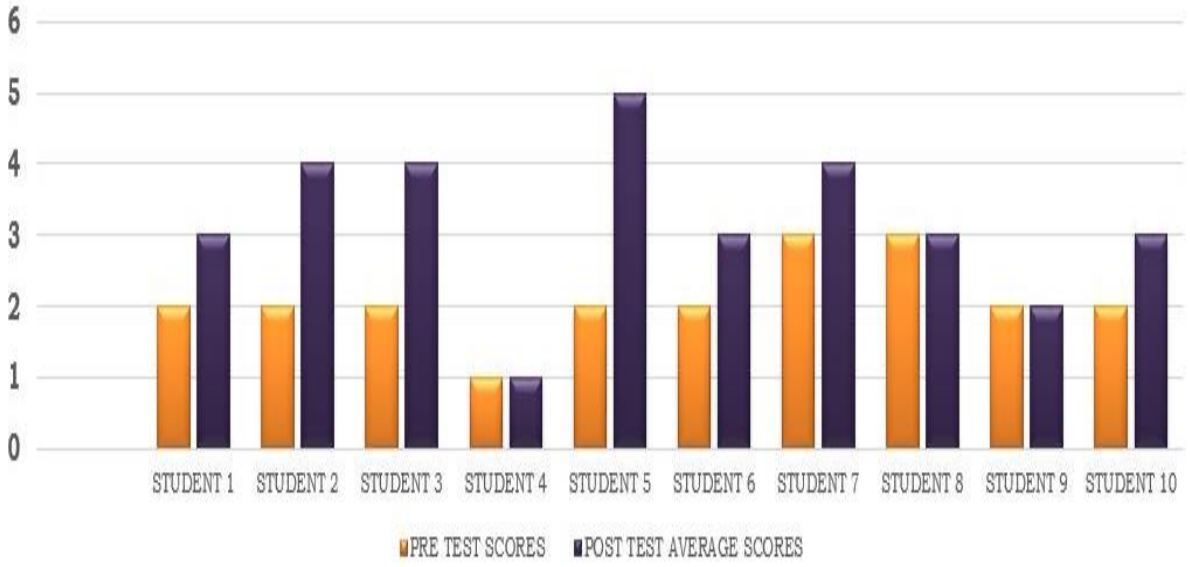

Figure 3: Comparative Graph Analysis.

Figure 4 also shows a comparative analysis of the percentage of the entire test. The analysis of ThinkAloud pre-test scores shows that student mastery is only 42%. However, after using this application, student scores increased by 22%, with an overall score of 64%. It is clearly shown that the ThinkAloud software effectively improves English skills among autistic students.

These findings align with a study from Sidek, et al. (2016), which states that the course software developed based on the ADDIE development methodology can attract the attention of autistic children to learn Malay. Meanwhile, in their study, Moganasundari Selvam & Hasnah Toran (2021) also proved that gamification applications positively impact children's physical and cognitive development.

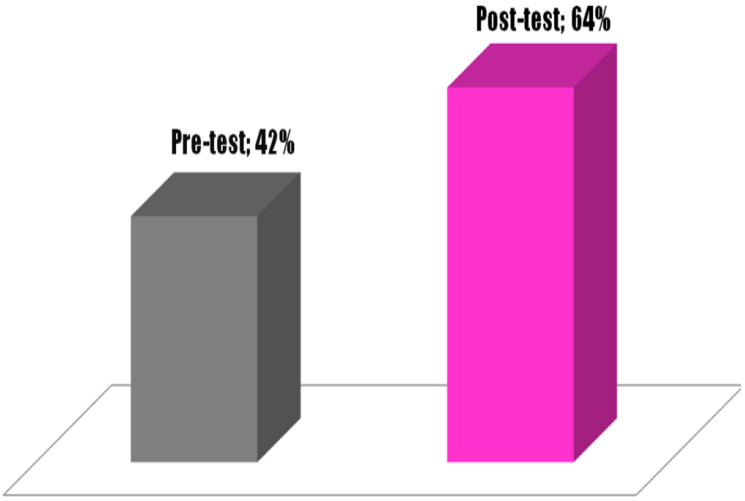

Figure 4: Overall Percentage Comparative Graph

6.0 Conclusion

Overall, the objectives of this study have been successfully achieved. As a result of the research that has been carried out, researchers succeeded in developing ThinkAloud for English subjects for autistic students. ThinkAloud was found to be effective in helping autistic students master English subjects. Therefore, it is hoped that these apps can be presented to realize the goals of SEAMEO SEN and respond to the slogan of no discrimination in education, especially to disabled groups who have the potential to succeed and be competitive. This study was proposed to be tested using modules other than English and tested on a larger sample size. It is to allow the effectiveness of this application to be measured more accurately and to be a reference to interested parties in this study.

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Author Contributions

Muhammad Afzhal A. W.: Conceptualisation, Methodology, Data Curation, Validation, Writing Draft Preparation;
Muhammad Anwar A. H.: Conceptualisation, Software, Data Curation, Validation, Supervision;
Nur Azlin A.: Validation, Writing-Reviewing and Editing.

Conflicts of Interest

The authors acknowledge that there were no conflicts of interest that could affect the integrity of this study. This research is conducted with sincerity and

objectivity to ensure its effectiveness as a useful source of information in improving the educational approach to students with autism

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