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The Effect of Using Augmented Reality-Based Media on Increasing the Attention of Students with Intellectual Disabilities

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Abstract: One of the most common problems experienced by students with intellectual and developmental disabilities is attention problems. To improve attention skills, effective learning strategies and attractive media are needed. Through the use of android-based augmented reality using tablet devices, and also providing positive reinforcement can increase student interest and student involvement in learning. This study uses a single subject experimental research method with the A-B-A model. The participants in this study are 10-year-old children with mild intellectual disabilities who attend SLB Idayu 1 Malang City. The results showed that there was a temporary increase in the duration of students' attention span when using augmented reality. The results showed that the average duration of students' attention span at the time of intervention occurred for 41 minutes, while in the baseline-1 and baseline-2 phases the average duration of students' attention span occurred for 18 minutes and 20 minutes. Based on the results of the study in general, it shows that the use of augmented reality-based media has a good impact on improving the attention of students with intellectual disabilities. The existence of an increase only in the intervention phase shows that there are other factors that need to be considered in learning, such as the learning environment, learning methods and content used, teacher attention, facilities that support activities and environmental control.
Keywords: Attention; Augmented Reality; Intellectual Disabilities

INTRODUCTION

Attention is the mind's ability to orient itself to a single object or set of thoughts that may appear simultaneously. Conscious focus and concentration is the essence of attention (Anderson, 2015). Attention can be defined as concentration on a mental task in which a person tries to ignore other distracting stimuli (Matlin et al., 1994). Schaefer & Millman (1994) revealed that a child's focused behavior can be interrupted by distracting sounds, sights, or personal feelings. Schaefer added that attention requires the ability to concentrate and filter out unimportant information. Attention is influenced by internal (endogenous) and external (exogenous) factors. Internal factors include personal knowledge and goals that influence information selection, while external factors involve the strength of outside information that attracts attention (Fitri, 2021).

Children with intellectual and developmental disabilities face the challenge of paying greater attention, which is associated with poorer cognitive, academic and social outcomes (Kirk et al., 2016). One of the most common problems experienced by people with intellectual and developmental disabilities is impaired attention (Emerson, 2003). Children with intellectual disabilities experience higher attentional difficulties, which increases the risk of academic and social impairment (Cornish et al., 2012). Distraction and inattention, or limited attention span, are two important characteristics for students with mild intellectual disabilities (Pirnazar et al., 2022).

Students' attentiveness in learning at school includes eight indicators: listening, looking, writing or taking notes, observing pictures, remembering, thinking, practice, and asking questions. These indicators can be observed directly by the teacher in the classroom. Listening means listening to the teacher's explanation well without other distractions (Purba, 2023). The ability to stay focused on a task while not doing anything else is also known as on-task behavior (Chairunnisa & Kemala, 2020). This on-task behavior involves the ability to focus attention on the task without being distracted by other irrelevant activities (Graham-Day et al., 2010). In contrast, difficulty maintaining attention can stem from a wandering mind or being distracted by things in the surrounding environment. Off-task behaviors include

looking around the classroom, staring at the floor, and daydreaming. Off-task behaviors include listening to what is being taught, paying attention to instructions, or completing work (Ayearst, 2023). Inattention includes lack of attention to detail or making careless mistakes, having difficulty keeping focus on tasks or activities, appearing not to listen when spoken to directly, not following instructions and not completing tasks, difficulty organizing tasks and activities, and

also being easily distracted by external stimuli (Mash, 2005). Based on the observation, there are students with intellectual disabilities who have problems in attention during the learning process. Students tend to be more easily distracted by circumstances outside the classroom and also do off-task activities. Students often do off-task activities when learning takes place. Therefore, a learning program that can overcome students' attention problems. Limited attention span is an important factor in understanding stimuli and affects the level of learning (Pirnazar et al., 2022).

Augmented reality media serves as an effective intervention tool to increase student attention. Muhaidat et al., (2022) mentioned that Augmented Reality can increase motivation to participate in physical activity and physical activity, and improve cognitive learning among children with down syndrome. In addition, in the research of Bos et al., (2019) also resulted that the concentration level of students was high when using Augmented Reality applications. Augmented reality induced significant differences in the focused attention of the learners. Augmented reality is effective in increasing students' focused attention and sustained attention compared to lecture mode (Jafari et al., 2023). Learning programs using android-based augmented reality using tablet devices function as a stimulator tool that not only creates interest but also student and teacher involvement in the learning process. Augmented Reality used in this study is android-based which has been developed in a study entitled "Android-Based Augmented Reality Development for Enjoyful Learning in ADHD Children" (Putri, 2023).

METHOD

This study used the Single Subject Research method with the A-B-A design. Single The use of this design is used to draw conclusions that there is a functional relationship between the independent variable and the dependent variable, with the addition of baseline-2 (A2) as an intervention control (Sunanto et al., 2006). Baseline-1 (A1) conditions represent conditions before treatment, Intervention (B) conditions represent conditions during treatment. While the baseline-2 (A2) condition represents the condition after treatment. The participant in this study was a 10-year-old girl diagnosed with mild intellectual disability identified as A. Observations and interviews conducted with the teacher showed that the child had a mild intellectual disability. Observations and interviews conducted with teachers show aspects of the subject's behavior during learning, including obstacles in maintaining attention and interest, which often affect learning activities such as reluctance and avoidance of tasks. Observations or observations were made to measure the subject's attention span with indicators of engagement in tasks carried out before, during and after treatment. In behavior modification, there is a measurement method called continuous recording. Continuous recording means recording each occurrence of a behavior pattern and its timing, including when it begins and ends. This method helps in obtaining data on the frequency, latency, and duration of the behavior (Bateson, 2007). Attention duration recording starts when the lesson opens and ends when the student performs off-task behavior. Attention duration recording is assisted by a time recording device (stopwatch).

RESULTS AND DISCUSSION

Results

The research implementation included 13 sessions, which included 4 baseline-1 (A1) sessions, 5 intervention sessions (B) and 4 baseline-2 (A2) sessions. The data obtained is the result of measuring the duration of time, by calculating the time the first student is off-task minus the time the learning starts. The following is a presentation of the data obtained from the research results of baseline-1 (A1) conditions, intervention conditions (B), and baseline-2 (A2) conditions. The research findings are presented in Table 1. As depicted in Fig. 1, there was a significant increase in the intervention condition compared to the baseline gase. The results of students' attention duration in each condition are packaged in Table 1, which explains the increase and decrease in the duration range. The decrease was caused by external and internal factors. External factors include unfavorable environment, distraction, teaching style and the influence of the child's condition, while internal factors include boredom or illness and decreased motivation and interest.

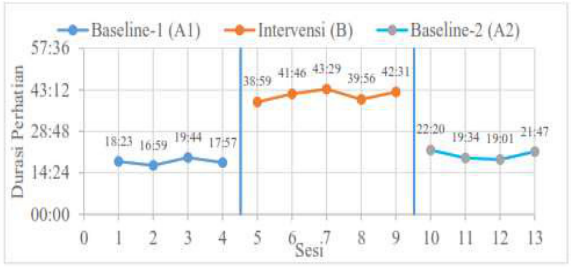


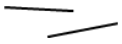
Figure 1. Attention Duration Chart

Based on Figure 1 and Table 1, the results of the attention duration data analysis show that in baseline-1 (A1) the trend line is stagnant (=) which indicates that the score tends to flatten from the beginning to the end of the session. There is a flat trend because changes are less visible. In the intervention condition (B), the trend line shows an increase, indicating a slight increase, so it is positive (+). Whereas at baseline-2 (A2) the trend line is stagnant again (=) which shows a horizontal trend due to a less noticeable decrease. There is a horizontal trend because the changes are less visible. Calculation of stability trends, the three conditions show a number of 100% which means stable.

Table 1. Duration Results of Each Condition

Baseline-1	Intervention	Baseline-2
18:23	38:59	22:20
16:59	41:46	19:34
19:44	43:29	19:01
17:59	39:56	21:47
	42:31	
Mean	Mean	Mean
18:16	41:20	20:41

Table 2: Intercondition Analysis Data

Condition Comparison	B/A1	A2/B
Number of Variables Changed	1	1
Change in Trend Direction and Effect	 (+) (=)	 (=) (+)
Change in Stability	Stable to Stable	Stable to Stable
Level Change	38:59 - 17:59 (+ 21:00)	22:20 – 42:31 (- 20:11)
Overlap Percentage	0%	

In baseline-1 and baseline-2 conditions, the stability range used is 15% and 10% for intervention conditions. According to Prahmana (2021), small stability criteria, 10% or 0.10, are used if the data is clustered above and large stability criteria, 15% or 0.15, are used if the data is clustered below. The results of the duration of attention in the baseline-1 (A1) condition rose steadily in the range 16:59-19:44. In the intervention condition (B) it increased in the range 38:59-43:29 and at baseline-2 it also increased in the range 19:01-22:20. The level of change in all conditions shows a positive sign (+) which indicates an increase.

Analysis between conditions is carried out by comparing two conditions, such as baseline-1 conditions with intervention and intervention with baseline 2. This analysis is carried out after achieving data stability. The results of the analysis between conditions can be presented in summary Table 2. In table 2, it is known that the directional trend in the baseline-1 (A1) condition flattened to increase in the intervention condition (B). While in the intervention condition to baseline-2 (A2) switching from increasing to flat tends to decrease. Changes in levels from baseline-1 to intervention conditions showed an increase of 21 minutes, while changes from intervention conditions to baseline-2 decreased for 20 minutes 11 seconds. In particular, in all conditions there is no overlapping data, so that the overlap percentage is obtained at 0%.

Discussion

Based on the results of the analysis in the previous chapter, Based on the results of the analysis in the previous chapter, the increase only in the intervention phase concluded that students' attention depends on the stimulus during learning. Ghasemi (2024) stated that augmented reality (AR) can help improve focus, engagement, and learning by combining visual and auditive cues with real environments, AR can direct people's attention to specific tasks or information, helping them maintain sustained and selective attention. The attention of students with intellectual disabilities during learning can be seen from indicators of student engagement in the task. According to Asatryan et al., (2023), inattention can be characterised by paying less attention to details or making careless mistakes in schoolwork, difficulty maintaining concentration while on task, appearing not to listen when spoken to directly, not following instructions and failing to complete schoolwork, difficulty organising tasks, as well as avoidance, dislike, or reluctance to engage in certain tasks.

Based on this, problems were found in students' ability to pay attention to learning. In the baseline-1 (A1) phase, students showed many signs of inattention during learning, students showed difficulty maintaining concentration while doing tasks, failed to complete tasks, avoided, disliked and were reluctant to engage in tasks. According to Maulana (2019), this behaviour occurs spontaneously because students feel less interested in the subject, the learning methods used by the teacher are less innovative, and the room conditions are not supportive. This shows that students' learning concentration begins to decline and students' intellectual-emotional engagement decreases.

Students' activities when able to engage attention in learning are seen when students are able to engage in tasks. In each session in the baseline-1 (A1) phase, students showed their attention in learning by responding to questions and answering teacher questions. This indicates that students listen to what the teacher says. In addition, students are also able to follow instructions and create tasks. The attention barrier shown by the student in session one was marked by the behaviour of delaying the task and also doing irrelevant behaviour. This was indicated by student activity when leaving the building to shift the position of the blackboard. Attention barriers in the second session were caused by students' lack of enthusiasm for learning. This is the indifferent attitude of students when spoken to by the teacher. In the third session, the inhibition of attention was indicated by the switching of gaze and tasks to smartphones. In the fourth session, attention barriers were carried out at the student's

own will. Of the four sessions in the baseline-1 (A1) phase, attention barriers during learning are caused by internal and external factors. In the observation results of the baseline-1 (A1) phase, it can be concluded that attention disorders are caused by students' lack of interest and motivation. When teachers are unable to attract students' attention, students will not be motivated to participate in learning activities. As a result, students will show off-task behaviour or get out of the learning context by doing other activities during class time (Halimah, 2020).

In the intervention phase, there was a significant increase compared to the baseline-1 (A1) phase. In the baseline-1 phase, the average attention span of students during learning only lasted 18 minutes from the opening of learning. Whereas in the intervention phase, the average student attention span lasted 41 minutes. In the intervention phase. These results are also in line with the research of Bos et al. (2019) which reveals that the application of AR is very important in the learning process because it increases interaction with content and increases student focus and attention. In addition, the increase in the attention span time span is also in accordance with the results in Ozdamli's research (2018) that augmented reality applications through tablets can increase students' active participation and attention span in activities.

In the intervention phase, in addition to using augmented reality-based media, researchers also used positive reinforcement whenever students were able to maintain attention on a task. This is reinforced by Purba's (2023) which states that using positive reinforcement is one way to overcome attentional problems in low-grade students. In the intervention phase (B), distraction was also shown by task avoidance behaviour, distraction and shifting gaze to irrelevant stimulus from the non-conducive classroom environment. In addition to presenting interesting learning, factors that affect student attention can also come from outside the classroom that is not conducive. This is supported by Halimah (2020) in her research which states that factors that can influence inattention include teacher factors, teaching methods, curriculum and peers and non-conducive classroom conditions. In addition, the behaviour of being reluctant to engage with tasks and looking away is related to boredom. It is also explained by Escobedo (2014) that repetition of tasks is often considered boring and frustrating, and the objects used may not be of interest to them. As a result, children often spend a lot of time off-task and have difficulty keeping their attention.

Baseline-2 (A2) condition is a condition after the intervention is given. In this condition, the magnitude of the effect of intervention with augmented reality on students' attention abilities can be seen whether there are changes that increase or return as during baseline-1 conditions. In the baseline-2 condition, the students' attention span decreased and returned to the phase at baseline-1. At baseline-2, the average attention span of students during learning only lasted 21 minutes since the opening of learning, a slight increase compared to the baseline-1 phase. In this condition, the distraction experienced by students was caused by reluctance to engage with the task. This is different from Broman's (1970) opinion which states otherwise. According to him, short attention span is caused not only by lack of interest and the problem is not the child's unwillingness to pay attention, but the teacher does not identify the real cause, the school system does not provide adequate services for diagnosis and correction, the school does not prepare teachers to observe the child accurately.

In this condition, students' enthusiasm to engage with learning tends to decrease when compared to the intervention phase. The difference in conditions in the intervention and baseline phases that affect the measurement results lies in the teaching method and also the classroom environment. It is also revealed by Eliza (2020) that students can have undesirable behaviour due to school adaptation, lack of teacher attention, influence of friends, boredom, and difficulties with lessons.

Attention to learning is an important aspect because for the success of student learning in school is influenced by the attention process, which includes the ability to focus on the task (Ruhland, 2021). Interventions using augmented reality during learning are able to increase student attention, this can be seen from the duration of the attention span. This is in line with Ghasemi's research (2024), which says that using augmented reality can help improve focus, engagement, and learning. By combining visual and auditive cues with real environments, AR can direct people's attention to specific tasks or information, helping them maintain sustained and selective attention. Research by López-García (2019), mentioned that AR can increase students' attention and motivation, help them understand content better, increase class participation, encourage student collaboration, and improve the quality of learning and learning. In addition to using technology, the selection of methods and conditioning is also important to maximise student attention. In line with this, Maulana (2019) revealed that off-task behaviour as an indicator of attention is strongly influenced by the use of appropriate learning methods and also a supportive learning environment.

From the description in the previous chapter, what distinguishes the conditions before and during the intervention are the factors that influence distraction. In this study, distraction factors tended to be more numerous when performing writing tasks. Failure to maintain attention is usually associated with feelings of boredom (Eastwood et al., 2012; Gerritsen et al., 2014; Raffaelli, 2018). This is in line with cognitive theory which asserts that individuals who experience boredom tend to face impaired concentration and have to make great efforts to direct their attention (Fisher,

1993; Hamilton, 1981; Harris, 2000; Todman, 2003; Eastwood, 2012). According to the cognitive definition, boredom is a condition in which there is a breakdown in concentration and the situation around does not provide many options for individuals to do something interesting, meaningful, or fun (Eastwood, 2012)

In the conditions before and after the intervention or in the baseline condition, learning takes place with many different characteristics of students in one class, including intellectual barriers and sensory barriers. This causes learning to be carried out using the lecture method which makes the learning atmosphere monotonous and less interesting if done every day. In addition, in this study, students' attention problems generally occur when doing writing assignments, where writing assignments are activities that are carried out every day after getting the material. This is in accordance with the opinion of Goldstein & Naglieri (2011) which states that the ability to stay focused also depends on the type of task; more interesting tasks are easier to maintain attention than less interesting tasks. In line with this opinion, student attention during the intervention phase showed a 100% increase compared to the baseline-1 phase, this was due to interactive tasks with a technology-based approach, so that student involvement and attention could increase. This is also in line with Bester's (2013) opinion that the use of technology creates a more interactive learning environment, allowing students to utilise various modalities that increase their focus and concentration for a longer time. In addition, Bester (2013) also adds that achievement tends to increase if technology is applied in learning to attract students' attention and maintain their concentration.

CONCLUSSION AND SUGGESTION

Conclussion

The results showed that interventions using augmented reality-based media can temporarily increase student attention. There are differences in attention patterns between the baseline and intervention phases. The attention pattern of the baseline phase tends to be influenced by distraction and demotivation while the attention pattern of the intervention phase tends to be influenced by fatigue and demotivation. Other factors that also affect students' attention patterns include classroom conditioning, providing reinforcement and appreciation, choosing the right method and controlling the environment.

Suggestion

The limitation in this study is the difference in classroom settings in taking baseline and intervention data which can affect the results of the study. In addition, data collection was carried out by the researcher himself, so there are weaknesses in the description of the research results. The findings of this study may not be generalisable to all students with intellectual disabilities due to the limited sample size. It is hoped that future researchers can explore the benefits of augmented reality for children with special needs and further develop the material aspects and learning interventions as this technology has a huge impact.

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