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ANALYSIS OF FOCUSED ATTENTION LEVELS IN SCIENCE LEARNING AMONG CHILDREN WITH HYPERACTIVITY: A STUDY IN A SPECIAL EDUCATION SETTING

S. D. Ardianti*[1], Sumaji[2], Evanita[3], M. Supratiwi[4], S. Wanabuliandari[5], A. B. Tanghal[6]

[1,2,3,5]Universitas Muria Kudus, Indonesia
[4]Universitas Sebelas Maret, Indonesia
[6]Nueva Ecija University of Science and Technology, Philippines

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ABSTRACT

The objectives of this study were: (1) to analyse the characteristics of focused attention behaviour during science learning in ADHD students; (2) to identify learning strategies implemented by teachers to improve focused attention in ADHD students; and (3) to analyse the improvement of focused attention. The method used was the Mix Method Sequential Exploratory. This study was conducted at the Sunan Kudus Special Elementary School (SES). Data collection was conducted through observation and interviews. The research instruments were observation sheets and interview sheets. Qualitative data analysis was conducted using the Miles and Huberman model, while quantitative data were analysed using t-tests and n-gain tests. The results of the study indicate that the characteristics of the focused-attention pattern among ADHD students are that they always respond to distractions in their learning environment. Students can complete assignments, but are unable to avoid distractions in their surroundings, which often disrupts their focused attention. The learning strategy implemented involves the teacher developing several practical approaches, intuitively and contextually, to manage student attention during learning. Science learning is designed to activate students in observation and discussion activities. The results of the t-test show a t value of -12.0, which is smaller than 0.05, indicating a difference in the focus of student attention before and after science learning with the teacher-implemented strategies. The results of the group N-Gain analysis show an average N-Gain obtained of 0.103, which is in the low category. This low N-Gain value confirms that the learning intervention has not produced substantial improvements in student attention and focus, indicating that more varied and contextual learning strategies are needed.

Keywords: attention focused; ADHD; science learning; inclusive education; child mental health

INTRODUCTION

Students with Attention Deficit Hyperactivity Disorder (ADHD) or hyperactivity tend to have difficulty maintaining attention during the learning process, including in science subjects in special elementary schools. A modern meta-analysis found a prevalence of around 7-8% in children and adolescents with hyperactivity (Salari et al., 2023). Research shows that attention disorders are stronger predictors of academic achievement than hyperactivity or impulsivity symptoms (Rabiner & Carrig, 2016; Tamsut et al., 2024). ADHD generally affects executive functions, such as inhibitory control, information processing, and working memory, all of which contribute to poor attention during learning activities (Barkley, 2015; Schmengler et al., 2023). Due to inattention, children with ADHD often experience academic difficulties, problems with organisation, and difficulty following continuo-

***Correspondence Address**
E-mail: sekar.dwi.ardianti@umk.ac.id

us instructions (Cabral et al, 2020). In science learning, attention is crucial because the material requires conceptual understanding, systematic observation, and logical inference. Students with ADHD often exhibit task avoidance, are easily distracted, and have difficulty following sequential instructions, thereby hindering understanding of scientific concepts (Orhan et al., 2023; McDougal et al., 2023). This results in poor academic performance in the classroom and reduced student engagement during learning (Kirk et al., 2017; Sinnari et al., 2018; Schneidt et al., 2018). Therefore, adaptive learning approaches and targeted interventions are needed to support attention and better meet the learning needs of students with ADHD in science instruction in special needs schools.

Attention deficits in children with ADHD lead to lower science achievement, both cognitive and affective (Rabiner & Carrig, 2016; Ediyanto et al., 2020; Wimbarti & Kusrohmaniah, 2023). Attention-deficit disorder has been shown to have long-term effects on children's academic achievement from elementary to secondary school (Harrison et al., 2019; Orhan et al., 2023; Rowan et al., 2024). Therefore, the problem of low attention deficits in students with ADHD in science learning is not a temporary phenomenon, but rather a major obstacle requiring evidence-based intervention. A strategic approach is needed through strategies, models, and educational media designed to increase attention, thereby facilitating ADHD students' optimal follow-up of science learning (Wanabuliandari et al., 2018; Ardianti et al., 2019). In this case, it is important to understand the extent of focused attention among ADHD students during science learning, as well as the characteristics of their behaviour when demonstrating focus in class, especially in the SES environment. In addition, it is necessary to analyse the learning strategies teachers have used to support the improvement of focused attention among ADHD students in science learning, so that the approach developed is genuinely relevant to their needs.

Focused attention is a crucial prerequisite for effective learning, particularly in science subjects, which require active involvement, conceptual understanding, and the ability to observe and reason logically. In students with Attention Deficit Hyperactivity Disorder (ADHD), the ability to sustain attention is often a significant obstacle to learning (Rabiner & Carrig, 2016; Sonuga-Barke et al., 2023; Tosto et al., 2021; McDougal et al., 2023). Students with ADHD often exhibit behaviours such as avoiding tasks, being easily distracted, and difficulty following sequential instructions, which can hinder their understanding of important scientific concepts (Mohammadhasani et al., 2015; Sullivan-Carr, 2016; Aquariza, 2017). In Special Education Elementary Schools (SES), teachers face complex challenges because attention deficits are not only individual but also closely related to learning design, classroom dynamics, and the types of media used (Sinnari et al., 2018; Agustini et al., 2020; Watari et al., 2021). Most studies discussing learning strategies or educational media for children with ADHD are experimental or focus on general executive function training, without directly examining how forms of focused attention, such as persistence in paying attention to instructions, consistency in observing activities, and resistance to distractions, emerge and change during science learning in special education classrooms. In this regard, it is important to explore how students with ADHD exhibit focused attention during science learning and to recognise the characteristics of their focused behaviour during learning interactions in SES classrooms.

Furthermore, research on focused attention in science lessons for students with ADHD is still rare, especially at the elementary education level and within the framework of inclusive education in Indonesia. This also requires exploring the learning strategies teachers actually use to improve students' focused attention during science instruction in the classroom. Thus, there is a significant research gap to bridge pedagogical needs with relevant empirical evidence in the context of special education.

This study aims to address the need for an in-depth understanding of students with ADHD's focused attention and how science learning in special needs schools (SES) supports or hinders the development of focused learning. Using a mixed-methods approach, this study seeks to directly observe students with ADHD's learning behaviour, identify indicators of attention deficits, and explore the learning strategies teachers employ to maintain student engagement during science instruction. The main novelty of this research lies in its specific context: science learning in special needs schools (SES), which has not been widely studied empirically in the international literature. Its approach examines not only learning outcomes but also the process of attention formation through interactions between

students, teachers, and learning media. Therefore, this study is expected to make a conceptual contribution to the development of more adaptive science-learning innovations for students with ADHD, while also providing contextual evidence from field practice relevant to inclusive education.

The objectives of this study are: (1) to analyze the level of focused attention in science learning in students with ADHD; (2) to analyze the characteristics of focused attention behavior and its disturbances that arise during science learning in students with ADHD in elementary school classes; and (3) to identify learning strategies that teachers actually implement to facilitate increased focus and learning engagement of students with ADHD during the science learning process. Based on these objectives, the research problem formulations in this study are: (1) what is the level of focused attention in science learning in students with ADHD; (2) what are the characteristics of focused attention behaviour of students with ADHD during science learning in elementary school classes? (3) What learning strategies do teachers use to support increased focused attention of students with ADHD in the context of science learning? The objectives of this study support Sustainable Development Goal 4 (Quality Education), namely to ensure inclusive and quality education and promote lifelong learning opportunities for all.

METHODS

The researchers used Creswell's mixed research approach, modified by integrating qualitative and quantitative data findings (Nashrullah, 2023). The method used was a Mixed Method Sequential Exploratory. This method aims to analyse the characteristics of focused attention in students with ADHD, teacher strategies to enhance focused attention, and the improvement of focused attention during science learning in students with ADHD.

This research was conducted at the Sunan Kudus Special Elementary School (SES), a special education institution located in Kudus Regency, Central Java, Indonesia. This school provides educational services for children with various disabilities, including attention-deficit/hyperactivity disorder (ADHD), and routinely integrates science into the curriculum. The location was selected purposively, as SES Sunan Kudus has representative conditions for exploring the dynamics of science learning in special education and has students with ADHD officially identified by the school and professional staff. The school is also committed to implementing individualised, needs-based learning, thereby supporting exploratory research into the phenomenon of academic attention.

The subjects in this study consisted of two main groups: students and teachers. First, five students diagnosed with ADHD in fourth and fifth grades were diagnosed by a psychologist and registered with the school administration as students with special needs. These four students were selected based on recommendations from their classroom teachers and the school's special services team because they exhibited typical symptoms of attention-deficit disorder during daily learning activities.

Second, two science teachers with more than three years of teaching experience directly taught these students in science learning contexts. Teachers were selected as key subjects because they play a central role in designing learning experiences, selecting media, and managing students with ADHD's focused attention during the learning process.

Inclusion criteria for subject selection were strictly established to ensure alignment with the research focus. These criteria included: (1) students actively engaged in science learning for at least the past semester; (2) students had evidence of an ADHD diagnosis recognised by a professional institution or school documentation; and (3) teachers were willing to participate in interviews and be observed during the learning process. Subject selection was conducted purposively and contextually, considering that the qualitative approach emphasises in-depth information and direct participant involvement in the situation being studied. This subject composition is expected to provide a rich, in-depth perspective on focused attention behaviour in ADHD students during science learning in special education settings.

The Mixed Method Sequential Exploratory research model consists of (1) a qualitative stage conducted to explore in-depth the behaviour of focused attention in science learning for students with ADHD, and (2) a quantitative stage conducted to gather data related to improving focused attention in students with ADHD in science learning.

The research procedure, with an explanation in the research procedure flowchart, is as follows:

Qualitative Stage

The qualitative stage is conducted to provide in-depth analysis and yield research findings (Pramesti et al., 2023). At this stage, data sources are identified, and qualitative data collection continues through interviews, observation, and documentation. The qualitative data are then analysed using the Miles and Huberman analysis model, which includes data collection, data reduction, data presentation, and conclusion drawing. Based on this data analysis, conclusions can be drawn about the behaviour of focused attention in science learning among students with ADHD (Mahardika et al., 2023).

To maintain data validity (trustworthiness) and enhance the integrity of the research results, three main verification techniques were used as recommended by Miles & Huberman (1994). First, triangulation of methods and sources, namely by comparing data obtained from observations, interviews, and documentation, to strengthen the validity of the findings and avoid bias in single perceptions. Second, member checking was conducted by requesting confirmation from participants, particularly science teachers, of the analysis's interpretations and preliminary findings to ensure that the recorded data aligned with their experiences. Third, peer debriefing was conducted, namely the process of discussing the analysis results with fellow researchers in the field of special education to obtain critical input on data interpretation and theme selection, ensuring that the analysis remains objective and transparent.

By applying these interactive analysis techniques and verification strategies, it is hoped that the results of this study will be highly credible and describe the phenomenon of academic attention in ADHD students in science learning in a valid and meaningful way within the context of special education.

Quantitative Stage

In the quantitative stage, researchers can determine research hypotheses as tentative assumptions based on the research results. Next, quantitative research data were collected using non-test techniques, using an observation sheet instrument to assess the level of focused attention in science learning. The observation sheet was developed based on indicators of focused attention in science learning for students with ADHD, with a score of 1-4 for each provided answer. The observation sheet scores were then categorised into four categories: very good (69-84), good (53-68), moderate (27-52), and poor (21-36).

The focused attention data were then statistically analysed using the T-test and the N-Gain test to determine the average differences before and after science learning and their improvement. The results of the data analysis were used to answer the research hypothesis.

RESULTS AND DISCUSSION

Learning Focused attention is a crucial aspect for successful learning, particularly in science subjects, which require active student involvement in understanding abstract concepts, making observations, and drawing logical conclusions from observed phenomena (Pfeifer et al., 2020; Sonuga-Barke et al., 2023; Cesias-Diaz et al., 2024; Ramlawati et al., 2025). For students with Attention Deficit Hyperactivity Disorder (ADHD), maintaining focus in learning situations that require high levels of concentration is a particular challenge (Tosto et al., 2021; Sonuga-Barke et al., 2023). Neurologically, students with ADHD exhibit functional differences in brain areas that regulate attention and self-control, particularly the prefrontal cortex, basal ganglia, and cerebellum. These areas play a role in executive functions, namely the ability to plan, focus attention, and control impulses. An imbalance in neurotransmitters such as dopamine and norepinephrine makes the brains of students with ADHD less responsive to monotonous academic stimuli, including many science learning activities that require sustained concentration (Yu et al., 2023; MacDonald et al., 2024). The attention deficits inherent in ADHD can affect how students respond to learning stimuli, follow teacher instructions, and interact with learning materials consistently (Oquendo & Finelli, 2024; Pagespetit et al., 2025). Therefore, it is important to understand how students' attention patterns in ADHD are formed and disrupted during science learning.

Based on observations and interviews, it was found that students with ADHD's focused attention during science learning fluctuates and is heavily influenced by environmental stimuli, task characteristics, and presentation methods. The indicators of focused attention deficits found can be summarised in Table 1.

Table 1. Disturbance Pattern Indicators Attention Focused ADHD students in Science Learning

Indicator Disturbance Attention	Description Observed Behaviour	Frequency Emergence
Diversion attention	Students quickly divert their attention to other things and are not yet able to focus fully on what is happening. They do it	often
Distractibility	Student responds to the disturbance. Good disturbance from friends and from the environment around	always
Avoidance task	Students avoid assignments given by the teacher	Sometimes
Inconsistent Engagement	The student does not respond to the instructions given by the teacher with speed and precision	often

Based on observations and interviews with teachers, it was revealed that a common pattern of distractions was that students consistently responded to distractions in their learning environment. While students were able to respond to and complete teacher-assigned tasks, they were unable to avoid distractions in their surroundings, which often disrupted their focused attention. Students can demonstrate scientific attitudes such as curiosity, a desire to experiment directly, and a desire to explore science objects. However, students experience attention difficulties, which often disrupt the completion of scientific assignments. This was evident in observed behaviour, where students frequently shifted their attention to other things and were unable to focus on their current work fully.

The results of the observations and interviews were corroborated quantitatively. The table above shows that distractibility, or easily distracted behaviour, had the highest frequency, with a score of 3, indicating that this behaviour occurred almost always during science lessons. Students with ADHD were highly reactive to environmental stimuli, such as noise, peer movement, and classroom activity. This indicates that distractions from external factors were the most significant challenge for them in maintaining focus. The indicators for distractibility and inconsistent engagement both scored 2, which is in the frequent category. This indicates that students frequently lost focus on the task at hand, and their engagement in following the teacher's instructions was unstable. This behaviour is characterised by a slow response to instructions or an inability to maintain focus from the beginning to the end of a learning activity.

Meanwhile, task avoidance has a score of 1, indicating that this behaviour occurs only occasionally. This means that most students are willing to try to complete the tasks assigned by the teacher, but at certain times, especially when the task is difficult or tedious, they tend to procrastinate or find excuses to avoid it. The average score across the four indicators is 2.00, indicating that students' attention deficits are generally in the frequent category. The minimum score is 1.00 (task avoidance) and the maximum score is 3.00 (distractibility). This difference indicates behavioural variation, with environmental distractions as the dominant problem, while task-avoidance behaviours occur less frequently. Overall, these results illustrate that attention deficits in students with ADHD are primarily influenced by external factors that make them easily distracted. Therefore, learning strategies should focus on creating a distraction-free learning environment and on using engaging, structured learning media to help them stay focused.

Table 2. Statistical Data Analysis of ADHD Students' Focused Attention Disorder Patterns in Science Learning

Statistics	Score	Interpretation
Mean (X)	2,00	The average attention deficit is in the Frequent category.
Median	2,00	The majority of indicators appear at the Frequent level
Standard Deviation (SD)	0,82	Variation between indicators is low, and impairments are relatively uniform.
Minimum	1,00	The least frequent impairment (Sometimes)
Maximum	3,00	The most frequent impairment (Always)
Confidence Interval 95%	0,70 – 3,30	Estimated average impairment in the population.

Based on the table, the average (mean) score for attention deficit disorder among ADHD students during science lessons was 2.00, which falls into the "Frequent" category. This indicates that attention-deficit disorder behaviours, such as shifting attention, responding to environmental stimuli, and inconsistent engagement, occur quite frequently in class. These results demonstrate that ADHD students require learning strategies that can consistently direct their attention, for example, through the use of visual media and clear instructions (Putri et al., 2023; Cuber et al., 2024). The median score was also 2.00, equal to the mean, indicating a relatively balanced distribution of impairments across indicators. This means that most types of impairments appeared with equal frequency, particularly in the "Frequent" category. The consistency between the mean and median indicates that no impairment indicator is so extreme as to skew the data distribution. However, the presence of one indicator with a maximum score (3.0) still indicates a very prominent symptom.

The relatively small standard deviation (SD) of 0.82 indicates that variation across indicators of attention deficit disorder is not significant. In other words, the four types of observed distractions (distraction, distractibility, task avoidance, and inconsistent engagement) occurred approximately equally often. This facilitates teacher planning of learning strategies because all indicators require relatively balanced interventions. The minimum and maximum score ranges reinforce this picture. The minimum score of 1.00 was observed for the task avoidance indicator, indicating that this behaviour occurs only occasionally and is not frequent.

In contrast, the maximum score of 3.00 was found for the distractibility indicator, indicating that students almost always respond to internal and external distractions, such as the sound of vehicles, the movement of peers, or conversations around the classroom. This reinforces the observation that environmental distractions are a significant challenge in science learning for students with ADHD. Next, a 95% Confidence Interval (CI) was calculated to estimate the average range of distractions in the broader population. The CI obtained was 0.70–3.30, indicating that if this study were repeated with another group of students with ADHD, there is a 95% probability that the average level of distraction would fall within this range. This range is relatively wide due to the small sample size (only four indicators), but it remains relevant for predicting general patterns of impairment.

Based on observations in science lessons, four leading indicators of impaired attention were found in students with ADHD, which appeared with varying frequency. First, attention shifting is a fairly frequent pattern. Students with ADHD tend to easily shift their attention to other stimuli around them, whether it be sounds, peer movements, or visual objects irrelevant to the lesson. They exhibit difficulty maintaining focus on ongoing activities, such as when the teacher is explaining or when asked to observe an experiment. This finding aligns with a study by Henning et al. (2022), which found that inattention is the ADHD symptom dimension most strongly associated with academic failure, even in the early years of education. Second, distractibility, or being easily distracted, is the most prominent symptom and is consistently present. Students are highly reactive to both internal factors (e.g., their own thoughts) and external factors (e.g., the sound of vehicles, peer movements, or classroom conditions). This is consistent with the findings of Lee et al. (2021) and Cheng et al. (2023), showing that inattention and uncontrolled impulsivity are strongly correlated with decreased social preference and increased experiences of peer victimisation, which, in turn, worsen learning focus in class.

Third, task avoidance occurs occasionally, especially when students perceive the assigned task as too complex or demanding of high concentration. They tend to procrastinate, ask to be excused from class, or simply sit still. This indicates a form of task avoidance that reflects difficulties in managing academic demands, as described in a systematic review by Pagespetit et al. (2025), which highlighted the impact of inattention symptoms on decreased self-efficacy and learning achievement. Fourth, inconsistent engagement patterns are also observed, with students often not responding quickly or appropriately to teacher instructions. Although they appear active at times, their engagement is short-lived. This pattern reflects weak sustained attention, which is a key neurocognitive aspect that impacts long-term social and academic functioning in children with ADHD (Español et al., 2023; Kalokyri, 2025). These findings suggest that impaired focused attention in students with ADHD in science learning is complex and manifests in a variety of behavioural forms. This impairment is influenced by the interactions among personal factors, the social environment, and the school's learning design. Therefore, teachers and schools need to develop learning strategies that are not only responsive to the focus needs of ADHD students, but

also capable of creating an adaptive, supportive, and inclusive learning environment.

The learning success of students with Attention Deficit Hyperactivity Disorder (ADHD) is largely determined by how teachers create a learning environment that supports their focus and engagement (Kakoulidou et al., 2021; Lee et al., 2021; Satwika et al., 2022; Rowan et al., 2024). In science learning in special education schools (SES), teachers' roles are crucial, as they serve not only as facilitators of learning materials but also as managers of student behaviour and attention. Given that students with ADHD tend to be highly distractible and have limited attention spans, adaptive learning strategies are crucial for maintaining concentration, reducing task avoidance behaviour, and increasing participation in learning activities.

Results of in-depth interviews with teachers and classroom observations indicate that teachers develop a range of practical, intuitive, and context-specific approaches to managing students' attention during science instruction. These approaches are not formally designed but emerge as adaptive responses to challenges that arise in real-life learning situations. These strategies are dynamic and flexible, tailored to individual student needs and the current classroom environment. To understand these strategies more systematically, the findings are categorised into three main approaches based on their intervention focus: media use, time management and activity structure, and personal interaction.

In the first category, media use, teachers tend to use concrete props, visual images, and short videos as attention-getters and aids for scientific observation. These visual and manipulative media have been shown to improve the focus of students with ADHD because they provide stronger visual and kinesthetic stimuli while reducing distractions from irrelevant stimuli. The pervasive engagement of ADHD students with social media platforms should be strategically redirected toward educational and inquiry-based endeavours, necessitating that science teachers adopt a proactive approach to leveraging these digital tools to foster higher-order thinking skills (Tanghal & De Leon, 2022). In practice, teachers also prepare simple tools such as lung models made from bottles and balloons, or show short experiments, which can increase students' attention to the learning topic. The second category is time management and activity structure. Teachers break learning activities into short, 10–15-minute stages, with clear active breaks or transitions between activities. The use of visual schedules on the board and time signals (such as alarms or lights) helps students manage expectations and increases the predictability of the learning process, which is crucial for sustaining attention in students with ADHD. This approach also minimises the cognitive fatigue that often occurs in students with attention-deficit/hyperactivity disorder.

Meanwhile, the personal interaction approach involves emotional closeness and positive interpersonal communication. Teachers build supportive relationships with students through direct name-calling, praise for effort, and the use of non-verbal cues to remind them to focus. Teachers also provide instructions in short, clear sentences and often choose to sit near students with ADHD to provide direct positive reinforcement when attention begins to wane.

These three approaches demonstrate that teacher strategies for addressing attention deficit disorders in students with ADHD are not singular or linear, but rather a combination of various reflective and contextual approaches. These strategies reflect the importance of inclusive, responsive learning design based on a deep understanding of students' attention needs in science learning contexts. These findings open the way for the development of more systematic pedagogical interventions to build adaptive, neurodiversity-friendly science learning.

Table 3. Teacher Strategies in Managing Attention-Focused ADHD Students in Science Learning

Strategy Category	Forms of Strategy Implemented	Purpose or Effect to Attention
Visual and Concrete Media	Teachers use concrete media in the form of picture and toy education (e.g. puzzles) available at school.	Use a picture intended to make the students more interested. Toy education. This helps practice the student's level of focus.
Segmentation Activities and Instructions	The teacher gives instructions gradually in the assignment given	Instructions given gradually with the aim that students can focus on what is being done before moving to the next task, furthermore
Personal Interaction and Reinforcement Positive	The teacher gives a strengthening, positive personal message to the student in the form of appreciation and reward.	The goal is to give students the strength to achieve good results.

Table 3 presents concrete strategies identified through observations and interviews and explains how they help maintain or restore students' attention during science lessons. These findings also indicate that teachers intuitively apply inclusive pedagogical principles, although these principles have not yet been formally framed within an intervention-based approach.

Based on classroom observations and interviews with teachers, it was found that the strategies used to manage students' focused attention during science lessons can be classified into three main categories: visual and concrete media, segmentation of activities and instructions, and personal interaction and positive reinforcement. These strategies were developed intuitively by teachers and used flexibly, tailored to class dynamics and each student's needs. The first category is the use of visual and concrete media. Teachers utilise visual images and educational toys, such as puzzles or simple anatomical models, available at school. These concrete media serve not only as learning aids but also as attention stimulants. The use of images is intended to capture students' interest and help them focus more on the topic being discussed. Educational toys, particularly those involving object manipulation, help train students' concentration and motor skills. Inattention is a key dimension hindering the academic achievement of students with ADHD, especially when they are faced with abstract learning without concrete visual support (Watari et al., 2021; Henning et al., 2022; Surya & Suteja, 2024).

The second strategy is segmenting activities and instructions, where teachers divide learning activities into smaller, clearly sequenced steps delivered in a step-by-step manner. For example, when assigning a lab or observation, teachers break the instructions into separate steps rather than providing the entire task at once. This approach allows students to focus on one part of the assignment at a time, minimising cognitive overload. Children with ADHD tend to exhibit decreased focus when managing complex information simultaneously, and a step-by-step strategy can help reduce the risk of attention loss (Kurniawan et al., 2021; Lee et al., 2021; Heni, 2022; Sadida et al., 2024; Surya & Suteja, 2024). The third category is personal interaction and positive reinforcement, which teachers use through verbal appreciation and small rewards when students demonstrate focus or complete tasks successfully. This form of reinforcement creates positive associations with focused behaviour and encourages active engagement in learning. Teachers also build warm interpersonal relationships, using name-calling, positive verbal touch, and friendly facial expressions as forms of emotional support. Kalokyri (2025), in his ethnographic study, also emphasised the importance of the social dimension and interpersonal relationships in helping students with ADHD feel accepted and motivated to participate in the learning environment actively. This type of interaction indirectly reduces students' tendency to experience alienation or withdrawal, which often hinders focus in collaborative and exploratory science learning.

The findings above demonstrate that teacher strategies for managing students' focused attention with ADHD are not uniform approaches but rather the result of a sensitive understanding of individual student characteristics and the classroom's contextual needs. These strategies demonstrate the potential of reflective practice-based classroom interventions, which deserve systematic documentation and further development.

The findings on the learning strategies used by teachers in science learning require analysis to determine their effectiveness in developing students with ADHD's focused attention skills. Data on the level of focused attention among ADHD students in science learning were collected using observation sheets based on focused-attention indicators. The results of improving focused attention in science learning among ADHD students using teachers' implemented learning strategies are presented in Table 4.

Table 4. The Level of Focused Attention of ADHD Students Before and After Science Learning

Score Range	Criteria	Number of Students	
		Pretest	Posttest
69-84	Very good	0	0
53-68	Good	0	1
37-52	Pretty good	3	4
21-36	Not good	2	0
Total		5	5
Mean (X)		37,4	52,6
Maximum		42	57
Minimum		33	51

Table 4 shows an increase in students with ADHD's focused attention before and after science instruction using the teacher's strategies. The data was then tested for normality as a prerequisite. In this study, the normality test was conducted

using the Shapiro–Wilk test, because this test is recommended for small sample sizes ($n \leq 50$) and has higher statistical power than other normality tests (Field, 2018). According to Ghasemi & Zahediasl (2012), the Shapiro–Wilk test is a method for assessing the normality of research data with a limited number of respondents because it can detect small differences between the actual data distribution and the theoretical normal distribution, even when the sample size is small. According to Kazdin (1982), small data can still be analysed quantitatively as long as their stability is checked and they follow a distribution pattern close to normal. If the test results indicate that the data are not normally distributed, the analysis uses the nonparametric Wilcoxon Signed-Rank Test (Field, 2018). The results of the normality test are shown in Table 5.

Table 5. Tests of Normality (Shapiro-Wilk)

Test Statistics	df	Statistic	Sig.
Shapiro-Wilk	5	0,860	0,921

The results of the normality test using Shapiro-Wilk on the score difference data showed a statistical value of 0.860 with degrees of freedom (df) = 5 and significance (Sig.) = 0.921. Because the Sig value is greater than 0.05, the data are normally distributed. This indicates that the normality assumption is met, so the analysis of the score difference before and after learning can proceed using a parametric test, namely the Paired Sample t-test.

Table 6. Paired Samples Test

Pair	Mean (pre-post)	t	df	Sig. (2-tailed)
Pre–Post	6	-12,0	4	0,001

The results of the Paired Sample t-test showed an average increase of 6 points in scores from before to after learning. The t-value obtained was -12.0 with degrees of freedom (df) = 4 and a significance value (Sig. 2-tailed) = 0.001. Because the p-value is much smaller than 0.05, this increase is statistically highly significant. This means the learning provided had a real impact on improving student scores, even though the magnitude of the increase was relatively small, as reflected in the average difference of only 6 points. Furthermore, to determine the extent of the increase, an n-gain test was conducted as presented in Table 7.

Table 7. Individual N-Gain Test Results

Student	Pre	Post	Difference	N-Gain	Category
Faw	40	46	+6	0,103	low
Azz	42	48	+6	0,100	low
Aba	41	47	+6	0,103	low
Abi	39	45	+6	0,104	low
Raff	40	46	+6	0,103	low

Based on the N-Gain calculation, all students showed an increase in scores after the learning process, but the increase remained in the low category. Each student obtained the same score difference of +6 points, with N-Gain values ranging from 0.100 to 0.104. The average N-Gain for the group was around 0.103, which falls within the low category. This indicates that although the learning process has a statistically significant effect on increasing students' focused attention, the magnitude of the increase remains limited and falls short of the medium or high category. Thus, more intensive and innovative learning strategies are needed to optimise the effectiveness of increasing students' attention.

Table 8. Group N-Gain test result

Statistics	Score
Average N-Gain	0,103
SD	0,001
Category	low

The results of the group N-Gain analysis showed an average N-Gain of 0.103 with a standard deviation (SD) of 0.001. This value is in the low category, meaning that although scores increased after the learning process, the effectiveness of this improvement was still very limited in practice. This low N-Gain value confirms that the learning intervention provided has not yet produced substantial improvements in student attention. Therefore, more varied, contextual, and intensive learning strategies are needed to encourage more optimal improvements in the future. Analysing students with ADHD's level of focused attention after learning for each indicator reveals the following scores.

Table 9. The Level of Focused Attention of ADHD Students in Science Learning for Each Indicator

Indicator	Score average
Task Focus	2,1
Response to Relevant Stimuli	2,6
Visual and Auditory Focus	2,4
Distraction Reduction	2,2
Goal Orientation	3
Reaction Time	2,9
Frequency of Attention Shifts	2,3

The average score showed that goal orientation reached the highest value (3.0), and reaction time was relatively good (2.9), while scores on the indicators of task focus (2.1), reducing distractions (2.2), and frequency of shifting attention (2.3) remained low. These results reflect that students with ADHD are better able to direct attention when they have a clear target, but have difficulty maintaining focus throughout each stage of the activity, especially when faced with external distractions or complex instructions. These findings align with research introducing digital modules based on ethnoscience and edutainment for science learning (Ardianti & Wanabuliandari, 2021; Ardianti et al., 2023; Ardianti et al., 2023). Their modules were designed to be concrete and culturally relevant, aiming to increase students' engagement and understanding of science concepts in elementary school. This strategy has been shown to increase student motivation and concentration in the conceptual and observational aspects of science. This approach aligns with the needs of students with ADHD, who require concrete and meaningful media to maintain learning focus, which is reflected in lower indicator scores when tasks are not visually or practically structured (Antonietti et al., 2021; Doulou et al., 2025). Thus, the primary challenge in strengthening focused attention in students with ADHD lies not only in their internal difficulties but also in how the material is presented: the more concrete, visual, and culturally relevant it is, the greater the potential for students to maintain focus and reduce their susceptibility to distractions. This paragraph highlights the relevance of the ethnoedutainment media design developed by Ardianti & Wanabuliandari (2021) as a potential solution to improve academic attention among students with ADHD in science learning.

Table 9 also shows that the highest score for the focused attention indicator for students with ADHD in science learning is for goal orientation, while the lowest score is for the task-focused indicator. This is due to the characteristic of students with ADHD, which is difficulty maintaining focus for extended periods. This aligns with research findings that students with ADHD are easily distracted by environmental stimuli (Tosto et al., 2021; McDougal et al., 2023; Sanjaya et al., 2023; Sonuga-Barke et al., 2023). Furthermore, the indicators for distraction reduction and attention diversion frequency are also low. This suggests that students with ADHD have difficulty maintaining focus and ignoring distractions. This aligns with the findings of Lawrence et al. (2021) and Sepúlveda et al. (2021), who found that students with ADHD have lower academic performance due to difficulty maintaining focus. The results of the t-test and n-gain test indicate an increase in focused attention in students with ADHD, but in the low category. This low n-gain value indicates that the learning intervention has not produced substantial improvements in students' focused attention, suggesting that more varied and contextual learning strategies are needed.

CONCLUSION

Based on the analysis, it can be concluded that the pattern of disturbances experienced by

ADHD students at Sunan Kudus Special Elementary School is that they consistently respond to disturbances in their learning environment, frequently disrupting their focused attention. Students can demonstrate scientific attitudes such as curiosity, a desire to experiment directly, and a desire to explore science objects. However, students experience attention difficulties, which often disrupt the completion of scientific assignments. The learning strategy implemented is for teachers to develop several practical, contextually appropriate approaches to manage the attention of ADHD students during science instruction. This strategy is dynamic and flexible, adjusted to the individual needs of students and class conditions, The results of the t-test and n-gain test show an increase, but this value is in the low category, meaning that even though there is an increase in scores after learning, the effectiveness of this increase is practically still very limited The impact of this study, namely the low N-Gain value, confirms that the learning intervention provided has not been able to produce a substantial increase in students' focused attention, so that a more varied and contextual learning strategy is needed.

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