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IDENTIFYING INTERACTIVE TOYS' KEY CHARACTERISTICS FOR INTELLECTUAL DISABILITIES CHILDREN IN SPECIAL SCHOOL

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Abstract: *The rising prevalence of intellectual disabilities in Indonesia, notably in Jakarta, raises pressing concerns. Many affected individuals, particularly children, face social challenges that need to be addressed and implemented in education, thus the role of Special Schools, which unfortunately often rely on teaching methods that are deemed unsuitable for intellectually disabled children. Therefore, it is imperative to design a media that is suitable for teaching social relations in Special Schools. The use of interactive toys in play activities has proven to be beneficial in education, due to their contribution to children's emotional and cognitive development. This research aims to identify toy characteristics that enhance learning for elementary students with intellectual disabilities, providing recommendations for developing interactive educational tools for teachers. The methods used in this research will be observation and literature studies. Findings show that it is important to consider the use of color, materials, as well as several engagement aspects in designing interactive toys for Special Schools' elementary students.*

Keywords: *interactive; toys; intellectual disabilities; game lenses; special school*

Introduction

The Ministry of Health states that the number of people with intellectual disabilities in Indonesia tends to increase every year with a prevalence of 1 in 5 people, where the highest percentage is found in the DKI Jakarta province, namely 24.3% of the total population in Indonesia (Widowati, 2023) with 3.3%, specifically 2.197.833, are children aged 5 to 19 years old (Fitri Syarifah, 2023). Until now, people with intellectual disabilities have been excluded from both their lifestyle and social status, with the problems they face becoming increasingly complex (Widyaiswara et al., 2018), due to mental, emotional, and behavioral deficiencies or limitations (Lestari et al., 2021), characterized by difficulty with adaptive behavior, slower learning rate, irregular learning patterns, and struggling in understanding abstract concepts (Ni'matuzahroh et al., 2024). Children with disabilities find it challenging to reciprocate social interactions, identified by less eye contact, minor facial expressions, and awkward body language, making it difficult to initiate a conversation and communicate their minds (Jacob et al., 2022) (Hodges et al., 2020). Many cases have shown that nearly half of the children with intellectual disabilities were found to have run away at least once which potentially leads to elopement risk, due to their social skills shortfall to check in on their

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parents and have communication and social bonding that most kids have (Anderson et al., 2012) (Hotez & Onaiwu, 2023), as social relations skills are strongly associated with self-awareness, the ability to identify themselves and their close surroundings, as well as interact with them, thus making it an integral part of their viability.

Nevertheless, these shortfalls can still be overcome with proper education and training (Lubis et al., 2023). Applying proper education for intellectually disabled children is not only focused on education at home but also needs to be emphasized in the school education system, which in Indonesia, can be addressed in Special Schools (Sekolah Luar Biasa). Special Schools play a major role in directing education for children with special needs, including developing attitudes, personality, intellectual, and physical abilities to achieve their optimal potential. It was recorded that in 2019, there were 38.545 children with intellectual disabilities registered at Special Schools (Lestari et al., 2021). However, according to field observations and past studies (Maryanti et al., 2021)(Istiyati et al., 2023), many Special Schools provide learning media that relies heavily on rigid textbooks and exam sheets which have unrepresentable visual aids, limiting experiential as well as practical learning, and are deficient in interactive aspects, making them less motivating, inflexible, and difficult to understand for students, causing hindrances in learning performance and dependencies. Not to mention other barriers such as teachers' insufficient ability in facing children with intellectual disabilities and substandard infrastructural support. It is advised that schools and teachers customize the study material to the needs and conditions of disabled students due to their abilities and potential differences (Maryanti et al., 2021).

Preceding studies have proved that playing therapy, as one of the intervention techniques that is suitable for intellectually disabled children (Lubis et al., 2023), fundamentally accommodates a child's growth, especially in emotional, social, and cognitive aspects (Johry & Poovaiah, 2019) (Hashmi et al., 2022) (Yogman et al., 2018). This type of intervention is carried out using various game tools accordingly to engage with their emotional aspects (Lubis et al., 2023), using toys for instance, where children interact, manipulate, and explore the toy's properties (Yogman et al., 2018).

The use of toys in the educational system to improve children's cognitive abilities is also supported by Bloom's theory which stresses the importance of comprehension, which is a condition where students understand what is being communicated and are able to utilize as well as apply the ideas contained independently. Comprehension success can be measured by how students understand the objectives of a context, as well as students' behavior and responses to information. This requires strength in communication, which can be in verbal and written forms. Basically, communication is carried out to describe, inform, influence, and entertain, yet in certain situations, for communication to be successful, a certain reaction is to be expected. As a result, a particular medium of expression is used to give a 'unique' experience in delivering an idea, a set of operations but an expressive creation, instead of a theoretical framework (Bloom, 1983). This statement shows how a toy in a play activity can be utilized to achieve a learning objective aside from using a conventional teacher-centered approach or textbook learning methods which are no longer considered effective, especially for students with disabilities.

Experts and previous research indicates that interactive toys have educational utility. It enhances cognitive development by offering a potentially superior or

more productive learning experience due to their interactive nature. However, there is a notable lack of studies on interactive toys focused on children with special educational needs and disabilities (Hall et al., 2022).

Therefore, this research was carried out as a preliminary review to identify the key characteristics of an interactive toy as a learning medium for elementary students with disabilities. The output of this research is in the form of recommendations, which we hope can be applied in developing interactive toys for Special Schools' students that can be used by teachers in teaching social relations.

Methodology

The methods used in this paper are direct observation, derived from the concept of purposive sampling to focus on subjects that fit a specific profile (Campbell et al., 2020), and literature review approaches to strengthen the in-depth knowledge of toy playing led by young children with intellectual disabilities in a Special School. Purposive sampling uses a relatively small sample, therefore this study specified to participate 6 intellectually disabled children, ranging from grade 1 to 3 in a South Jakarta Special School.

The observation protocols were conducted by using free play, where children can participate voluntarily in playing activities with two different types of toys, namely Stacking Toy Train and Go Go Gelato!, as seen here in Fig.1, chosen by considering representative characteristics from Kudrowitz and Wallace toy's classification that motivate enjoyment and process-oriented learning, such as sensory, constructive, fantasy, and challenge (Johry & Poovaiah, 2019) (Kudrowitz & Wallace, 2010).

Figure 1. Stacking Toy Train and Go Go Gelato! (Source: Personal research documentation)

Expanding from Kudrowitz and Wallace's toy categorization, the research indicators will be formulated using Jesse Schell's Game Lenses, namely the lens of emotion, the lens of fun, the lens of motivation, the lens of curiosity, the lens of time, the lens of challenge, the lens of problem solving, the lens of skill, and the lens of accessibility, to evaluate the children with intellectual disabilities' engagement with the provided toys. The lens of emotion discusses the feelings that the player perceives which is the foundation of memorable experiences, strongly related to the lens of fun that emphasizes not simply pleasure but also the aspect of excitement in a game. The lens of motivation is established from the idea that humans are innate explorers thus having a high sense of curiosity and drive for enrichment and satisfaction. Each person's motivations can diverge therefore it is important to work out the targeted audience's true collective motivation. The lens of curiosity talks about how a game can trigger someone's inquisitiveness, answering the player's questions related to their interests. Determining the length of playing activities is associated with the lens of time, taking into account whether a designated game duration will ensure an overall positive experience to avoid boredom or frustration. The lens of challenge refers to how a game can provide a chance to exercise a player's skills in completing a game, for example by presenting obstacles for players to overcome. The lens of skill discusses considerations related to choosing a suitable combination of skills,

generally divided into physical, mental, and social skills, required in completing levels of challenges in the game. Schell stated that every game is a problem-solving exercise approached playfully, hence the lens of problem solving, used to analyze how a game engages players in tackling problems (Schell, 2014). These lenses exist to keep the player engaged and invested in playing the game, therefore creating a stronger emotional connection and leading to playing retention. The indicators as shown in Table 1 will be measured using Likert scale, ranging from strongly agree to strongly disagree.

Table 1. Game Lenses Research Indicator
(Source: Personal research documentation)

Game Lenses	Indicators
Challenge & Skill	Can students remember the contents of the media?
	Can students read content/media content?
	Can students understand the content of the media?
	Can students actively say the content out loud?
	Can students explain using their own words about the context of the media?
	Can students imitate the instructions/words/sounds they hear?
Challenge, Problem Solving, & Skill	Can students differentiate media content based on color/shape/image?
	Can students arrange media content based on color/shape/image?
	Can students solve problems in the media?
	Can students take the initiative/creatively look for alternatives to solve media?
	Can students think logically about media content?
	Can students complete the activities/objectives from the media?
Challenge, Skill, & Accessibility	Can students interact appropriately with the media?
Fun, Motivation, Curiosity, Time, & Accessibility	Can students focus on the media?
	Do students seem to like/be comfortable with the media?
	Do students feel bored with the media?
	Do students are not attracted to the media?
	Do students squint / frown when looking at the media?
	Do students bring the media close to their eyes?
Emotion	Can students express what they feel about the media?
	Do students are prone to tantrums and do not hesitate to hit, throw or bite the media?
	Do students do something that endangers themselves or others with the media?
	Can students be responsible with the media they own?
Emotion & Time	Can students sit quietly?
	Do students' moods change easily?
Emotion & Skill	Can students focus and concentrate?
Emotion & Motivation	Do students look confident?

Result

Observation is carried out by establishing conditions as follows:

1. In order to see the effectiveness of the characteristics of toys that are suitable for social relations learning media, it is imperative to understand thoroughly the teacher's role in introducing and coaching students using the media provided, therefore observations will be carried out using a one-on-one system, where one teacher will accompany one student.

2. The teacher will introduce two types of toys to students, namely Stacking Toy Train and Go Go Gelato! Toys will be

given one by one to study the interactions between teachers and students, as well as the students' responses to the media.

Based on the observations conducted on 6 elementary school students in grades 1 to 3 who have intellectual disabilities, the following results are identified in Table 2.

Table 2. Game Lenses Research Indicator (Source: Personal research documentation)

Indicators	Result
Can students remember the contents of the media?	3/6 agree 3/6 strongly disagree
Can students read content/media content?	6/6 strongly disagree
Can students understand the content of the media?	3/6 agree 3/6 disagree
Can students actively say the content out loud?	6/6 strongly disagree
Can students explain using their own words about the context of the media?	6/6 strongly disagree
Can students imitate the instructions/words/ sounds they hear?	6/6 strongly disagree
Can students differentiate media content based on color/shape/image?	3/6 strongly agree 2/6 agree 1/6 disagree
Can students arrange media content based on color/shape/image?	3/6 strongly agree 2/6 agree 1/6 disagree
Can students solve problems in the media?	3/6 agree 3/6 disagree
Can students take the initiative/creatively look for alternatives to solve media?	6/6 strongly disagree
Can students think logically about media content?	3/6 agree 3/6 disagree
Can students complete the activities/objectives from the media?	3/6 strongly agree 2/6 agree 1/6 disagree
Can students interact appropriately with the media?	3/6 strongly agree 3/6 agree
Can students focus on media?	2/6 strongly agree 3/6 agree 1/6 disagree
Do students seem to like/comfortable with media?	3/6 agree 2/6 neutral 1/6 strongly disagree
Do students feel bored with the media?	1/6 strongly agree 2/6 neutral 3/6 disagree
Do students are not attracted to the media?	6/6 disagree
Do students squint / frown when looking at the media?	2/6 agree 4/6 disagree
Do students bring the media close to their eyes?	6/6 disagree
Can students express what they feel about the media?	2/6 strongly agree 4/6 neutral
Do students are prone to tantrums and do not hesitate to hit, throw or bite the media?	2/6 agree 4/6 strongly disagree
Do students do something that endangers themselves or others with the media?	6/6 strongly disagree
Can students be responsible with the media they own?	4/6 agree 2/6 disagree
Can students sit quietly?	4/6 strongly agree 1/6 agree 1/6 disagree

Do students' moods change easily?	2/6 strongly agree 1/6 neutral 3/6 disagree
Can students focus and concentrate?	4/6 agree 2/6 disagree
Do students look confident?	5/6 agree 1/6 neutral

Discussion

Kudrowitz and Wallace's toy categorization explained how sensory highlights the use of senses in how a toy feels, sounds, smells, and even tastes, which could also involve textures and material aesthetic elements of the toys, such as sandy, tactile, stretchy, and other types of tactile. Fantasy stresses the idea of pretense, imagination, and role-playing. Toys like tea sets, action figures, dolls, toy cars, and other similar toys, can immerse a child in their own make-up world. The construction type revolved around assembling, making, and creating things, not limited to stacking activities, thus including some degree of creativity, for example beading, doodling, arranging new words, and building blocks. Challenge-based can be a form of play that tests someone's abilities, mentally or physically. Toys that are challenge-based incorporate strengthening the child's cognitive ability (mental) like puzzles and riddles, as well as fine and gross motor skills (physical), soccer and juggling for instance (Johry & Poovaiah, 2019). Table 3 provides the Stacking Toy Train and Go Go Gelato! type of play affordance based on Kudrowitz and Wallace toy characteristics.

Table 3. Selected Toys Type of Play
(Source: Personal research documentation)

Toy Name	Type of Play	Description
Stacking Toy Train	Sensory	Colourful wood texture and different stacking shape variants.
	Fantasy	Encourage imagination by creating scenarios and envision adventures.
	Constructive	Stacking shape blocks and connecting compartments .
	Challenge	Motoric activity by pushing and pulling the train, as well as putting each block by matching its hole with the stick.
Go Go Gelato!	Sensory	Colourful and quishy gelato balls, as well as textured cones.
	Fantasy	Encourage imagination by creating scenarios related to engaging with ice cream.
	Constructive	Stacking the gelato balls and cones.
	Challenge	Motoric and mental, involves stacking the gelato balls and cones according to the randomly picked cards.

These toys are then given to children with the aim of observing the quality or property of the toys that define their pos-

sible uses for intellectually disabled children.

Through observations, it was found that most students, even with varying understanding and duration, had better abilities in identifying colors than shapes. This can be seen from the relatively short duration of the students' responses from when they heard the instructions until finally selecting and grouping objects based on the types of colors mentioned by the accompanying teacher. Past study explained that in designing for children, designers need to consider the fact that color is a form of visual language. Apart from being able to influence a child's preferences and interest in an object, color enriches and stimulates their visual vocabulary (referring to the elements, characteristics, or visual features used to identify, describe, and categorize an object), especially those who have limited psychological and cognitive development (Xu et al., 2022). It is also showed that children are more interested in color than the shape of an object and tend to easier recognize and interpret colors. The younger a child is, the brighter and more contrasting their color preferences are. In addition, the research results suggest using complementary color combinations rather than complex color schemes due to their undeveloped cognitive abilities to avoid distraction and visual fatigue (Xu et al., 2022).

Meanwhile, the majority of students seemed to have difficulty when given a game with too many variations in object shapes, Go Go Gelato, which only consists of two object shapes, seemed easier for the students to group compared to Stacking Toy Train, which had more shape variations, so instead arranging trains through shapes, students prefer to stack the object based on its colors. It is also debatable due to the fact that there is a possibility that the shape of Stacking Toy Train is not representable enough as the shape is too basic, contradicting with Go Go Gelato! which looks exactly like ice cream. This idea is supported by the fact that one of the students tried to eat the toy because they perceived it as food.

Another interesting finding is how the students handle the objects. It can be seen that students often have difficulty matching the holes in objects, often drop or accidentally bump toys, and have the habit of placing objects by pressing them, so it is concluded that students are less able to deal with objects with fragile materials, because they will break quickly, or materials that are too hard, because there is a possibility that they will hurt themselves if not handled appropriately.

The game's engagement needs to be considered so that students stay focused. Several times students were distracted by sounds from friends around them or other objects. Students can return to focus if they are persuaded by their accompanying teacher through words or physical touch on the hands and forehead which are close to the eye area to divert their gaze from other external interventions. Aside from encouraging physical engagements, the use of sound in toys is recommended as a past study explained the importance of sound in toys to increase attention, curiosity, and interest, thus motivating the children to explore the affordance of the toy (Carlson et al., 2019). This sound should be identifiable, commonly heard, and imitable, applied as an interactive mechanism, activated as a respond to the action given to the toy.

Seeing that learning social relations requires a form of habit formation, Skinner's theory of operant conditioning is also used to assess the observation results. Operant conditioning introduces the concepts of antecedent (stimulus), behavior (response), and consequence (reinforcement). This theory discusses how a habit is first formed due to external encouragement or stimuli, thus the

term antecedent, which will later be responded to with a certain action by the subject. Different responses will give rise to different consequences, whether in the form of reinforcement, namely a situation where something is added or subtracted to strengthen behavior, or punishment to reduce behavior retention (Skinner, 2013). This concept of behavior formation cannot be separated from the duration of the stimulus-behavior-consequence process (time-variable), the action or response of the individual, the object that influences the action, insight or the takeaway through the repeated behavior, and expression or emotions shown through the individual interactions with the object.

Based on the results of observations, it is known that stimuli mostly start from encouragement and instructions by teachers, which are usually communicated verbally or through physical contact to maintain the child's focus. Instructions are given in stages and adjusted to each child's ability to respond. If the student succeeds in carrying out the action according to the instructions, then the teacher will give further directions. The responses shown by each student were different, some were able to immediately understand the instructions, others were able to understand but for a long time, view of them looked hampered, while one student even looked frustrated. For those who successfully follow the instructions, the accompanying teacher will give rewards in the form of applause or praise. This action does make the students look spirited, yet for some reason is not effective in creating behavior retention, so it is concluded that students are still not necessarily able to connect how appropriate responses or actions will have certain impacts or consequences.

Therefore creating a playing mechanism that discusses social relations using interactive toy designs is expected to have an integrative breakthrough, not just through technology convergence, but a new game mechanism, "a new way to play" or so they said (Hall et al., 2022).

Conclusion

In conclusion, the observations indicate that students show a stronger ability to identify colors than shapes, which highlights a potential area for focused development in utilizing colors. Further research regarding the shape of an object, simplified or detailed and representable, is needed as a consideration in designing toys that put forward social relations themes, which in this case highlights the substance of identifying and likening real-life individuals with its illustrative portrayal. Difficulties in handling objects suggest that students struggle with fragile or hard materials, impacting their learning experiences. Effective engagement strategies, such as sound implementation may be able to redirect students' attention amidst distractions. Additionally, while teachers' encouragement and structured instructions facilitate learning, the inconsistent retention of learned behaviors indicates a need for enhanced reinforcement strategies. Ultimately, tailored playing mechanism approaches that consider individual student responses and the dynamics of their interactions with materials will foster more effective learning outcomes in social relations and cognitive skills development.

There is a considerable need for interdisciplinary and collaborative research to investigate the development of interactive toys. The participatory design approach is recommended to deepen understanding related to what the teachers need in teaching social relations to students with intellectual disability. Teachers are suggested to be more adaptable in teaching students with variations of intellectual disabilities, adjusted accordingly to their limitations, needs, and potentials. Con-

ventional instructional learning is deemed to be ineffective, thus this research encourages teachers to be more accustomed to the play-learning method, facilitated by Special Schools.

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