ANIMATION DESIGN FOR LETTER AND COLOR RECOGNITION FOR CHILDREN WITH MENTAL DISABILITIES

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ABSTRACT

This study aims to design an educational animation for recognizing letters and colors for children with intellectual disabilities as an interactive and inclusive learning medium. Children with intellectual disabilities require a special approach because their intellectual limitations impact their ability to understand basic material. By utilizing animation, the learning process can be made more interesting, enjoyable, and easy to understand. The method used is descriptive qualitative with a practice-based research approach that focuses on the design process of works based on visual communication design. The animation design refers to 12 Disney animation principles, such as squash and stretch, timing, staging, and appeal, which are applied in scenes to present expressive movements, measured rhythms, and friendly visual characters. The results show that the application of animation principles can increase the appeal and effectiveness of communication of learning messages. Animation not only enriches the visual aesthetic aspect but also functions as a pedagogical instrument that supports children's cognitive, affective, and motor development. Thus, this educational animation has a dual role: as entertainment that motivates children to learn and as a learning medium that helps the process of internalizing letters and colors gradually. This research makes a real contribution to the development of adaptive educational media for children with special needs.

Keywords: Animation, Colors, Letters, Mentally Retarded.

1. INTRODUCTION

Mentally Disabled is a term for children with special needs who experience problems with intelligence and the ability to adapt to basic daily needs (Putra et al., 2024). In Indonesia, the term "Tunagrahita" (Intellectually Disabled) is a grouping of several children with special needs. Many terms used to refer to children with intellectual disabilities essentially have the same meaning: describing children with below-average intellectual limitations, which impact academic problems and difficulties in carrying out their daily activities (Amanullah, 2022). In the learning process, children with intellectual disabilities require a different approach than children in general. Therefore, media is needed to train children with intellectual disabilities in the learning process. With the rapid development of technology, learning activities can be carried out in various ways, one of which is the role of interactive media (Putra, 2025). This media is not only interesting but can also improve children's listening skills. Basically, human learning is influenced by the environment, which is coordinated, organized, and has a positive impact, so that people respond to this improvement by providing appropriate responses (Munar, 2021).

For example, using animation media to deliver learning materials to children with intellectual disabilities can be more engaging if presented creatively and interactively. Animation not only entices children to pay more attention to the material but also makes the learning environment more enjoyable. Learning components, including students, teachers, materials, and so on, must be interconnected and supportive to ensure a more controlled and structured learning process with measurable results, and achieve the desired learning objectives (Prihatin et al., 2021).

Animated media has the potential to be developed as a learning tool for children with intellectual disabilities. One potential development is the introduction of letters in the alphabet. The introduction of each letter in the alphabet has a different shape from other letters, such as lowercase and uppercase. This can train children to recognize letters in understanding and memorizing (Eka Putri et al., 2023). In addition to letter recognition, many children with intellectual disabilities cannot yet recognize colors, such as how to name and point to colors according to teacher instructions. Learning activities such as mixing colors can improve creativity, cognitive skills, and fine motor skills in children, increasing stimulation in the teaching and learning process (Hakim et al., 2024).

Thus, animated media can help children with intellectual disabilities focus on absorbing the lessons. This animation not only provides education but also creates a more interactive learning environment to encourage and engage them in learning (Khuzaima Zahra et al., 2025). This design aims to create an educational animation about letter and color recognition for children with intellectual disabilities. This animation is specifically used as a learning aid, with a visual approach relevant to the material. It is hoped that this animation can assist teachers as a learning tool for students with intellectual disabilities.

The research problem is how to design an engaging animation that can pique the interest of children with intellectual disabilities. Through this animation, the author aims to present a well-organized educational animation that delivers messages, visuals, and audio to introduce letters and colors to children with intellectual disabilities.

2. METHOD

This study employs a qualitative descriptive approach with a practice-based research model that focuses on the design process for visual communication design (Oyedare et al., 2025). The choice of this method is based on the research objective, which seeks not only to uncover phenomena but also to produce a prototype educational animation about letter and color recognition that can be tested for its effectiveness. In this case, the educational animation about letters and colors serves as the object of study, while the research subjects are focused on children with intellectual disabilities as the primary users.

The conceptual framework used in this study utilizes Disney's animation principles, as introduced in the book "The Illusion of Life: Disney Animation" (Suyadi et al., 2023). These animation principles serve as the author's foundation in designing educational animations, ensuring they are more engaging and leave a lasting impression. The animation principles are divided into 12 principles:

Table 1. Conceptual Design Framework
12 Principles of Animation from Disney

Anticipation	The movement is done in the opposite direction to the main movement to carry out a lifting or pushing movement of energy before the main movement which can give the impression of preparation before the movement, so that it doesn't look too stiff.
Squash and stretch	The movement of grinding and stretching the body to show an organic and more flexible impression where the movement looks as if it is influenced by gravity so that the object looks more realistic.
Staging	The process of placing objects within a scene or shot in animation. By placing these objects according to their intended purpose, this can make the composition of the image appear clearer and more refined.
Straight ahead action & Pose to pose	The method of creating animated movement by moving from the first image to the second, then the third, and so on, thus drawing the entire frame. Meanwhile, Pose to pose is a method of creating animated movement by creating one image, then a third image. After that, the animator will fill in the second image between the first and third images, called in-between, which will make the animation more dynamic.
Follow through & Overlapping	Sequential movements of a character or object that occur after the character or object stops.
Slow in & Slow out	Slow motion (the process that must occur immediately after an object stops), slow motion that occurs at the beginning and end of an animation. Animation without slow motion at the beginning and end of the animation would look very stiff.
Arcs	The movement contains circular curves, the animation will look more natural compared to straight movements.
Secondary Action	Additional or supporting movements occur to complement existing primary movements. Secondary movements only complement and do not take over the execution of primary movements.
Timing	The speed at which an object moves is determined by how many frames are in-between the object's or character's movements. The more frames in the animation timeline, the faster the animation, and vice versa.
Overlapping / exaggeration	Actions or expressions that are as usual but exaggerated to create a more convincing animated impression.
Solid Drawing	The ability to draw images with 3-dimensional perspective depth and consistency in each frame of the animation.
Appeal	The appearance of the characters seems to have its own charisma and is interesting to look at.

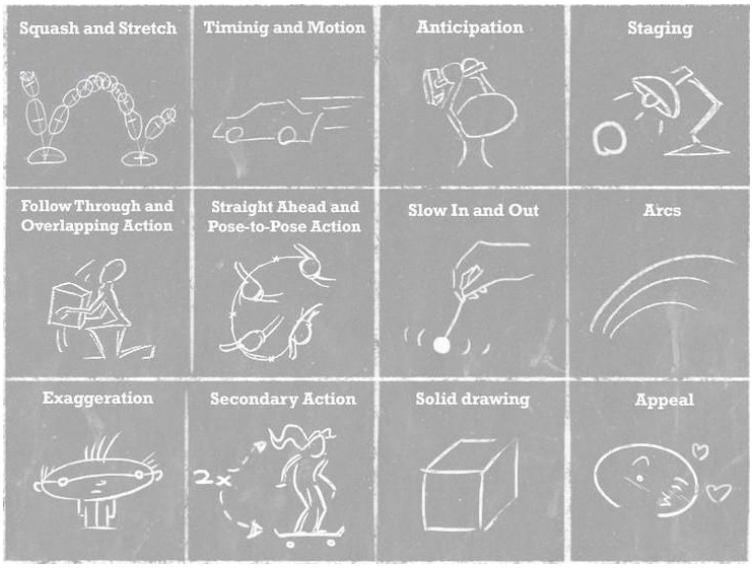


Figure 1. 12 Principles of Animation from Disney

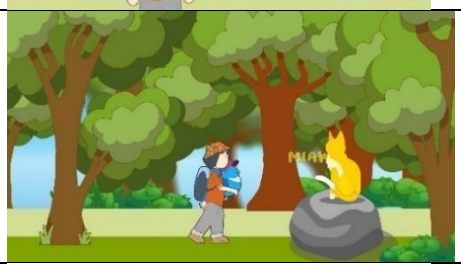
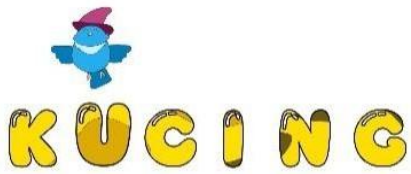
Thus, the animation principles helped the author in designing educational animations for introducing letters and colors for children with intellectual disabilities, by placing the movement of certain elements that can make the visual form more interesting and also enjoyable. With these steps, this research is expected to produce an educational animation design that is not only visually appealing and interactive, but also has a social impact in improving the understanding of learning letters and colors for children with intellectual disabilities.

3. RESULTS AND DISCUSSION

In this stage, the author will discuss the results of designing an educational animation to introduce letters and colors for children with intellectual disabilities, based on animation principles. The results of this research are as follows:

Table 2. Application of Animation Principles in Letter and Color Recognition Animations

No	Animation Scenes	Results of Applying Animation Principles
1.		In this scene, the animation principles of squash and stretch and exaggeration are used.
2.		In this scene, the principles of timing and spacing are used.
3.		In this scene, the principles of staging and appeal are used.

4.		In this scene, the principle of staging animation is used, and the flying movements of the bird character use the principle of timing and spacing.
5.		In this scene, the animation principle of timing and spacing is used.
6.		The animation principles used here are squash and stretch as well as timing and spacing.
7.		The animation principle used in this scene is slow in and slow out.
8.		The animation principles used in this scene are staging and also slow in and slow out.

The design of an animation introducing letters and colors for children with intellectual disabilities demonstrates that the application of animation principles not only strengthens the visual aspect but also increases the effectiveness of educational communication. During the implementation stage, the principles of squash and stretch and exaggeration help provide more expressive movement, so that letters and colors do not appear rigid, but rather more vivid and memorable for children. For example, when the letter "A" is introduced, the animation jumps with exaggerated, elastic movements. For children with intellectual disabilities, this type of visual representation provides a powerful stimulus because it provides a learning experience that is both enjoyable and easy to understand. Thus, animated movement is not merely aesthetic but also serves as a cognitive tool to strengthen visual memory.

Furthermore, the principles of timing and spacing play a crucial role in regulating the pace of material presentation. Children with intellectual disabilities tend to take longer to grasp new information, so adjusting the pauses, speed, and transitions in animation can facilitate internalization. For example, when introducing the differences between red, blue, and yellow, each color transition is given a slow tempo and repetition, allowing children sufficient time to recognize, name, and point to the colors as instructed. In this context, timing is not just an animation technique, but a pedagogical strategy to adapt to the specific needs of the audience.

The principles of staging and appeal have also proven effective in focusing children's attention. Staging ensures that the essential element, letters or colors is placed in a dominant position on the screen, while supporting elements remain present but do not distract from the main focus. Appeal enhances visual appeal through friendly, playful, and expressive characters. Children with intellectual disabilities are generally more attracted to simple visuals with clear

expressions, so this principle bridges aesthetic needs and educational functions. Thus, the resulting animation not only displays letters and colors but also creates a warm and motivating learning atmosphere.

The application of the slow-in and slow-out principles becomes significant when material must be grasped gradually. Slow motion at the beginning and end of the animation allows children to anticipate changes and better understand the meaning of the movement. For example, when a bird character flies carrying letters, slow motion at the beginning of the flight and upon landing helps children grasp the storyline without confusion. This principle also provides an opportunity for teachers or facilitators to repeat explanations or provide additional guidance, making learning more inclusive.

When linked to the context of children with intellectual disabilities, all animation principles provide a multisensory learning environment. Dynamic movement, engaging visuals, and controlled rhythms help engage children's cognitive, affective, and motor skills simultaneously. For example, by pointing to a color after a character performs a specific movement, children not only learn to recognize color concepts but also develop hand-eye coordination and fine motor response skills. This aligns with the educational needs of children with intellectual disabilities, which emphasize repetitive practice, concrete visualization, and positive emotional stimulation.

Thus, the analysis shows that applying animation principles in designing educational animations not only enriches the aesthetic aspect but also supports more adaptive learning strategies for children with intellectual disabilities. Animation serves a dual function: as an engaging entertainment medium and as a pedagogical tool that helps children gradually master letters and colors. This approach confirms that animation-based visual communication design can bridge intellectual limitations by creating a more meaningful, inclusive, and empowering learning experience.

4. CONCLUSION

Research on designing letter and color recognition animations for children with intellectual disabilities provides a clear picture of how animation-based interactive media can play a crucial role in supporting the learning process for children with special needs. Based on analysis and implementation, the application of Disney's animation principles has proven effective not only in enhancing visual aspects but also in enhancing children's cognitive, affective, and motor engagement. Elastic movement through the principles of squash and stretch and exaggeration creates a more vivid and memorable visual experience, so that letters and colors do not appear rigid but instead become enjoyable and educational elements.

Furthermore, the application of timing and spacing principles is key to aligning the tempo of material delivery with the needs of children with intellectual disabilities, who require more time to absorb information. With the right rhythm, children are able to understand, recognize, and repeat letter and color concepts more consistently. The principles of staging and appeal also successfully place the primary focus on essential learning elements, while maintaining an engaging, friendly, and motivating learning environment. This demonstrates that animation design is not merely aesthetic but also a pedagogical strategy capable of adapting to the characteristics of a specific audience.

Furthermore, this study confirms that educational animation has a dual role. First, animation serves as an entertainment medium that can capture the attention of children with intellectual disabilities, making them more enthusiastic about learning. Second, animation functions as a pedagogical instrument that bridges intellectual limitations by providing a multisensory learning experience, combining visuals, movement, and rhythm into an easily understood whole. With this approach, learning letters and colors is no longer simply a cognitive activity, but rather a holistic process involving the child's emotional and motor skills. Therefore, it can be concluded that this study has successfully produced an animation design that is not only visually relevant but also adaptive and inclusive to the needs of children with intellectual disabilities.

Based on the research findings, several recommendations can be made for further development. One of these is that further research should consider long-term evaluation aspects, such as how animation can influence the improvement of academic skills, learning independence, and children's motivation over a longer period of time. This will provide a more comprehensive picture of the impact of animation as a learning medium for children with special needs.

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