DEVELOPMENT OF PRESENTATION SLIDE DESIGN GUIDELINES TO SUPPORT LEARNING OF UNIVERSITY STUDENTS WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

The advancement of learning in higher education has positioned presentation media as one of the primary tools for delivering instructional content. However, most presentation slides are still designed for general audiences and do not adequately address the needs of students with disabilities, particularly those with Autism Spectrum Disorder (ASD)**.** Characteristics commonly associated with ASD, such as heightened sensitivity to visual stimuli, differences in information processing, and the need for clear and consistent information structures, may affect students' ability to comprehend learning materials. This condition highlights the need for presentation slide design guidelines that are more inclusive and tailored to the characteristics of students with ASD. This study aims to design accessible presentation slides to support the learning needs of university students with ASD. The design process was conducted by identifying user characteristics through a literature review and observational studies as the conceptual foundation. The study adopted the Design Thinking approach, emphasizing a user-centered design process. The primary outcome of this research is a set of presentation slide design guidelines intended to help university students with ASD achieve a more inclusive learning experience within higher education environments.

Keywords: *Autism Spectrum Disorder; Inclusive Learning; Presentation Slide Design; Visual Communication Design*

A. INTRODUCTION

The digital transformation in education has accelerated the use of presentation media as one of the primary tools for delivering instructional content in higher education. Presentation slides no longer serve merely as supporting materials but have become essential instruments for communicating learning content in a systematic and visually engaging manner. The quality of slide design plays a crucial role in helping students comprehend information, maintain attention, and foster an effective learning experience. At the same time, the implementation of inclusive education in higher education has continued to expand, providing greater access for students with disabilities, including those with ASD, whose characteristics vary considerably. ASD is a neurodevelopmental disorder resulting from differences in brain development. Individuals with ASD may behave, communicate, interact, and learn in ways that differ from those of most other people. Although they generally do not exhibit distinct physical characteristics, they possess diverse abilities, strengths, and support needs. (NEI Psychopharm 2022)

Individuals with ASD often exhibit patterns of communication and social interaction that differ from those of neurotypical individuals. Common characteristics include limited or inconsistent eye contact during conversations, reduced sharing of interests, emotions, or enjoyment with others, limited responsiveness to social interactions, difficulties in initiating or maintaining reciprocal conversations, and a tendency to speak extensively about topics of personal interest without recognizing the listener's level of engagement. In addition, some individuals may display a monotone voice, limited facial expressions and body gestures, as well as repetitive behaviors or restricted patterns of interest. These characteristics vary considerably among individuals, depending on the severity and presentation of their ASD. (National Institute of Mental Health 2024)

Recent research suggests that students with ASD continue to face considerable challenges in accessing, participating in, and completing higher education, despite a growing number of autistic students enrolling in universities. A 2024 literature review concluded that *"for autistic people the landscape of higher education remains precarious,"* highlighting that, although progress has been made toward inclusive education, substantial barriers to participation and academic success persist within higher education institutions. (Horlin et al. 2024)

A study investigating the characteristics of first-year university students with ASD in the United States (U.S.) analyzed data from a large-scale survey of incoming college students. The study identified students with ASD and compared their demographic and educational characteristics with those of students with other types of disabilities. (Petcu, Zhang, and Li 2021) Global estimates from the World Health Organization (WHO) indicate that approximately 1 in 127 individuals worldwide were living with autism in 2021. In addition, findings from the *Global Burden of Disease Study 2021* revealed that the global age-standardized prevalence rate of ASD has increased at an average annual rate of approximately 0.07% since 1990. (World Health Organization (WHO) 2025)

In the East Asian and Southeast Asian regions, the study *"Burden and Inequality of Autism Spectrum Disorders in Global, East Asian, and Southeast Asian Regions, 1990–2021: Results from the Global Burden of Disease Study 2021"* reported an Estimated Annual Percentage Change (EAPC) of +0.24% per year for East Asia and +0.10% per year for Southeast Asia. These results suggest a consistent upward trend in both the prevalence and the absolute number of individuals with ASD across these regions and worldwide. (Liu et al. 2025)

According to Statistics Indonesia (Badan Pusat Statistik [BPS]), Indonesia's population was estimated at 270.2 million in 2020, including approximately 3.2 million children with autism (BPS,

2020). During the opening address at the *Special Kids Expo (SPEKIX) 2024*, the Vice Minister of Health of the Republic of Indonesia, Dr. Dante Saksono Harbuwono, noted that the number of children with ASD continues to rise, with current estimates suggesting that approximately 2.4 million children in Indonesia are on the autism spectrum. In addition, pediatrician Dr. Bernie Endyarni Medise, Sp.A(K), MPH, estimated that Indonesia records approximately 4.5 million live births annually, of which 1 in every 100 children is diagnosed with ASD. (Stefanni 2024)

"Furthering Victor Papanek's Legacy: A Personal Perspective," emphasizes that Victor Papanek's design philosophy remains highly relevant in contemporary design discourse, particularly with respect to social responsibility, sustainability, and human-centered design. Beyond his critique of unethical commercial design practices, Papanek was among the first to advocate for design as a means of addressing real-world problems, fostering community participation, and ensuring accessibility for diverse user groups. His work has become a cornerstone of design education and continues to shape inclusive, ethical, and socially responsive design approaches that prioritize the needs of society. (Bont 2021) A human-centered design approach promotes the development of systems, instructional media, and learning environments that are adaptive, structured, and tailored to the specific needs of university students with ASD. This approach is particularly important for students who require clear instructional guidance, reduced visual and cognitive distractions, and flexible modes of interaction to support their learning process. Accordingly, this study establishes the conceptual foundation by defining its scope and examining the role of Visual Communication Design (VCD) in conveying messages within the context of contemporary communication. Furthermore, it discusses the fundamental elements of design—including line, shape, color, texture, and space—and the core principles of

design, such as balance, contrast, emphasis, repetition, and harmony, which collectively underpin the development of effective, accessible, and inclusive visual communication. (Safanayong 2006)

B. IMPLEMENTATION AND METHODS

This study was implemented through the design of presentation slides tailored to the learning needs of university students with ASD in the New Media Department, School of Design, BINUS University. The implementation began with the identification of user characteristics through a literature review and observations of presentation media used in classroom learning. In addition, semi-structured interviews were conducted with university students with ASD, lecturers, psychologists, and other stakeholders with expertise in ASD to gain a deeper understanding of users' characteristics and learning needs. The findings from these activities were analyzed to identify the visual requirements that informed the design process.

The research employed the Design Thinking methodology, which consists of five stages: Empathize, Define, Ideate, Prototype, and Test. During the Empathize stage, data were collected through literature review, observation, and semi-structured interviews to understand the experiences and needs of students with ASD. In the Define stage, the primary design problems were formulated based on the analysis of the collected data. The Ideate stage generated a range of design solutions grounded in the principles of VCD. These ideas were then translated into a prototype in the form of a presentation slide design guideline. Finally, the Test stage involved expert reviews and limited usability testing to gather feedback for refining and improving the proposed design. This methodology was selected because it places users' needs at the center of the design process, ensuring that the resulting guidelines are effective, practical, and well suited to support inclusive learning in higher education.

C. RESULTS AND DISCUSSION

Sensory integration is a fundamental component of learning and adaptive behavior in individuals with ASD, as it enables the central nervous system to receive, organize, and interpret sensory information from the environment to generate appropriate behavioral responses. However, the majority of individuals with ASD exhibit sensory processing dysfunction, characterized by either hypersensitivity or hyposensitivity to sensory stimuli. These atypical sensory processing patterns are widely recognized as underlying factors contributing to academic difficulties and reduced learning performance. Consequently, understanding an individual's sensory profile is essential for accurate assessment and for designing effective educational interventions that accommodate their specific learning needs.

Table 1. Learning Characteristics of University Students with ASD.

Subject Group	Sensory Sensitivity Categories	Affected Function/ Impact	Behavioral Characteristics (Inferred)
Sensory Sensitivities Present (SS Present)	Hypersensitivity Hyposensitivity, Sensory Seeking	Auditory, Tactile, Gustatory, Pain, Vestibular	(Pendergast 2014)Individuals in this category demonstrate relatively higher levels of cognitive and adaptive functioning than those without sensory sensitivity. However, they continue to experience difficulties in regulating and modulating their responses to environmental sensory stimuli. (Pendergast 2014)
Sensory Sensitivities Absent (SS Absent)	No Clinical Sensitivity Exhibited	No Clinical Sensitivity Exhibited	(Pendergast 2014)Tend to have slightly lower mean scores on cognitive and adaptive abilities than the sensory sensitivity group in this sample. (Pendergast 2014)
Autistic Spectrum (AS) Individuals	Hypersensitivity	Auditory, Tactile	(Ginanjar 2007)Sensory integration problems are a major cause of behavioral problems; withdrawal from the outside world is a coping strategy for overstimulation. (Ginanjar 2007)

Subject Group	Sensory Sensitivity Categories	Affected Function/ Impact	Behavioral Characteristics (Inferred)
Individual ASD (General Group)	Hypersensitivity	Auditory (unexpected sounds), Visual (glare/visual clutter), Tactile (unexpected touch)	(Yusof Baharuddin and Aminudin 2025)Tends to focus on inner thoughts (private self-consciousness), easily feels overwhelmed by environmental stimuli and requires regulatory strategies to reduce sensory input. (Yusof Baharuddin and Aminudin 2025)
Individual ASD (General Group)	Hyposensitivity	Visual (low contrast), Auditory (verbal cues), Vestibular (balance), Proprioception (body awareness)	(Yusof Baharuddin and Aminudin 2025)Often misses sensory cues from the environment, appears less responsive or slow and requires increased stimulus intensity to perceive information. (Yusof Baharuddin and Aminudin 2025)
Individual ASD (General Group)	Sensation Seeking	Tactile (variable textures), Vestibular (high intensity movements), Gustatory/Olfactory (strong taste)	(Yusof Baharuddin and Aminudin 2025)Actively seek out new sensory experiences, have a higher public self-consciousness, and enjoy sensory stimulating environments. (Yusof Baharuddin and Aminudin 2025)
Individual ASD (General Group)	Sensation Avoiding	Auditory (noise), Tactile (physical contact), Visual (bright lighting), Vestibular (sudden movements)	(Yusof Baharuddin and Aminudin 2025)Shows defensive behavior towards sensory input, often experiences social anxiety, and requires a structured and predictable environment. (Yusof Baharuddin and Aminudin 2025)

Considering the sensory sensitivity profiles outlined above, optimizing the neurological processes responsible for receiving, organizing, and interpreting sensory information is essential to enable individuals with ASD to respond more adaptively within academic environments. Supporting conceptual understanding is particularly important in addressing challenges associated

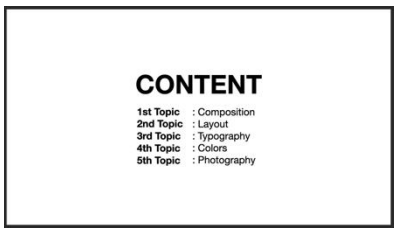
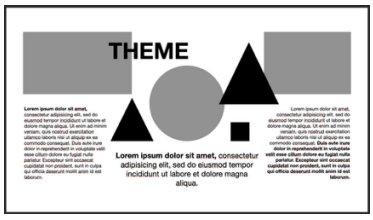
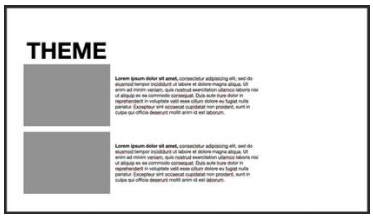
with abstract thinking and learning readiness. By accommodating students' sensory processing needs, educational materials and learning environments can facilitate more effective information processing, thereby improving comprehension, engagement, and appropriate responses to academic tasks.

Table 2. Summary of Interviews with University Students with ASD,Lecturers, and a Psychologist

Visual Work	**Audience (4 Students with a diagnosis of ASD)**
Imaginary(ASD Student)	• 3 of 4 students chose Design Content with Right Aligned Composition • Each students choose different lay out: Silhouette, Multi panel, Frame and Copy Heavy • 3 of 4 students choose Rhythm • All of the students choose a type of Helvetica • None of the students chose cartoon or Decorative Illustration • All students choose simple Visual Characteristic
Technical (Lecturer and Psychologist)	• Simplification of language so that it can be captured by their reasoning abilities. Minimize the use of color. Simple visual form. Close with Glossary and Quiz.

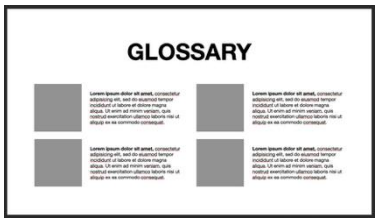
Table 2 summarizes the findings from interviews with four university students with ASD, supported by additional interviews and observations involving three lecturers and three psychologists. Three of the four student participants expressed a preference for presentation slide designs featuring right-aligned compositions. Although the preferred layout styles varied—including silhouette, multi-panel, frame, and copy-heavy formats—they consistently reflected a structured and systematic visual organization. Participants also identified rhythm as the dominant compositional principle and selected Helvetica as their preferred typeface. Notably, none of the respondents preferred cartoon-style or decorative illustrations. These findings suggest a consistent preference for simple visual characteristics, highlighting the importance of visual clarity and reduced cognitive complexity in supporting information processing among university students with ASD.

Table 3. Presentation Slide Design Guidelines for University Students with ASD.

Essential Elements	Visual Features
Opening Slide The opening slide should feature a strong and concise presentation title that clearly communicates the main topic without unnecessary wording. A subtitle may be included in a smaller font size to provide additional context, while the presenter's name and institutional affiliation should be placed below using a smaller font size. This structure establishes a clear visual hierarchy and enables the audience to identify the presentation topic quickly and efficiently.	
Agenda Slide The agenda slide should present a clear and concise overview of the main topics to be covered in the presentation. Its visual design should remain simple and uncluttered to help establish focus at the beginning of the learning session for university students with ASD. Excessive visual elements or large amounts of text should be avoided, as they may increase cognitive load, reduce attention, and diminish students' interest in the presentation. A clean layout with a limited number of agenda items enables students to anticipate the structure of the lesson and supports a more organized and effective learning experience.	
Content Slides The content slides should present the learning material sequentially, with each slide focusing on a single topic or concept. Text should be kept to a minimum by highlighting only the key points, while detailed explanations should be delivered verbally through a storytelling approach. The presenter is encouraged to speak at a moderate and consistent pace, avoiding rapid delivery, with a rhythm of approximately two to three beats per phrase to allow university students with ASD sufficient time to process and comprehend the information. This approach helps reduce cognitive load, maintain attention, and facilitate more effective learning.	 Avoid: Unstructured Layouts  Highly Recommended: Right-Aligned Layout  Less Recommended: Left-Aligned Layout



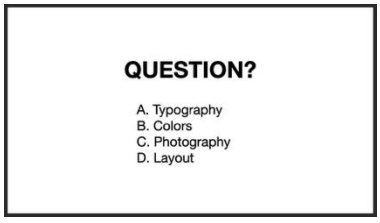
Strongly Recommended: Center-Aligned Layout



Images should be arranged in a balanced and symmetrical composition—for example, two images positioned on the left and two on the right—to establish a clear and organized visual structure. A balanced distribution of visual elements enhances visual harmony, predictability, and spatial organization. Such a layout is particularly beneficial for university students with ASD, as it minimizes unnecessary visual distractions and supports more efficient information processing through an orderly and consistent presentation.

Closing Slide

The closing slide should feature a clear title centered at the top of the slide, followed by a concise summary of the key points covered throughout the presentation. The content should be arranged in a balanced, organized, and visually clean layout, with ample white space surrounding both text and images to minimize visual clutter and maintain students' attention. In addition, key terminology or a glossary should be revisited on the closing slide to reinforce learning and support memory recall. This structured approach enables university students with ASD to review essential concepts, consolidate their understanding, and retain information more effectively.



For assessment slides, both the question and its corresponding answer choices should be center-aligned to create a visually balanced and organized composition. This layout emphasizes the focal content, enhances readability, and promotes sustained attention while reducing cognitive effort during decision-making. Such a presentation format is particularly beneficial for university students with ASD, as it provides a predictable and structured visual environment that supports effective information processing.

Quiz Slide

The quiz slide should include four questions designed to assess students' understanding of the material presented. Each question should be displayed individually, allowing approximately 15–20 seconds for students to read, process, and respond before proceeding to the next question. The question text should be centered on the slide and surrounded by ample white space to reduce visual distractions and support sustained attention.

Visual Hierarchy Image Quality Graphs and Data White Space	**Visual Hierarchy** Presentation slides should establish a clear visual hierarchy by emphasizing the most important information through appropriate variations in font size, weight, color, and positioning. Titles, headings, and key points should be visually distinguishable from supporting content, enabling university students with

ASD to identify essential information quickly and navigate the slide with minimal cognitive effort.

Image Quality

All images should be high-resolution, relevant to the learning content, and directly support the concepts being explained. Decorative or unrelated images should be avoided, as they may distract students and increase cognitive load.

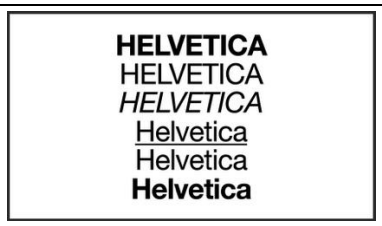
Graphs and Data

Graphs, charts, and numerical data should be presented in a simple, uncluttered format with clear labels, readable typography, and a limited number of variables. Complex visualizations should be broken down into smaller components or presented sequentially to facilitate comprehension.

White Space

Adequate white space should be incorporated throughout each slide to create a clean and balanced layout. Sufficient spacing between text, images, and other visual elements reduces visual clutter, minimizes cognitive load, and helps direct students' attention to the most important information. The effective use of white space also enhances readability and supports sustained focus during the learning process.

Concise and Clear Text
Font Size and Readability
Safe Font Combinations



Helvetica is recommended as the primary typeface due to its clean, sans-serif letterforms and the absence of decorative serifs, which contribute to high legibility. Its simple and consistent character shapes facilitate faster visual recognition and improve text readability, thereby supporting more efficient information processing for university students with ASD.



	Times New Roman, a serif typeface with decorative stroke endings, is generally less suitable for presentation slides intended for university students with ASD. Compared with sans-serif typefaces such as Helvetica, serif fonts may reduce on-screen readability and require greater visual effort, potentially increasing cognitive demand during information processing.
Colors  Normal Vision, Monochromatic, Polychrome	Use natural and realistic colors that closely match real-world objects. Avoid excessive color variations, as they may increase cognitive load and create unnecessary visual stimulation. A simple, consistent color palette helps reduce sensory distractions, maintain attention, and improve information processing for university students with ASD.

As summarized in Table 3, effective presentation slide design for university students with ASD should prioritize simplicity, consistency, and cognitive accessibility to facilitate visual information processing. Each slide is recommended to present a single key concept within a clear and systematic structure. Instructional content should be concise and highly legible, with Helvetica identified as the preferred typeface. In addition, presentation slides should incorporate balanced layouts with adequate white space and a restrained color palette to minimize unnecessary cognitive load. The integration of relevant visual imagery, a well-defined visual hierarchy, and a sequential instructional structure—including an introduction, content delivery, summary, and quiz-based assessment—can support sustained attention, strengthen memory retention, improve conceptual understanding, and enhance the overall learning experience for university students with ASD.

Table 4. Profile of Clinical Psychology for Research Interview

Code	Areas of Expertise	Experience	Institution	Role in the Research
Expert 1	Clinical Psychologist (2012 – Present)	Neurofeedback Therapy, IFS Theraphy, Psychotherapy.	Siloam Hospital, Gading Pluit Hospital.	Concept validator for the visual language to be incorporated into the presentation design.

Code	Areas of Expertise	Experience	Institution	Role in the Research
Expert 2	Clinical Psychologist (2006 – Present)	Child and Adolescent Psychologist, Child Development Neurodiversity.	For Kids Clinic.	Concept validator for the visual language to be incorporated into the presentation design.
Expert 3	Clinical Psychologist and Teaching for Autism. (1983 – Present)	Educational and Curriculum Head Department for Autistic School.	Special School for Autistic individuals.	Concept validator for the visual language to be incorporated into the presentation design.

After developing the presentation slide guidelines presented in table 3, the study proceeded with a validation was conducted using an assessment rubric of question and involved three experts with diverse professional backgrounds and institutional affiliations, as described in table 4. The results of the validation process are presented in table 5.

Table 5. Summary of interview results with three Clinical Psychology experts.

Theme	Question	Expert 1	Expert 2	Expert 3
Sensory Compatability.	Use of color.	Use a maximum of three colors. For example, use one color for the title, one for the subtitles, and one for the main content.	Avoid using too many colors to reduce cognitive load. Two to three colors are sufficient.	The use of color should not be overly busy, as this may interfere with the student's ability to maintain focus.
Visual Clarity.	Simplification of the visual objects presented.	Simplifying the visual objects presented can help reduce cognitive load.	Avoid overly complex visual objects.	Visual objects should preferably be presented through simple illustrations, such as cartoons or photographs of real objects.

Theme	Question	Expert 1	Expert 2	Expert 3
Cognitive Accessibility.	Paragraph organization and font selection to facilitate readability and comprehension.	Follow the conventional reading direction in Indonesia, with the reading flow proceeding from top to bottom and from left to right.	A sans-serif typeface such as Helvetica is less visually tiring and facilitates reading.	Avoid overly long paragraphs. Present the main points directly on the slide, while additional information can be explained verbally.
Universal Design Learning (UDL).	Navigation and pacing throughout the presentation.	The presentation is appropriate because it goes directly to the key points being conveyed and does not introduce unnecessary complexity.	The structure is appropriate. However, it should be further developed for other courses that may contain more numerical or information-dense content, such as history or information systems.	The structure is appropriate.
Emotion and Psychological Safety.	Minimizing anxiety when receiving and processing learning materials.	Center-aligned placement of visual elements, combined with sufficient surrounding white space, can reduce cognitive load and help students maintain focus.	The use of sufficient white space around the presentation elements is beneficial.	As long as the presentation is not visually overwhelming and focuses directly on visuals that represent the learning material, this does not pose a problem.
Aligment with Neurodivergent Preferences.	Relevance to the needs of students with ASD.	The design is appropriate based on the findings of the most recent trial involving students with ASD.	The design is appropriate and incorporates input provided by students with ASD.	The design is appropriate.

D. CONCLUSION

Based on the results of the presentation slide guideline design, it can be concluded that presentation media for university students with ASD should be developed by prioritizing the

principles of simplicity, consistency, and visual accessibility. A systematic slide structure that applies visual design principles tailored to users' needs has proven to be effective in reducing cognitive load and improving students' focus and comprehension of instructional materials. These findings demonstrate that well-designed presentation slides can facilitate more efficient information processing while supporting the learning characteristics of students with ASD. Furthermore, the proposed guidelines demonstrate that presentation slide design serves not only as a medium for delivering information but also as a tool for promoting inclusive learning through the application of VCD principles and a user-centered design approach.

Ultimately, the implementation of these guidelines is expected to improve the quality of teaching and learning, enhance the academic participation of students with ASD, and serve as a reference for the future development of inclusive learning media in higher education. This research is limited by it is small sample of four university students diagnosed with ASD, representing four of the seven students with ASD enrolled in the School Design at BINUS University in 2024. In addition, the study was limited to learning materials within the New Media program has not yet been tested in other academic disciplines. Future research is therefore encouraged to involve larger and more diverse samples and to examine the applicability of the proposed presentation design across other programs and courses beyond New Media or Visual Communication Design.

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English, ensuring an unbiased tone throughout every section from the background, citations, methodology to the results, discussion and conclusion." The objective was to ensure that the presentation of the research findings is precise and free from ambiguity.

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