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Inclusive Infographic Design as Adaptive Learning Media for Autistic Collegers in the Visual Communication Design

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ABSTRACT

This research aims to develop and evaluate the effectiveness of inclusive infographics as adaptive learning media for autistic collegers in DKV study program. The background of the research is based on the urgent need for learning materials that accommodate the visual, structured, and literal learning styles typically possessed by autistic collegers, while also addressing the challenges in understanding the complex concepts of DKV. The ADDIE (Analysis, Design, Development, Implementation, Evaluation) innovation development model was chosen as a systematic framework to guide the entire research process. The Analysis identifying the learning characteristics of autistic collegers and analyzing relevant DKV materials. The Design Stage focuses on creating infographics with inclusive design principles. The Development Stage involves the production of digital infographics and validation by experts. The infographics are then implemented in real learning contexts, followed by a comprehensive evaluation using a qualitative approach. The research results show that inclusive infographics are effective as adaptive learning media. Qualitatively, the findings indicate that infographics with clear structure and appropriate visualization successfully reduce cognitive and sensory load, enhance focus and attention span, and facilitate the understanding of conceptual connections. Collegers also showed positive emotional responses and increased learning motivation. The conclusion of this research is that inclusive infographic design is a transformative and highly effective pedagogical strategy in creating a more accessible and empowering learning environment for autistic collegers in the DKV Study Program. This research recommends the integration of inclusive infographics into the DKV curriculum and the continuous development of similar adaptive learning media.

KEYWORDS: autis; colleger; inclusion; infographic

INTRODUCTION

Inclusive education is a policy expected to open up the widest possible opportunities for individuals with special needs to receive the same or equivalent education as the general population(Yu et al., 2018). The Inclusive Education Development Team states that Inclusive Education is a philosophy of education (Education for all, non-discriminatory, and appreciating diversity), an education system (segregated education system vs. inclusive education system), and a method/strategy (a strategy to find ways to eliminate barriers so that learners can fully participate in learning)(Jaffer et al., 2024). Upon closer examination, based on the Philosophy of Education, the Education System, and the Educational Method, Inclusive Education ultimately leads to educational equality between learners with special needs and general learners(Hillier et al., 2018). Higher education in the inclusive era today is demanded to provide equal access for all groups, including collegers with special needs. One of the groups that often face challenges in the academic world is collegers with Autism Spectrum Disorder (ASD) or autism. Autism is a neurodevelopmental condition characterized by differences in social interaction, communication, as well as repetitive behaviors and limited interests(Cage et al., 2020). In the context of higher education, collegers with autism often face challenges in keeping up with the pace of lectures that are not always designed according to their cognitive and sensory needs(Jaffer et al., 2024).

In Indonesia, data on autistic collegers is still very limited and has not been comprehensively documented by the Directorate General of Higher Education. However, based on preliminary studies and interviews with academic managers and lecturers in several Visual Communication Design Study Programs in Surakarta, it is known that there are currently a number of collegers with autism diagnoses pursuing formal education at the undergraduate level. Based on internal observations between 2019-2024, it was found that in several universities in Surakarta, there are 4 collegers with autism spectrum disorders enrolled in the Visual Communication Design Study Program. In one private university in Surakarta, out of a total of 282 active collegers from 2019-2024, 4 collegers with mild to moderate autism characteristics have been identified, requiring special visual learning adaptations.

Autistic collegers generally have strengths in visual processing(Mittmann et al., 2024). This is because they pay more attention to detail and tend to work in a structured manner. Therefore, many of them choose majors based on visual creativity such as illustration, both manual and digital illustration, or animation(With et al., 2025), which are part of the curriculum of the Visual Communication Design study program. However, in the process of learning Visual Communication Design, there are still several challenges. The learning process in Visual Communication Design often requires abstract understanding, two-way verbal communication, intensive teamwork, and flexibility in absorbing and expressing visual ideas. These aspects are often not easy for collegers with autism to navigate, especially if the learning media used is verbal and lacks visual structure(Gumulya, 2023). One important solution that can be developed to address this need is through the design of inclusive and adaptive visual learning media in the form of infographics. Infographics as a visual-based medium have great potential in conveying complex information in a simple, structured, and engaging manner(Crawford, 2024). In the context of autistic collegers, infographics can serve as an information organization tool that supports understanding through a combination of icons, illustrations, colors, and cognition-friendly typography. This also takes into account aspects of visual perception, visual communication, and visual semiotics, which can shape infographics into an inclusive and effective learning tool.

Research in designing an innovative learning model for autistic collegers using inclusive design and the principles of universal design for learning (UDL)(Chumairo et al., 2022). UDL is an approach that emphasizes the importance of providing various ways of presenting information, engagement, and expression in the learning process(Aghasafari et al., 2025). The principles of UDL enable the development of media that not only consider the needs of minorities but also benefit all collegers. In the context of Visual Communication Design, this means presenting learning materials that are accessible to both typical collegers and collegers with special learning needs such as autism.

Therefore, in this research, the Lee & Owens innovation development model or the ADDIE model is considered in the infographic design process. The ADDIE model is an innovation development methodology consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation(Ardiyanti & Lestyanto, 2024). Testing is very suitable in the context of inclusive education. Through this approach, designers can directly understand the specific needs of autistic collegers in absorbing information, and then design media that meets those needs.

Based on a preliminary study conducted through classroom observations and limited interviews with lecturers and autistic collegers in one of the Visual Communication Design study programs in Surakarta, several main challenges they face in the learning process were identified: (1) Difficulty understanding long verbal or narrative materials; (2) Confusion with instructions that are not visually displayed or not structured in a clear format; (3) Anxiety when facing group assignments; and (4) Limitations in expressing ideas through verbal communication. This indicates that there is a need for teaching strategies that can accommodate their needs in understanding information with a clear, simple, and systematic visual approachs(With et al., 2025). Several previous studies have shown the effectiveness of infographics in improving retention and concept understanding among collegers with special needs. Infographics are a type of visual communication media that use a combination of text, icons, images, colors, and layouts to convey information concisely, clearly, and succinctly(Apriyanti et al., 2020). Infographics play a crucial strategic role in higher education, especially for collegers with exceptional learning needs, such as those on the autism spectrum(Nugraha et al., 2023). The learning style of autistic collegers focuses on strong visual forms and information that centers on the core message. This is due to the characteristics of autistic collegers who have difficulty understanding lengthy and ambiguous verbal communication. Thus,

infographics are a tool that can help connect cognitive needs with the method of delivering oral or narrative material. Infographics have the main goal of simplifying difficult ideas or content into a visual format that is easy to understand and remember for autistic collegers(Araújo & Hannachi, 2021). By using symbols and visuals that are easier for their visual processing systems to understand, infographics help autistic children in processing information. A well-structured infographic format also makes the flow of information predictable, which is very important for providing comfort and focusing the attention of autistic collegers while they learn(Kibar, n.d.). Because children can obtain educational and systematic images instead of having to digest the material verbally and sequentially, this media effectively reduces cognitive tension.

Research on information media for autistic collegers with the title "Designing a Website Application for Autistic Collegers with Spectrum Disorder Using the PECS Method Adaptation" (Gumulya, 2023). And research with the title "The Effectiveness of Infographic Learning Media in Increasing Learning Interest, Visual Spatial Intelligence, and Colleger Learning Outcomes in Gugus Ahmad Yani Kec. Kuningan" (Nugraha et al., 2023) which includes the effectiveness of infographic media in increasing collegers' interest in studying Pancasila and Citizenship Education (PKn). PKn learning will be engaging if teachers can innovate in the implementation of the learning process. With this great potential in mind, this research aims to design inclusive infographics as adaptive learning media for autistic collegers in the Visual Communication Design Study Program. The infographic design will focus on basic theoretical course materials, such as Introduction to Visual Communication Design, Color Theory, or Visual Strategies. The design process will use the design thinking method and direct evaluation by users through the prototyping and user testing stages.

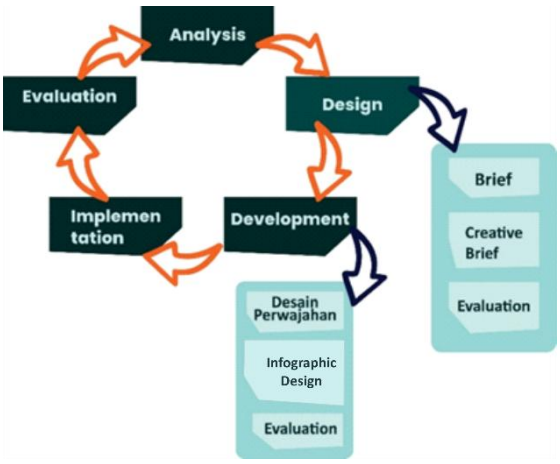
The results of this research are expected to: (1) Provide a communicative, adaptive, and cognition-friendly infographic design model for autistic collegers; (2) Offer recommendations for visual learning strategies for lecturers in teaching theoretical material to special needs collegers; and (3) Contribute to the development of inclusive higher education based on visual design and user empathy.

METHODOLOGY

This research uses the ADDIE development model according to Lee and Owens.

Diagram 1

ADDIE Innovation Development Method Diagram



The ADDIE development procedure according to Lee and Owens begins with stage of analysis and needs assessment, which consists of two stages: need assessment analysis and front-end analysis(Gronseth et al., 2025). By selecting data samples and processing the data. In the Need Analysis, the needs analysis is conducted using observation and interview methods with the observed aspects being: 1) task completion in class during lectures; and 2) interviews with DKV lecturers. With the help of observations and interviews, the learning objectives, core competencies, basic competencies, and learning materials to be developed are identified. And in the Front-End Analysis, it consists of: (1) analysis of autistic collegers in DKV that will be developed; (2) analysis of

learning technologies that have been used to create the learning innovations that will be developed; (3) situational analysis regarding the classroom environment and facilities; (4) analysis of course specifications, classes, and competency programs related to the learning innovations that will be developed.

In the second stage, which is the design phase, the process of creating the product design begins with developing a research schedule, creating a material structure, and specifying media that are easy to understand. The steps taken by the researchers in the design phase include: 1). Conducting a Brief, Creative Brief, and Creative Strategy based on literature study and observation, 2). Creating storyboards and Breakdown sheets using Adobe Illustrator software. The storyboards created include the infographic layout design that will be developed. 3). Creating project content that aligns with the competency learning materials, and 4) The Concept Result of the infographic design for the DKV practical course. Proceeding to the third stage, which is the development stage, involving the visualization of infographic learning innovation design. The researcher in this development stage creates the product using Adobe Illustrator and Adobe After Effects software with the following steps: 1) Layout creation and 2) Icon creation. After the development phase, the next step is stage 4. Implementation, which is the Infographic Design stage developed for autistic collegers in DKV, who previously had visualizations of learning innovations with project content that aligns with competency learning materials. This implementation is carried out on a majority of collegers randomly. And the final stage, which is stage 5, is Evaluation to see the level of suitability of the Infographic Design, which will be measured by conducting tests on autistic collegers. Next, the supervising lecturer provides feedback. The feedback comes from the questionnaire instrument. The evaluation results are used as material or reference for improvement. To serve as a reference in the creation of the Infographic.

RESULTS AND DISCUSSION

This research aims to develop and evaluate the effectiveness of inclusive infographics as an adaptive learning medium for autistic collegers in the Visual Communication Design (DKV) study program. Considering the unique learning characteristics of autistic collegers, such as visual preferences, difficulties in processing non-literal information, and the need for clear structure, infographics have great potential as an effective learning solution.

Therefore, a development model approach is taken in this research, namely the ADDIE (Analysis, Design, Development, Implementation, Evaluation) innovation development model as the main framework. This model was chosen because of its systematic, iterative nature, and its focus on user needs, which is highly relevant for the development of adaptive learning media. Starting with conducting Analysis: The initial stage involves an in-depth analysis of the characteristics of autistic collegers in the DKV program, including learning styles, strengths, challenges, and the complex DKV learning materials. This research also analyzes the availability of existing learning media and identifies gaps. From this stage, it was found that structured information visualization, the use of clear iconography, non-distracting color palettes, and concise text presentation are crucial for autistic collegers.

Figure 1

Level of Understanding of Lecture Material for Autistic Collegers

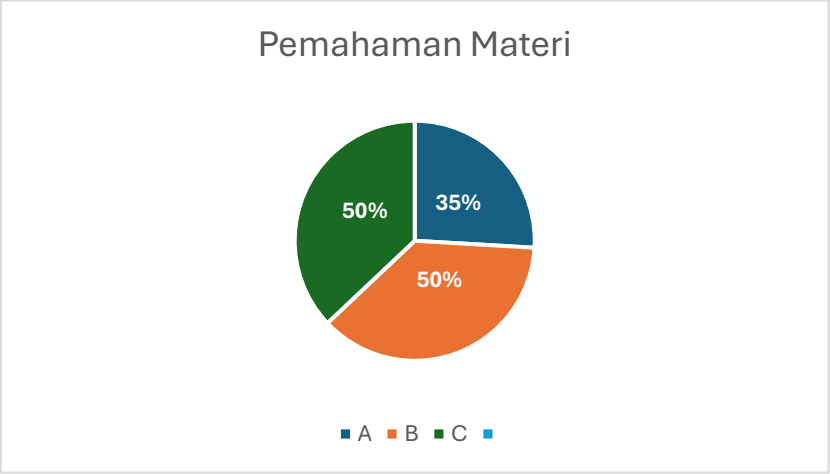
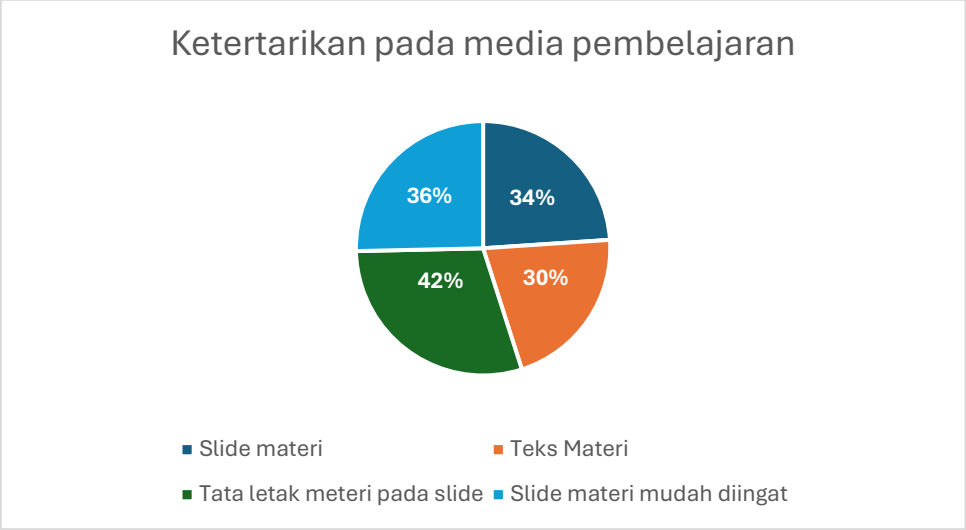


Figure 2
Interest Level in Course Material for Autistic Collegers



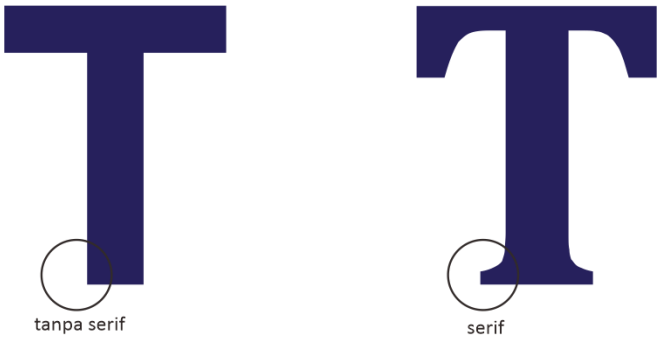
Based on the image above, it shows that autistic collegers in the visual communication design program are not or less interested in learning materials that contain more text than images, illustrations, or icons. Therefore, this can reduce the level of understanding of autistic collegers towards the material presented.
At the Design stage and based on the analysis results, the design stage focuses on creating inclusive infographic prototypes. Design principles are adjusted to meet the needs of inclusive learning, and therefore need to be applied, such as Visual Clarity with the use of a clean layout, clear visual hierarchy, and easily understandable graphic elements. This is because autistic collegers only focus on elements that have the same and orderly visuals with a simple appearance. In addition, the reading flow of the visual display must also use a sequence that is orderly from top to bottom and from left to right consistently.

Figure 3
Layout of Slide Material for Autistic DKV Collegers

The layout used with the rule of thirds technique divides the field into 3 parts horizontally and 3 parts vertically(Gao et al., 2018). Where 2/3 of the space is for illustrations related to the text material being presented(Swanson et al., 2012). The use of contrasting colors but not too striking. This is used to avoid color combinations that can trigger sensory overload.

The type of typography used is a font that is easy to read, with an adequate size and comfortable spacing. Sans serif font types, which do not have serifs/wing-like features(Day et al., 2024), give the impression of being easy to read even with a large number of words(Shinahara et al., 2019).

Figure 4
Typography for Slides of Material for DKV Collegers with Autism



The use of illustrations and icons in slide materials for autistic collegers in the Visual Communication Design program by utilizing universal and relevant icons and illustrations to convey concepts without ambiguity(Cendekia et al., 2021).

Figure 5
Illustration/icon for Slides Material for DKV Collegers with Autism

At this development stage, the infographic prototype is realized in digital form, ensuring the accuracy of the content and visual quality. This process also involves initial validation by experts (validators), in this case, the course instructors, to ensure that the design meets the criteria of inclusivity and pedagogy. This form of digitization is in the form of a PDF file, and the materials are created using flipbook techniques. For the implementation stage of inclusive infographics as an adaptive learning medium in classroom settings or tutoring sessions with the participation of autistic collegers. At this stage, direct observation and qualitative data collection are conducted to see how collegers interact with the infographics, their level of understanding, and the feedback provided. At the evaluation stage, which is the core of this research. We collected data through questionnaires, interviews, observations, and material comprehension tests. The evaluation results show that inclusive infographics significantly improve material comprehension, engagement, and learning independence among autistic collegers. Collegers showed a strong preference for infographics compared to conventional text media, particularly because of their ability to present information visually and in a structured manner.

Table 1
Qualitative Results on the Implementation of Infographics for Course Materials for Autistic Collegers in the Visual Communication Design Study Program

No.	Observed Qualitative Aspects	Description of Main Qualitative Findings	Implications for the Effectiveness of Infographics
1	Visual Clarity	Autistic students believe that: • Clean layout, clear icon usage, and linear information flow greatly help in processing the material. • Infographics that are "not cluttered" and "easy to follow".	A neat and clean visual design reduces confusion and facilitates information processing for autistic students.
2	Cognitive	A neat and clean visual design reduces confusion and facilitates information processing for autistic students. The results observed by the lecturer were that; • Autistic students show fewer signs of fatigue or frustration when learning with infographics compared to dense text. • Autistic students feel "more at ease" and "not too overwhelmed".	Infographics successfully present complex information in a more digestible format, reducing sensory and cognitive overload.
3	Focus & Attention	Students tend to maintain focus longer on infographics.	Visual appeal and concise information presentation maintain attention, which is important for the learning style of autistic students.
4	Conceptual	Students are able to explain the relationships between the concepts presented in the infographic better.	Infographics help build a clear cognitive map, making it easier for autistic students to see the big picture and the details.
5	Motivation	• Students show positive expressions, such as smiles or nods, when understanding the material through infographics. • Showing "more confidence" and "motivation" to learn.	A positive learning experience enhances internal motivation and self-confidence, which are crucial for learning success.

This table provides an in-depth qualitative overview of how inclusive infographics interact with the needs and learning styles of autistic collegers, as well as their positive impact on the learning experience. These findings provide an understanding of the effectiveness of infographics as an adaptive learning medium. Based on the results of interviews and field observations in the classroom, there are several findings from the evaluation, including: 1) Improved Concept Understanding: Infographics help autistic collegers better understand abstract or complex DKV concepts through visual representation, 2) Cognitive Load Reduction: The presentation of concise and structured information reduces cognitive load, allowing collegers to process information more efficiently, 3) Increased Independence: Intuitive design enables autistic collegers in the Visual Communication Design program to learn independently with less assistance, and 4) Positive Feedback: Collegers reported that infographics made learning more engaging and did not make them feel overwhelmed. By accommodating structured visual learning preferences with reduced cognitive load, infographics bridge the learning gap in a more equitable and effective educational environment. This result not only serves as a foundation for the development of a more inclusive Visual Communication Design

study program curriculum but also opens up great opportunities for further exploration in content personalization and interactivity to support the diversity of collegers' learning styles.

CONCLUSION

This research has comprehensively explored and proven the effectiveness of inclusive infographic design as an adaptive learning medium that is highly relevant for autistic collegers in the Visual Communication Design (VCD) Study Program. By systematically applying the ADDIE (Analysis, Design, Development, Implementation, Evaluation) innovation development model, the research successfully created infographics that specifically accommodate the unique learning needs of autistic collegers.

The results of this study consistently show that inclusive infographics have a significant positive impact. Quantitatively, there is a proven substantial increase in the average understanding of the material, supported by positive colleger perceptions of ease of learning, increased engagement, independence, and memory retention. The very high preference of collegers for infographics compared to other media also serves as a strong indicator of its success. Qualitatively, the findings show that visual clarity, a neat structure, and concise information presentation in infographics successfully reduce cognitive and sensory load, enhance focus, and trigger positive emotional responses in collegers. Infographics also facilitate the understanding of conceptual connections and support their independent learning abilities. Thus, it can be concluded that inclusive infographics are not just visual aids, but rather an effective and adaptive pedagogical strategy to create a more accessible and empowering learning environment for autistic collegers in the field of Visual Communication Design (DKV). This innovation bridges the learning gap, optimizes their learning potential, and contributes to the creation of a more inclusive higher education. Strategic recommendations are proposed for the sustainability and optimization of the DKV Study Program, with the official integration of inclusive infographics into the curriculum and the provision of adequate resources highly recommended to support sustainable development. Lecturers and educators are encouraged to enhance their competencies in inclusive design and make the most of infographics, even considering personalization to accommodate individual needs. Furthermore, for future research and development, it is recommended to explore variations in infographic formats (e.g., interactive or animated), conduct long-term studies, and compare development models to identify best practices. The ultimate goal is to continue creating innovative and inclusive learning solutions, ensuring that every colleger, regardless of their learning style, can reach their full potential in the field of visual communication design.

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