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Visual Strategies as Infographic Modeling Course Material for Deaf Students at Universitas Sahid Surakarta

Evelyne Henny Lukitasari[1*], Ahmad Khoirul Anwar[2], Arif Yulianto[3], Dea Syahnnas Paradita[4]
[1-4] Visual Communication Design, Universitas Sahid Surakarta, Surakarta, Indonesia
Email: evelynehenny@gmail.com[1], dea.syahnnas@gmail.com[4]*

**Corresponding author: evelynehenny@gmail.com*

Abstract: *Since 2014 Universitas Sahid Surakarta has accepted deaf students. However, starting in 2018, communication problems emerged in the delivery of material from lecturers to deaf students. This is because: 1. 90% of deaf students in Visual Communication Design cannot read written sentences that are too long and 2. Deaf students' digital applications to translate the voice of the lecturer when explaining do not function properly. This study aims to produce icon designs for lecture material infographics for deaf students of Visual Communication Design Study Program, Universitas Sahid Surakarta and test the feasibility of the design. Therefore, the research method is carried out using qualitative methods. By using data triangulation in conducting data validation. This is done based on the problems that arise, so it is necessary to find a cause-and-effect relationship by looking at the symptoms, conditions, and phenomena that occur. The results achieved are visual strategies in the form of icons from representative words/sentences arranged to form infographics from information about lecture material. This is done because the way of understanding communication, one way of learning language for the deaf is by maximizing the sense of sight as a tool in receiving information stimuli through visual language. One of them is using visual language in the form of infographics that are formed through visual strategies according to the information needs of deaf students in the Visual Communication Design study program.*

Keywords: *Icon, Infographics, Visual strategy.*

1. INTRODUCTION

Inclusive education in Indonesia began to be developed since the early 2000s. Elementary to secondary schools are the main targets in the implementation of inclusive education. This is based on the circular letter from the Director General of Basic and Secondary Education, Ministry of National Education No. 380/C.C6/MN/2003 dated January 20, 2003, regarding inclusive education, which states that at least 4 (four) schools consisting of elementary, junior high, senior high, and vocational schools should be organized and developed in each district/city. Inclusive education is a teaching and learning process within an educational unit that provides opportunities for individuals with disabilities to pursue education alongside non-disabled individuals. Inclusive education is a solution to the desire of students with disabilities to pursue further education in higher education. Students with disabilities who attend inclusive schools are individuals with potential in the field of education. This makes these students with disabilities have the desire to continue to higher education. The government itself has mandated the right to education for children with special needs as stipulated in Article 54 of Law Number 39 of 1999 on Human Rights, which states: Every child with physical and/or mental disabilities has the right to receive care, education, training, and special assistance at

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the expense of the state, to ensure their life in accordance with human dignity, to improve themselves, and to have the ability to participate in community and national life. Deaf students can pursue regular education with the same curriculum and facilities as all other students. The Minister of Research and Higher Education Regulation number 47 of 2017 does not explain the levels of each disability.

In 2014, Universitas Sahid Surakarta opened opportunities for hearing-impaired individuals and the deaf to pursue higher education. The Visual Communication Design and Interior Design study programs have received these students, with 4 hearing-impaired students in Visual Communication Design and 2 in Interior Design. In 2022, the total number of hearing-impaired or deaf students pursuing education in the Visual Communication Design program at Universitas Sahid Surakarta was 19 students. The 2014 batch had 3 students, 2 of whom graduated with Cumlaude honors. The 2016 batch had 1 student, the 2017 batch had 1 student, the 2018 batch had 3 students, the 2019 batch had 3 students, the 2020 batch had 4 students, the 2021 batch had 2 students, and the 2022 batch had 1 student. However, starting in 2020, communication barriers have emerged in the delivery of material from lecturers to deaf students. Especially when delivering lecture materials in the classroom. This is because:

a. Deaf students in Visual Communication Design 90% cannot read written sentences that are too long. This is because they are accustomed to using root words and commonly used words. The tendency to read texts with denotative meanings rather than connotative meanings. Meanwhile, in the Visual Communication Design course material, there are many borrowed terms/words from foreign languages.
b. The digital application that deaf students use to translate the lecturer's voice when explaining does not function properly. This is because sentences/words often appear that do not match what the course instructor is saying. Therefore, the method of understanding communication in lecture materials for deaf/hard of hearing students is by maximizing the sense of sight as a tool for understanding information. Sign language, which is commonly used by deaf/hard of hearing students, generally involves the use of hands, which is a form of visual language. Visual language functions to identify and analyze messages or words within information. To overcome communication barriers and the transfer of knowledge between lecturers and deaf students, visual language is used. One of them is through visual language in the form of infographics.

The goal is for deaf students to understand and comprehend information about lectures, especially regarding borrowed terms from foreign languages, and to be able to implement them well, thereby creating deaf students who can compete in society. This is also course material

presented using visual language for deaf students, which can be beneficial in the following ways: a. stimulating students' motivation and interest, b. helping to improve understanding, presenting data in an engaging and reliable manner, c. facilitating data interpretation and condensing information, d. making it easier for students to complete tasks such as design, animation, photography, or film production. Research related to icons by Max Friedric, Dale Richards, and Max Vollrad titled "Icon.

2. LITERATURE REVIEW

Infographics are information technology in the process of delivering information from the sender to the receiver, making it faster, more widely disseminated, and longer-lasting. Communication with visual language has the power to captivate the attention of the right audience, spark imagination, clarify complex problems, provide understanding, and present what we conceive, see, and imagine (Nugraha et al., 2023). The journal titled "The Effectiveness of Infographic Learning Media in Increasing Learning Interest, Visual Spatial Intelligence and Student Learning Outcomes in Gugus Ahmad Yani KEC. Kuningan" reveals that study investigates the efficacy of graphical learning medium in enhancing primary students' spatial visual intelligence, learning interest, and academic performance (Nugraha et al., 2023). The conclusion of the journal's content is that infographic learning media can be an effective tool in increasing learning interest, visual spatial intelligence, and student learning outcomes in Civics education, useful for sharpening the process of creating infographic design concepts for deaf students in the visual communication design program at Universitas Sahid Surakarta. The artcle using research methode with used a smartpho app to collect daily data from participants, including pain symptoms, mood, physical activity, and weather data from nearby weather stations. The data was analyzed using a case-crossover design, comparing the weather on pain-event days to weather on control days within a risk set of a calendar month. The research used a case-crossover design, where participants served as their own control, eliminating confounding by time-invariant factors and also the participants were asked to collect daily symptoms for six months, and weather data were obtained by linking hourly smartphone GPS data to the nearest UK Met Office weather stations. The research methode also uses a conditional logistic regression model to estimate the odds ratio for a pain event in response to changes in weather variables includes the preceding day’s pain score, mood, physical activity, and time spent outside as covariates.

Journal article with the tittle Needs Analysis Of Infographic Media Using Technology for Learning Physics from Malaysian Online Journal of Educational Technology reaveals that the study explores the need for infographic media in teaching and learning physics, particularly the concept of kinematics of rectilinear motion, and suggests the use of smartphones and social media to facilitate access to infographic media (et al., 2020). The conclusuion about that articel is infographic media that utilizes computer innovation in learning material science in tall school. The infographic media will be well bundled and available by means of Facebook social media and supported up utilizing smartphones as a learning instrument for learners. The conclusion of this ponder is that understudies need infographic media to memorize the concept of kinematics of rectilinear movement, and they need to utilize their smartphones for learning. The learning strategy ought to be changed and not dull, and instructors ought to get ready and utilize directions media amid the learning prepare. The think about concludes that infographic media is vital and doable to be created to encourage learning and educating of material science, especially the concept of kinematics of rectilinear movement. The utilize of smartphones and social media can encourage get to to infographic media, making learning more adaptable and free. The research method used in this study is a qualitative method with the need analysis of the ADDIE development model according to Lee and Owens. The instruments used in this study are interview guides, observation sheets, and document analysis. Data collection techniques in research through direct observation and semi-structured interviews and document studies. That article using reserch methods with: (1) interview guides, (2) observation sheets, and (3) document analysis. The data collected were analyzed using thematic analysis, and the validity of the data was ensured through triangulation and member check techniques and used interviews and document analysis to collect data from teachers and students.

Design for Representing Safety-Critical Aircraft Functions to Support Supervisory Control of Remotely Piloted Aircraft Systems" in the Aerospace journal in 2022, discusses that the conventional aircraft control display for pilots has icons used to associate meaning with functions on the flight deck. Thus, it enables pilots to understand information effectively (Friedrich et al., 2022). This research uses icon design principles from 18 icons that represent important safety functions related to aircraft operation. Most of the designed icons are already suitable for representing the intended meanings. The infographic design used aims to help dyscalculic students from regular junior high school classes understand the numerical language related to the mathematics learning process, motivating achievement among dyscalculic students through infographic design media. Research related to Visual Strategy by Genial Nabilaisyah Firdauzi, Asep Sufyan Muhakik Atamtajani, and Diena Yudiarti, titled

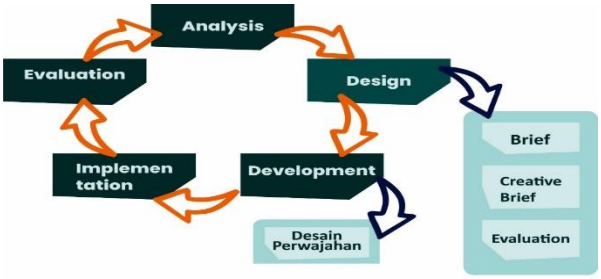
"(Atamtajani et al., 2021). Accessories with a Visual Strategy Approach" in the eProceedings of Art & Design Telkom University, discusses the application of visual strategies with the theme of the uniqueness of marine biota waste, which has good potential to be developed into jewelry to enhance personal charm . Visual strategies are used as parameters in applying visuals to jewelry to achieve optimal visual quality.

Based on the articles above, it shows that the creation of infographics takes into account design principles such as simplicity, coherence, emphasis, and balance. An infographic is a graphic representation that visually represents a collection of data, information, and design. And the research methods they used provide valuable input for the study on infographics as learning media for deaf students in the visual communication design at Universitas Sahid Surakarta.

The difference between the research methods from the two articles above and the infographic research method for deaf students is that the infographic research for deaf students in visual communication design at Sahid University Surakarta uses the Lee & Owens Model innovation method.

3. METHODS

In solving the proposed problem using the innovation method with the ADDIE development model according to Lee and Owens.



Picture 1. Methode Lee & Owens Model
(Evelyne, 2024)

The ADDIE development procedure according to Lee and Owens includes:

1. Analysis and Needs AssessmentThe stage of analysis and needs assessment consists of two phases: need assessment analysis and front-end analysis. This is done by selecting data samples and processing the data.
   a. Need AnalysisThe need analysis is conducted using observation and interview methods with the observed aspects being; 1) classroom learning during the subject; and 2) interviews with course lecturers. With the help of observation and interviews, the learning objectives, core competencies, basic competencies, and learning materials to be developed are identified.

b. Front-End AnalysisFront-End Analysis consists of: (1) analysis of deaf students in visual communication design at Sahid University Surakarta; (2) analysis of learning technologies that have been used to create the learning innovations to be developed; (3) situational analysis regarding the situation, climate, and culture education in visual communication design at Sahid University Surakarta and its facilities

2. Design Creating the design of the produced product, starting with making a research schedule, creating a material structure, and media specifications that are easy to understand. The steps of the researcher in the design phase include:
   a. sketch creation, b. layout determination to be used, c. icon creation to support lecture materials, and d. typography determination to be used
3. Devolopment

   The development resulted in a product in the form of UI/UX design for infographic learning innovation. The researcher at this development stage created the product using Adobe Illustrator and Adobe After Effects software with the following steps:1) Creation of Icon Design; 2) Font Selection; 3) Sentence Compression without Reducing Meaning or Message Content.
4. Implementation

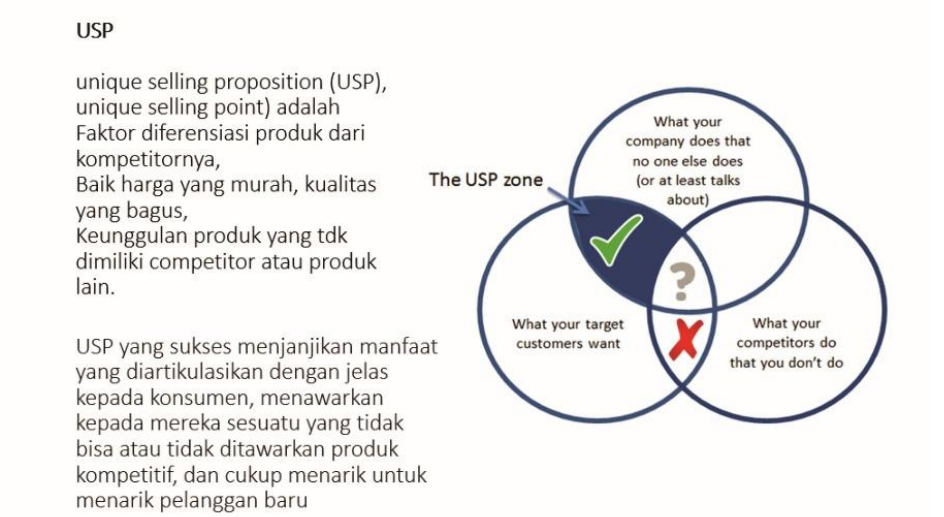
   The implementation stage is the infographic design developed for visual communication design students at Sahid University Surakarta, which has previously been validated in terms of content and learning innovation with learning materials and projects that align with competency learning materials.
5. Evaluation

   The level of suitability of the infographic design will be measured by conducting tests with deaf students. Subsequently, the deaf students will provide feedback. The feedback will come from a questionnaire instrument. The evaluation results will be used as material or reference for improvement.

4. RESULTS

The form of slides regarding lecture material on concept development, with slides containing a lot of text, poses comprehension challenges for hearing-impaired students in the Visual Communication Design program at Sahid University Surakarta. Especially long sentences that are structured into paragraphs. Therefore, the format of the lecture slides is simplified by minimizing long sentences into short sentences that are directed/focused on the core information to be conveyed. Here are the lecture slides on concept development, including

slides on USP (Unique Selling Proposition) compiled in 2020, focusing on the various forms of writing.



Picture 2. Brand Lecture Material Slide with a lot of text
[Sumber: Evelyne, 2020]

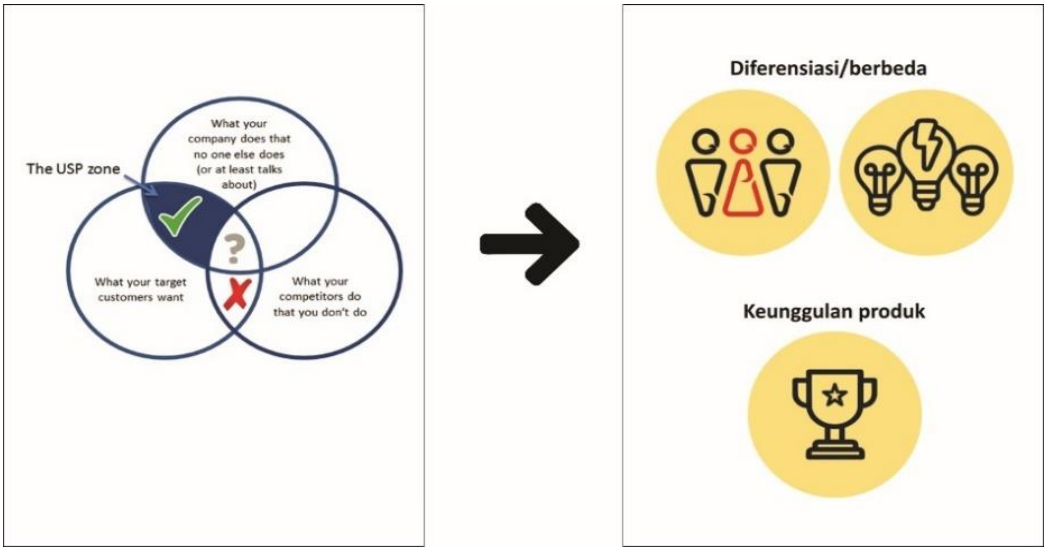
Based on the image 4 above, it shows that 90% is dominated by text. The illustrations/images on that slide do not help clarify the presentation of the text in paragraph form next to its left side. Based on this, for deaf/hard of hearing students, it is necessary to simplify the content of the material in the slides. This simplification involves selecting the core words/sentences of the information. Thus, making the sentences not too long but informative and not causing misunderstandings. Therefore, this simplification is presented in the form of an infographic that focuses on illustrations/images. In infographics, there are characteristics (Chen et al., 2019), namely: a) Objective information sources, b) Easy to understand and engaging, c) Information content presented in good visual language, d) Searching for or creating appropriate graphic elements, e) Capable of providing sensational visual language expressions, f) Selecting and conveying the necessary capacity.

Picture 3. Brand Lecture Material Slide with condensed text
[Evelyne, 2024]

. The simplification involves reducing the number of words and focusing on the core information to be conveyed, bolding important words, and using sans serif fonts. The use of sans serif fonts is because their characteristics are impressionable, flexible, relaxed, and easy to read when arranged in long sentences (Wang et al., 2018). And to avoid discomfort, eye strain, and to maintain focus when reading the displayed words/sentences, the font size used is 18pt – 20pt. This is done so that the function of using typography in complementing textual word elements can enhance cognition and message comprehension (Lee & Park, 2023). The use of typography can also have the effect of understanding information well by paying attention to design principles, thus presenting visuals that are not only attractive but also consider reading comfort, which can evoke trust in the conveyed information (Thiessen et al., 2020).

Picture 4. Sentence simplification
[Evelyne, 2020]

Then, the simplification is done by providing illustrations/images that can reinforce the sentence/word being conveyed. The use of illustrations/images is focused on the core information to be delivered with a visual form that can represent a word/sentence. The images that represent/ resemble the word/sentence are done in the form of icons (Chi et al., 2019). This is done because the visual form of an icon is easier to interpret. Therefore, in the creation of icons that use illustrations/images that are easily recognizable, easy to understand, simple, and not overly colorful (Liu & Chen, 2022). This is done so that attention remains focused on the core information being conveyed (Friedrich et al., 2022). The creation of icons uses principles related to aesthetics, composition, and function in the making of icons regarding learning materials. The visual appearance of icons tailored to the course independently, taking into account the core and characteristics of the course material (Collaud et al., 2022).



Picture 5. Image simplification
[Sumber: Evelyne, 2024]

The effectiveness of this learning innovation in improving the understanding of deaf students towards the material is good, as evidenced by their ability to comprehend and apply it in completing assignments well and on time. The learning innovation for deaf students in the Visual Communication Design program at Sahid University Surakarta uses infographics as a medium to present lecture materials. Infographics are media of information in text and illustrations/visualizations/images used to represent data so that its presentation is easy to understand and read. The elements of infographics as a medium for presenting lecture materials are: 1. Layout, 2. Color, 3. Font, 4. llustration/Visualization/Image. The results of the questionnaire analysis given to Visual Communication Design students at Sahid University Surakarta regarding the learning media that has been revised to meet the needs of deaf students in Visual Communication Design at Sahid University Surakarta. Starting with understanding the constraints of the material provided. From the analysis of 11 deaf students in the Visual Communication Design program at Sahid University Surakarta, who are active in understanding the text in a slide presentation, the results are as follows;

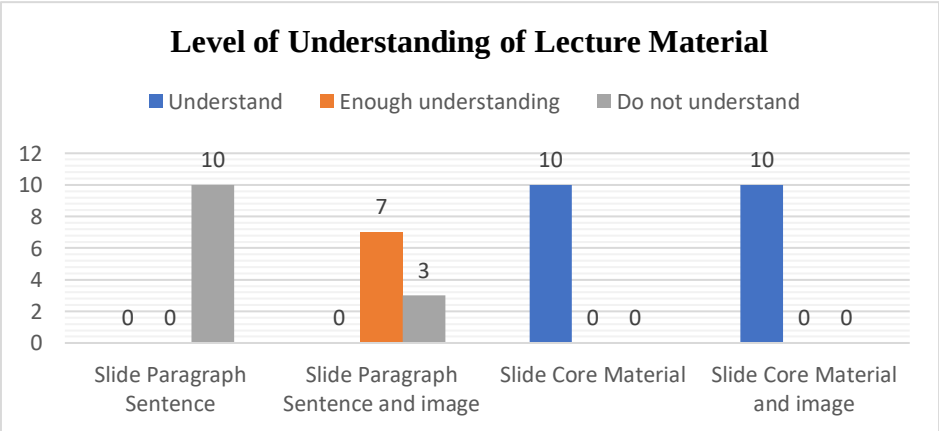


Chart 1. Level of Understanding of Lecture Material
[Sumber: Evelyne, 2024]

5. DISCUSSION

The use of the ADDIE development model according to Lee and Owens is very helpful in creating infographic designs that meet the needs of deaf students. The systematic process from analysis to evaluation ensures that the resulting infographics are not only visually appealing but also effective in conveying information. Some important points to consider in the development of infographics for deaf students:

a. Student involvement in the design process: Involving deaf students in the analysis and evaluation stages is crucial to ensure that the resulting infographics meet their needs.
b. Use of additional technology: For example, adding subtitles or sign language videos to support understanding.
c. Sustainable development: Infographics should be continuously updated based on student feedback and technological advancements.

The ADDIE model provides a flexible framework that can be tailored to the needs of deaf students. By using this approach, educators can create more inclusive and effective learning media.

6. CONCLUSION

Sahid University Surakarta has opened opportunities for hearing-impaired individuals to pursue higher education since 2014. The study programs that have accepted these students are Visual Communication Design and Interior Design. Based on the findings from the observation activities on learning for students with special needs, particularly hearing-impaired students in the Visual Communication Design program at Sahid University Surakarta, there is a need to simplify the visual appearance of learning material slides. The simplification of learning material slides is done through visual icons in the form of infographics, which are very useful in overcoming communication barriers that occur when lecturers deliver lecture materials to students. This simplification takes the form of visual icons arranged in infographics, considering: a. the core information/material, b. font style, c. font size, d. icon shape, and e. icon color.

The design of infographics for deaf students, if done following the ADDIE model, can enhance their understanding and engagement in learning. It is important to continuously evaluate and improve the materials based on feedback to remain relevant and effective. With this approach, education can be more inclusive and support diversity in learning styles.

LIMITATION

Limitations during the research process that occurred during the creation of infographic design learning materials for deaf visual communication design students at Universitas Sahid Surakarta due to several factors, namely;

1. Sample Limitations by only involving 10 deaf students, which may not be sufficiently representative to generalize the findings to the entire population of deaf visual communication design students outside Universitas Sahid Surakarta. Thus, a broader and more diverse sample from various backgrounds and institutions would provide a more comprehensive picture.
2. The limitation of the learning context focuses on the use of infographics in the classroom learning process. This is because deaf students also need other visual media approaches in the context of independent learning or outside the classroom. Thus, being able to expand the research to various learning contexts will provide a more comprehensive understanding.
3. The limitations of the technology used in this research process. This infographic research can explore the use of technologies such as AR and animation, and open up opportunities to develop more innovative and integrated technological solutions. Therefore, there is a need for follow-up on the potential of new technologies that can optimize the ease, effectiveness, and efficiency of learning media for deaf students and enrich the research outcomes.
4. Limitations of long-term evaluation. The results of the infographic research are an evaluation of the effectiveness of infographics in the short term. Meanwhile, this research will be more beneficial for deaf students in visual communication design outside the Sahid University of Surakarta, thus requiring a long-term evaluation to see the sustainable impact on the academic performance and learning experience of deaf students.
5. The limitation of interdisciplinary collaboration in this research is that it not only involves design experts but also includes education and psychology experts. Similarly, broader collaboration with experts in technology, accessibility, and sign language can enrich the perspectives and solutions offered. Thus, an interdisciplinary approach will result in more comprehensive and effective innovations for deaf students.

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