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A Mixed-Method Study on the Effectiveness of Infographics in World Regional Geography Learning Among University Students

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ABSTRACT

Infographics can effectively enhance learning in World Regional Geography. This study aims to analyze the effectiveness of using infographics in World Regional Geography learning. The study involved 18 fourth-semester students in the Geography Education Study Program without a control class. This study used a mixed approach, with quantitative methods of evaluative surveys through questionnaires and tests and qualitative methods through structured interviews and open questionnaires. Statistical analysis of quantitative data was conducted descriptively. Qualitative data was analyzed using thematic analysis. The results of the study indicate that the average understanding of students toward infographics reached 8.94 (SD=1.35), indicating good understanding of infographics supported by qualitative themes on the effectiveness of infographics. Students' perceptions showed an average score of 8.94 (SD=1.21), indicating a very positive response supported by the qualitative theme of improved understanding among respondents and the effectiveness of infographics, while the average student satisfaction was 9.06 (SD=1.00), indicating high satisfaction supported by the qualitative theme of the benefits of use. The average post-test results for students were 3.78 (SD=0.73), indicating a good understanding supported by the qualitative theme of improved understanding as well as student participation and engagement. This study concludes that infographics are an effective medium for learning Regional Geography of the World.

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1. INTRODUCTION

Geography education plays a crucial role in shaping students' understanding of the world and the complex interactions between humans and their environment. Geography is not merely about memorizing place names or geographic locations, but emphasizes spatial analysis, understanding natural and social processes shaping the Earth's surface, and how humans adapt to and influence their surroundings (Putra & Masruri, 2019). In this context, learning World Regional Geography becomes essential, as it enables students to understand the unique characteristics of various regions, including their physical, social, economic, and cultural aspects (Nurjanah et al., 2021). Through such learning, students can develop global insight and the ability to think critically about contemporary global issues such as climate change, migration, resource conflicts, and sustainable development (Wahyu et al., 2020).

However, traditional approaches in teaching World Regional Geography often face challenges in conveying complex and multidimensional information effectively. Instruction based heavily on lectures and textbooks is often perceived as monotonous and tends to reduce student engagement and motivation (Choiriyah, 2021; Anggriani, 2019). Consequently, students may struggle to grasp abstract and intricate geographical concepts, resulting in a limited understanding and diminished learning outcomes.

To address these issues, the integration of multimedia in education has gained prominence. Studies have shown that combining visual and verbal modalities enhances cognitive processing, supports information retention, and enriches the learning experience. This aligns with the principles of dual coding and cognitive load theory, which advocate for the use of multiple sensory inputs to facilitate deeper learning (Mayer, 2021). Visual media such as videos, e-comics, 3D models, and augmented reality—have been found to positively influence student motivation, comprehension, and engagement in geography learning (Mutmainnah et al., 2022; Larasaty et al., 2024). Furthermore, computer-based digital media have demonstrated increased student performance in Urban Geography courses, with 97.67% of students reporting the media as effective and enjoyable (Suwarsito et al., 2011).

Among various visual media, infographics have emerged as a promising tool for representing data and information in a concise, attractive, and accessible way. Infographics combine text, graphics, illustrations, and design elements to simplify complex geographic phenomena, reveal spatial patterns, and facilitate a better understanding of regional characteristics (Kustandi et al., 2021; Marpaung, 2025). Some findings indicate that infographic-based learning results in higher conceptual understanding compared to passive learning methods (Anggriani, 2019). Despite this potential, the academic exploration of infographics in geography education remains limited.

However, there remains a significant research gap that must be addressed. Most previous studies have focused on the general effectiveness of visual media, but few have comprehensively integrated students' perceptions, conceptual understanding, and learning outcomes in a single study—especially in the context of higher geography education (Kustandi et al., 2021; Mutmainnah et al., 2022). Furthermore, the rationale for choosing infographics over other visual media such as videos or animations requires clarification. Infographics offer unique advantages in delivering information concisely, visually, and systematically, aligning with cognitive principles such as dual coding theory and cognitive load theory (Mayer, 2021). While prior studies have confirmed the role of visual media in engagement, there remains a lack of studies analyzing infographic effectiveness using mixed methods in higher geography education contexts.

Therefore, this study aims to investigate the effectiveness of infographics in learning World Regional Geography using a mixed-methods approach. This approach is expected to provide

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a more holistic understanding of how infographics influence students' perceptions, comprehension, and academic outcomes, while offering practical insights for geography educators and instructional designers.

2. LITERATURE REVIEW

2.1. Infographics as Learning Media

Infographics are visual representations of data and information designed to convey messages effectively and efficiently (Rahma et al., 2023). They combine text, graphics, illustrations, and other design elements to present complex content in an accessible and engaging way (Anggriani, 2019). In education, infographics can serve as powerful learning tools that simplify abstract content, foster attention, and enhance understanding. Compared to static visuals such as posters, infographics integrate data, spatial elements, and narrative flow, potentially increasing student retention and comprehension (Lyra et al., 2016).

Unlike other visual aids, infographics facilitate the synthesis of multiple information types numerical data, geographic patterns, and conceptual relationships into a unified whole. This holistic nature makes them especially relevant for geography learning, where spatial reasoning and conceptual mapping are critical. Infographics do not merely attract attention; they support layered processing of content, allowing learners to interact with information on both visual and textual levels.

2.2. Relevant Learning Theory

The theoretical basis for using infographics in education is grounded in several cognitive and constructivist learning theories. Mayer's (2009) Cognitive Theory of Multimedia Learning posits that individuals learn more effectively when verbal and visual inputs are combined, as this reduces extraneous cognitive load and fosters better integration of knowledge. Complementing this, Paivio's Dual Coding Theory (2006) explains that the brain processes verbal and visual information through separate but interconnected channels, which when activated together, lead to improved memory and learning outcomes.

These theories align with the nature of infographics, which present information in dual formats to maximize cognitive engagement. Constructivist theory further supports infographic use by emphasizing that learners construct knowledge through experience and meaningful interaction with content. Infographics provide this experiential platform by encouraging learners to decode, interpret, and relate visualized data to their existing knowledge base. This interaction promotes deeper learning and personalization of content, especially in complex subjects such as geography.

2.3. Effectiveness of Infographics in Educational Context

Research demonstrates that infographics enhance educational outcomes by improving comprehension, motivation, and critical thinking. Asih et al. (2023) and Anggriani (2019) found that students exposed to infographic-enhanced learning performed better on assessments and reported greater engagement. Fahmi et al. (2021) highlighted how infographics deconstruct complex concepts into digestible elements, facilitating deeper processing and long-term retention.

Beyond cognitive gains, infographics also foster metacognitive and affective development. Their visually engaging format draws attention, promotes curiosity, and supports sustained interest in learning (Violla & Fernandes, 2021). Moreover, students are often required to analyze and synthesize the information embedded in infographics, thus exercising higher-

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order thinking skills. These strengths align with the shift in modern education from rote memorization to deep, skill-oriented learning (Bystrova, 2020).

2.4. World Regional Geography Learning

World Regional Geography requires the mastery of diverse and interconnected concepts related to human-environment interactions across various regions. The complexity of this subject demands instructional strategies that foster clarity, contextual understanding, and spatial awareness. Infographics are particularly suitable for this task, as they can visualize statistical patterns, regional comparisons, and systemic relationships in geography.

While traditional tools like maps and graphs have long been used in geography education, infographics offer an integrative medium that blends these tools with narrative and thematic coherence. By using infographics, educators can better support student understanding of geographic interconnections, promote critical analysis, and enhance spatial thinking. Furthermore, the effectiveness of media like infographics is closely tied to student engagement; when learners are visually stimulated and cognitively challenged, their motivation and retention increase (Istyasiwi et al., 2021; Utami et al., 2023). Thus, infographics not only simplify learning content but also support the broader pedagogical goals of geography education.

3. METHOD

This study uses a mixed methods approach, which is a combination of quantitative and qualitative approaches. This approach was chosen to gain a more comprehensive understanding of the effectiveness of using infographics in learning World Regional Geography, both in terms of student learning outcomes and from the perspective of their experiences and responses to the learning media. The infographics used in this study are digital-based infographics designed using Canva. The subjects in this study were students taking the World Regional Geography course in the even semester of the 2024/2025 academic year. The sampling technique was carried out purposively, considering the active involvement of students in the learning process. The independent variable in this study is the use of infographics and the dependent variable is the effectiveness of learning which includes learning outcomes and student perceptions of the use of infographics.

The research instruments used to obtain quantitative data include a questionnaire on the level of student understanding, a questionnaire on student perceptions of infographics, a questionnaire on the level of satisfaction with learning methods, a test of understanding the material in the form of multiple-choice questions. Meanwhile, to obtain qualitative data, the author used a research instrument in the form of a structured interview questionnaire, and an open-ended questionnaire regarding student perceptions of the use of infographics. The quantitative data analysis technique uses descriptive statistics and qualitative data is analyzed using thematic analysis.

Descriptive statistical analysis of quantitative data includes the calculation of mean, standard deviation, and frequency to describe the characteristics of the sample and research variables. Categorization of student understanding scores on the clarity of infographics, student perceptions of infographics, student satisfaction with learning methods, and learning outcomes is carried out based on previously established criteria. The criteria for understanding infographics can be seen in the following Understanding Score Range table.

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Table 1. Infographic Understanding Score Range

Score Range	Category	Interpretation
9,01 – 10,00	Very knowledgeable	Students clearly understand infographics
8,01 - 9,00	Understand	Students understand well
6,01 – 8,00	Quite knowledgeable	Students understand part
4,01 – 6,00	Not Quite Understanding	Students' understanding is still limited
≤ 4,00	Don't understand	Students do not understand the clarity of infographics

Source: Riduwan, 2009

Meanwhile, to determine students' perceptions of the use of infographics in teaching the Regional Geography of the World course, the following table of Student Perception Scale Ranges was used.

Table 2. Student Perception Scale Range

Score Range	Perception Categories	Interpretation
8,41 – 10,00	Very Positive	Students really like and understand infographics
6,81 – 8,40	Positive	Students quite like and find it helpful
5,01 – 6,80	Neutral/Sufficient	Ordinary perception, not particularly striking
3,21 – 5,00	Negative	Infographics considered unhelpful
1,00 – 3,20	Extremely negative	Infographics are considered ineffective or confusing

Source: Riduwan, 2009

Next, to measure student satisfaction with the learning method using infographics in the World Regional Geography course, the following Satisfaction Scale Range table was used.

Table 3. Student Satisfaction Scale Range

Score Range	Satisfaction Categories	Interpretation
8,41 – 10,00	Extremely Satisfied	A highly satisfying and effective method
6,81 – 8,40	Satisfied	Students feel satisfied with the method
5,01 – 6,80	Quite Satisfied	Students feel the method is good enough
3,21 – 5,00	Not Satisfied	Students find the method unsatisfactory
1,00 – 3,20	Not Satisfied	Students are very dissatisfied with the method

Source: Riduwan, 2009

Furthermore, students' level of understanding of World Regional Geography material is categorized based on the following Understanding Score Range table.

Table 4. Range of Material Comprehension

Score Range	Percentage	Understanding Category
4,05 – 5,00	81–100%	Excellent
3,05 – 4,00	61–80%	Good
2,05 – 3,00	41–60%	Enough
1,05 – 2,00	21–40%	Insufficient
0 – 1,00	0–20%	Extremely Poor

Quantitative descriptive statistical analysis also includes the calculation of standard deviation. Standard deviation is a statistical metric that serves to describe the extent to which values in a data set are distributed or deviate from the mean value of that set. In other words,

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standard deviation indicates the level of variation or diversity in the data. When data shows a low standard deviation, this indicates that the majority of values are close to the mean. On the other hand, if data shows a high standard deviation, this indicates that the values in the data are spread out more widely than the mean. Standard deviation serves to assess how close or far the data distribution is from the mean. Standard deviation can be considered good if the number is lower than the average. Conversely, if the standard deviation value is higher than the average, then the standard deviation is considered less good (Budiono et al., 2024). Calculation of the average (mean), percentage, and standard deviation values using data analysis in Microsoft Excel.

Thematic analysis is a method used to evaluate data in order to identify patterns or themes from information collected by researchers. This thematic analysis is carried out through six steps, namely: (1) familiarizing oneself with the data; (2) generating initial codes; (3) constructing themes; (4) reviewing the themes that have been created; (5) defining the themes; and (6) compiling a report (Braun & Clarke, 2006).

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistical Analysis

This study was conducted on 18 undergraduate students in the Geography Education Program who were taking the World Regional Geography course. Quantitative data in this study, including students' understanding of infographics, their perceptions of infographics, their satisfaction levels, and their learning outcomes in the form of post-test scores, were analyzed using descriptive statistics, including mean calculations, percentages, and standard deviations. The results of data processing showed that the average (mean) understanding of infographics among students was 8.94 with a percentage of 89.4% and a standard deviation of 1.35. The average score for understanding infographics indicates that students have a good understanding of the infographics used in World Regional Geography learning. The standard deviation value of 1.35 is lower than the mean value, indicating that the level of students' understanding of infographics is uniform or homogeneous. The results of this study are in line with the research conducted by Marlina et al. (2021), which showed that the use of media in learning has a positive effect on learning activities. This finding indicates that the use of infographics as a learning medium is positively correlated with students' level of understanding of World Regional Geography material, where the relatively homogeneous level of understanding among students indicates that infographics can be accessed and understood equally by all students.

In addition to understanding infographics, this study also measures students' perceptions of infographics in World Regional Geography learning. Data on students' perceptions of infographics were also analyzed using descriptive statistics. Based on the data analysis, the average perception of students toward infographics was 8.94 with a percentage of 89.4% and a standard deviation of 1.21. This indicates that students responded very positively to the infographics used in World Regional Geography learning.

Next, data on student satisfaction with the learning method using infographics was analyzed using descriptive statistics. Based on the results of the data analysis, it was found that the average level of student satisfaction was 9.06 with a percentage of 90.6% and a standard deviation of 1.00. This indicates that the learning method is highly satisfactory and effective for future use. The standard deviation value of 1.00, which is lower than the average value, indicates that the students' responses are homogeneous or uniform.

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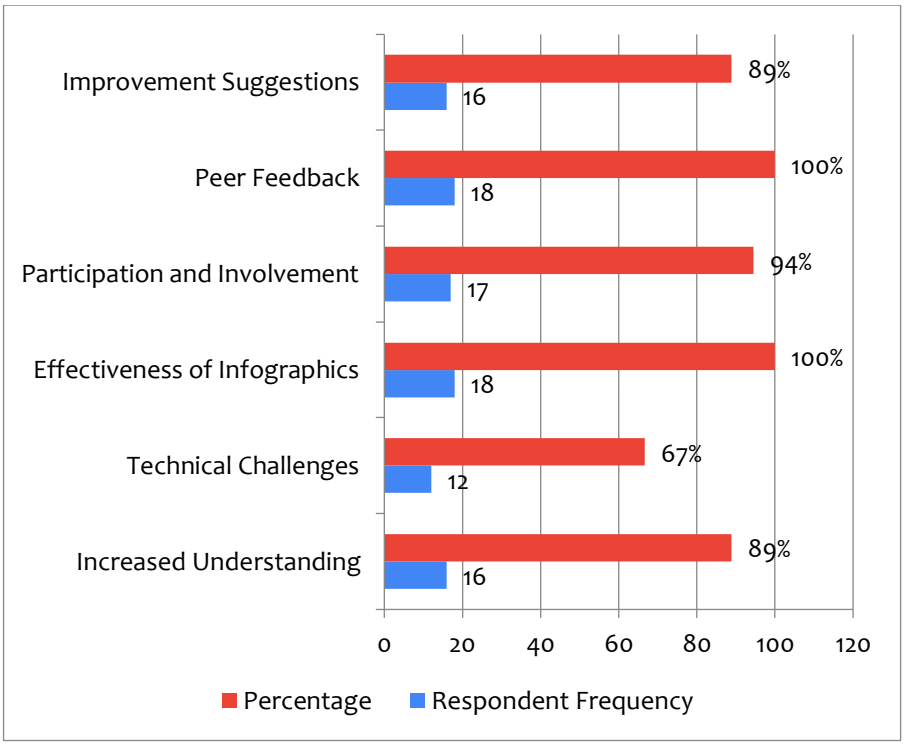
Next, we will discuss data on student learning outcomes measured using post-test scores. Based on the analysis of student post-test data, the average score was 3.78 or 75.6% with a standard deviation of 0.73. The post-test results show that the majority of students have a good understanding of the material after learning using infographics. With an average of 75.6% and a small score spread, it can be concluded that the infographic method is quite effective in improving understanding evenly. The combination of attractive visualization, concise data presentation, and the integration of relevant design elements makes infographics an effective medium for conveying complex information in a way that is easier to digest and remember (Ratnaningsih & Nastiti, 2018). These findings align with research showing that visual media, including animated videos, can improve student learning outcomes. The effectiveness of infographics in enhancing material comprehension is further supported by their ability to facilitate the development of higher-order thinking skills, such as analysis, synthesis, and evaluation (Anggriani, 2019).

4.2. Qualitative Thematic Analysis

Thematic analysis was conducted on qualitative data obtained from interview transcripts and open-ended questionnaires. The purpose of this analysis was to identify key themes that emerged related to students' perceptions and experiences of the use of infographics in learning World Regional Geography. The results of thematic analysis of interview responses and open-ended questionnaires showed 6 (six) main themes for interview data and 5 (five) main themes for open-ended questionnaire data. The interview themes consisted of Increased Understanding, Technical Challenges, Effectiveness of Infographics, Participation and Involvement, Peer Feedback, and Infographic Improvement Suggestions. The frequency for each theme is shown in the diagram below.



Source: 2025 Research

Figure 1. Frequency for Each Theme of Interview Data

Based on the diagram, the most prominent theme from the interview results is the theme of Infographic Effectiveness and Peer Feedback. The results of the data analysis show that as

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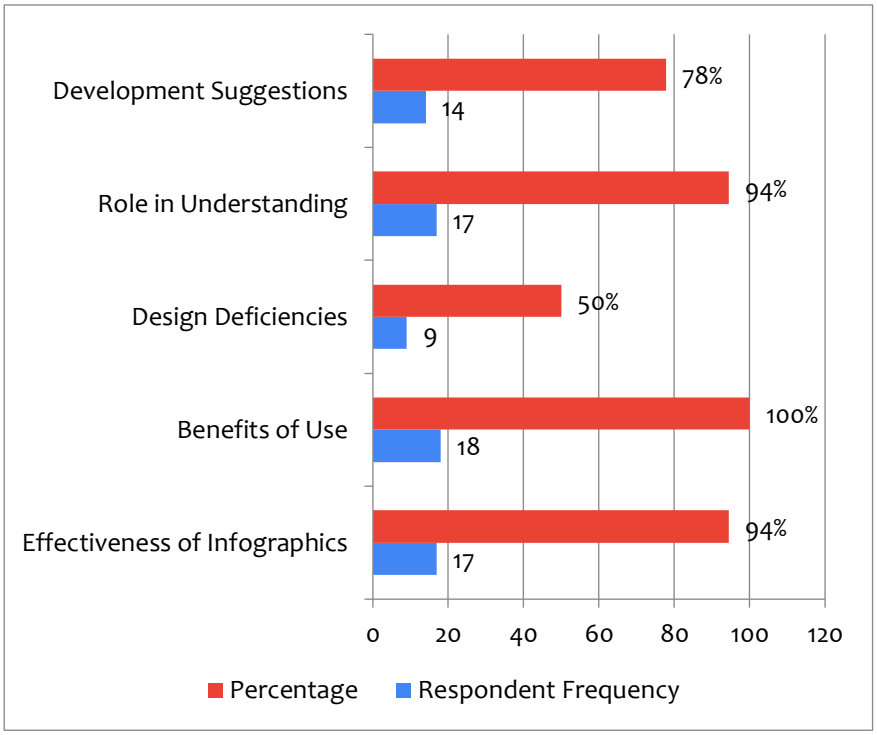
many as 18 respondents or 100% stated that infographics are effective in learning World Regional Geography. This is because infographics present information visually and concisely, making it easier to understand. In line with the data, all respondents gave positive feedback for each infographic product produced by each group. Meanwhile, the lowest frequency was in the problem of technical challenges. This is due to the respondents' minimal experience in designing infographics and is their first experience involved in making infographics. To make it clearer, the author includes a table of quotations for each theme of the interview results as shown in Table 5 below.

Table 5. Interview Results Thematic Table

Theme	Respondent Frequency	Direct Quotes of Respondents
Improvement Suggestions	16	Adding more interesting, precise and accurate data elements and visualizations
Peer Feedback	18	All responses were positive
Participation and Involvement	17	I feel more involved
Effectiveness of Infographics	18	Infographics are very effective for me in conveying information about the continents because they present data in a visual, concise and easy-to-understand way, making comparisons easier and increasing understanding.
Technical Challenges	12	Can't edit in a crowd, new questions arise, testing patience, don't know how, lack of group cooperation
Increased Understanding	16	Discussion process using infographics & Many aspects that aid understanding

Source: 2025 Research

Furthermore, the analysis of the open questionnaire data produced 5 (five) main themes, including: Infographic Effectiveness, Benefits of Use, Design Disadvantages, Role in Understanding, and Development Suggestions. The frequency for each theme can be seen in the diagram below.



Source: 2025 Research

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Figure 2. Frequency for Each Open-Ended Questionnaire Data Theme

Based on the diagram, the theme with the highest frequency is Benefits of Use. All respondents stated that the use of infographics in learning World Regional Geography helps in understanding lecture materials, increases interest in learning, and provides a new and enjoyable learning experience. Meanwhile, the theme with the lowest frequency is Design Disadvantages. A small number of respondents provided input on the infographic design, namely the selection of colors, icons or symbols that are inappropriate and less informative, text that is too dense, and designs that are too complicated. Several students also suggested the development of more interactive infographics, for example collaborating infographics with learning platforms, interactive quizzes, or adding animation features. To make it clearer, the author presents a table of direct quotes from respondents for each open-ended questionnaire theme.

Table 6. Thematic Table of Open Questionnaire Results

Theme	Respondent Frequency	Direct Quotes of Respondents
Development Suggestions	14	Infographics collaborated with learning platforms.
Role in understanding	17	Infographics make it easier to understand.
Design Deficiencies	9	The use of bright colors or highly contrasting color combinations Inappropriate and uninformative choice of colors, icons or symbols, text that is too dense, design that is too complicated.
Benefits of Use	18	Facilitate understanding, attract interest in learning, train public speaking.
Effectiveness of Infographics	17	Easy to understand the material because of the interesting data visualization.

Source: 2025 Research

The relationship between the two data analyses shows that there is a convergence between quantitative and qualitative findings. Quantitative data shows that the use of infographics is effective in improving student learning outcomes, while qualitative data provides deeper insights into how infographics help students understand the material, increase learning interest, and provide new learning experiences. The integration of quantitative and qualitative results provides a comprehensive understanding of the effectiveness of infographics in learning World Regional Geography (Nasiruddin & Rapa', 2022; Saputri et al., 2022). Increasing student activeness in learning through the use of interactive media also confirms the importance of active involvement in the learning process, which is facilitated by infographics (Setyaningrum, 2020). In particular, infographics have been shown to be effective in conveying complex information visually and concisely, making it easier to understand and increase information retention (Anggriani, 2019).

Overall, this thematic analysis provides a comprehensive picture of students' perceptions and experiences regarding the use of infographics in learning World Regional Geography. The majority of students felt positive benefits from the use of infographics, especially in improving understanding, learning interest, and providing a more interesting learning experience (Sari, 2020). Infographics can be an effective solution to increase learning motivation, as is the adaptive gamification design in the learning system (Firdaus, 2021). These findings also

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confirm that visual-based digital media is very worthy of being an alternative innovative learning media (Umairoh & Amaliyah, 2022).

The effectiveness of infographics as a learning medium is supported by its ability to present information visually and concisely (Lyra et al., 2016). Complex information can be simplified and visualized through design elements such as icons, graphics, and illustrations, making it easier to understand and remember (Samra, 2021). In addition, infographics can also increase student engagement and participation in the learning process. This is because infographics can be designed interactively and collaboratively, so that students can actively participate in the process of creating and using infographics.

5. CONCLUSION AND IMPLICATIONS

Based on the results of the study and discussion, it can be concluded that the use of infographics is effective in improving students' understanding of the World Regional Geography material. In-depth quantitative analysis revealed a significant increase in students' understanding scores after the implementation of infographic-based learning, indicating the effectiveness of this media in conveying complex concepts in a more digestible manner. Qualitative analysis also supports this finding, with the majority of students reporting that infographics helped them understand the material, increased their interest in learning, and provided a more engaging learning experience. Furthermore, the integration of infographics into the curriculum has the potential to empower students with essential data visualization and communication skills, preparing them to face challenges in various disciplines and professional careers, where the ability to convey complex information concisely and attractively is highly valued. Therefore, the use of infographics can be considered as one of the innovative and effective learning strategies in improving the quality of geography learning and other disciplines. In closing, this study confirms that infographics are not just visual aids, but rather a pedagogical innovation that has the potential to change the way students learn and interact with information, equipping them with relevant competencies for the 21st century and beyond, and recommends wider implementation in the context of higher education.

5.1. Implications for Curriculum Development

These findings have a significant impact on the development of geography education curricula at the university level. The use of visual media such as infographics in learning activities must be implemented in a planned manner, especially for material that is conceptual and spatial in nature. Instructors and curriculum designers should incorporate infographics as a key element in required course materials and enhance students' visual literacy skills in analyzing maps, patterns, and spatial data. Additionally, training in creating simple infographics could be integrated into 21st-century skill development programs for students.

5.2. Research Limitations and Recommendations

The lack of a control group and the small sample size of this study limit how far the results can be applied. To confirm and broaden the findings of this study, future investigations should use experimental or quasi-experimental designs with bigger and more varied samples. Further insights into the precise ways that infographics contribute to student learning may also be obtained by comparing with other instructional media and including pre-test/post-test assessments.

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