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TRANSFORMATION OF GEOGRAPHY EDUCATION IN THE DIGITAL ERA: EVALUATION OF GEOGRAPHY TEACHER READINESS THROUGH OUTCOME-BASED EDUCATION (OBE) APPROACH

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ABSTRACT

This study aims to evaluate the readiness of geography teachers to apply digital technology and understand and implement the Outcome-Based Education (OBE) approach. The research method was a descriptive quantitative survey with data collection techniques through closed questionnaires and in-depth interviews. The research sample involved 88 geography teachers selected using a cluster sampling technique based on geographical location (Java Island and outside Java Island) and school type (public and private). Data analysis was conducted using descriptive statistical methods using SPSS software version 26. The results showed that teachers' digital readiness was in the good enough category, with basic understanding related to the use of technology obtaining the highest average score (Mean = 4.25). However, routine utilisation of technology, such as Geographic Information Systems (GIS) and e-learning, is still limited (Mean = 3.41). Supporting factors, such as confidence in integrating technology, had a relatively high score (Mean = 4.02), while the main obstacle of limited digital facilities and internet access recorded a score (Mean = 3.65). In addition, teachers' understanding of the OBE approach is also reasonably good (Mean = 3.49), especially in assessing student learning outcomes (Mean = 4.16). However, outcome-based learning planning still needs to be improved through continuous training programs. Curriculum support and implementation of project-based or case study-based learning strategies showed significant variations among respondents. Based on these results, this study recommends improving technological infrastructure, implementing applicable training, and strengthening the curriculum to encourage the transformation of education based on digital technology and the OBE approach.

Keywords: *Digital readiness; Education Transformation; Geography teacher; Outcome-Based Education (OBE)*

INTRODUCTION

Technology has become an integral part of life in the 21st century, influencing various aspects such as how humans communicate, forming education systems, disseminating knowledge, and formulating new ideas (Cladis, 2020). The advancement of digital technology

presents new challenges for educators, so mastering digital competencies is essential, not only in technical aspects such as operating programs or software but also in their proper utilization by integrating effective learning materials into the teaching process (Vojteková et al., 2022; Wilson et al., 2022) This transformation also drives significant changes in global education, including technological innovations, pedagogical approaches, and access to learning resources (Dias-Trindade & Moreira, 2020; Syvyi, 2020). Learning processes previously centred on conventional methods are shifting to more innovative and adaptive strategies, such as integrating technology into teaching. This reflects a shift from traditional input-based teaching methods to approaches toward achieving specific outcomes (Sarfraz et al., 2023a). This change requires educators to have the flexibility to utilise technology and design learning strategies that focus on learners, enhance interactivity, and ensure the achievement of competencies aligned with the demands of the digital era and global dynamics.

The transformation of the digital era in education encourages the comprehensive integration of technology, including the utilisation of digital devices, technology-based learning media, and online platforms to improve the quality of teaching and learning processes (Falloon, 2020; Korkmaz & Toraman, 2020). This supports learning interactions and equips educators with the ability to develop digital literacy in students to effectively utilise current and future technologies to improve the quality of learning and student understanding (Sánchez-Cruzado et al., 2021). Educators need to see digital technologies as part of literacy practices to integrate critical digital literacynto the curriculum, not just as an additional topic (Baroud & Dharamshi, 2020). However, important questions arise regarding the extent of geography teachers' readiness to adopt this digital approach and how they can implement the Outcome-Based Education (OBE) approach to ensure student learning outcomes meet the set standards.

Geography learning in Indonesia philosophically aims to develop spatial literacy so students can strengthen spatial reasoning skills and apply various spatial concepts in real life (Purwanto et al., 2023). Geography, as a study of the relationship between humans and the environment, both physically and culturally, has characteristics that require

a holistic and interactive learning approach. In this digital era, technology in teaching geography can enrich students'earning experiences and critical thinking skills (Ryan & Aasetre, 2021). Tools such as geographic information system (GIS) software, digital maps, mobile devices, and online learning platforms can help students understand geography concepts dynamically and visually and improve spatial and digital competencies (Puertas Aguilar et al., 2022; Puertas-Aguilar et al., 2023). The rapid development of digital technologies opens up new opportunities in geography education, where geographic and GIS applications enable more in-depth analysis and production of geographic information.

In contrast, using digital GIS portfolios effectively improves students' competence, motivation, and understanding of geography learning (Anunti et al., 2020). The application of project-based and collaborative learning supported by technology has been proven effective in developing students' critical thinking skills and problem-solving abilities (Rombe, 2024). However, to maximise the potential of this technology, geography teachers need to have adequate digital skills (Lubis et al., 2022). According to Artacho et al. (2020), many teachers feel unprepared or lack competence in integrating technology into their teaching. In line with research conducted by Revilla et al. (2020) that the importance of re-evaluating the handling of digital competencies in teacher training, as well as the relevance of the influence of the teacher education curriculum and its orientation, given that teachers tend to show low levels of confidence in their ability to integrate technology with pedagogical and content knowledge. Several factors influence the readiness to implement technology in education, including limited technological infrastructure, low levels of digital literacy among teachers, and the lack of comprehensive training on digital tools in the learning process (Morote et al., 2021). Thus, strategic steps are needed to increase investment to provide adequate technology infrastructure and implement continuous training programs to strengthen educators' digital competencies.

The outcome-based education (OBE) approach is currently widely applied in various educational institutions worldwide, including in Indonesia (Katawazai, 2021; Yunus & Maksum, 2024). Outcome-Based Education (OBE)

emphasises the achievement of specific, measurable learning outcomes that have been formulated before the learning process begins, with the primary objective of forming graduates with comprehensive competence in attitude, knowledge, and skills reflected in the formulation of Learning Outcomes (Suharsono et al., 2024). In geography learning, this approach emphasises mastering competencies and skills that students must master after completing the learning. OBE aims to produce students who not only know the concepts of geography but can also apply the knowledge in real life (Liang et al., 2022). This approach emphasises the importance of continuously evaluating students' progress through various forms, such as tests, assignments, or projects, to ensure the achievement of predetermined learning objectives. Through Outcome-Based Education (OBE), geography teachers can be more oriented to the expected learning outcomes and adjust teaching methods to ensure that all students can achieve them optimally. Applying the Outcome-Based Education (OBE) approach in teaching geography in the digital era requires teachers to adapt, especially in designing teaching materials that are not only theory-based but also prioritise practical application through effective technology integration (Talwelkar et al., 2024). This approach aims to promote active learning, develop critical thinking skills, and utilise digital competencies to strengthen the relationship between teachers and students, where teachers are expected to act as role models and mentors in the digital context.

In practice, geography teachers face several key challenges in digital transformation, including infrastructure issues. To support technology-based teaching, schools must provide adequate digital resources, such as computers, mobile devices, and stable internet access (Kurniawan & Eva, 2020). Although the rapid development of technology has not been fully matched by infrastructure readiness, many schools, especially in certain regions, still face challenges in providing adequate digital facilities to support the learning process (Khan & Abid, 2021). Second is the issue of digital literacy. Not all teachers have sufficient skills in using technology for educational purposes. Like teachers in other fields, geography teachers must be trained to understand how to utilise technology to develop teaching materials, facilitate interactive discussions, and provide

practical assessments (Kurniawan & Eva, 2020). Without adequate training, many teachers can only rely on traditional teaching methods, even though digital technology can provide a more engaging and practical learning experience. Third, there is the problem of understanding the OBE approach itself. OBE is not just a way of teaching material but rather a way to design learning that focuses on the outcomes that students want to achieve (Akramy, 2021). Integrating OBE in geography learning in the digital era requires a deep understanding from teachers on how to design learning focused on clear learning outcomes and how to use technology to achieve these goals.

Given the challenges, an evaluation of geography teachers' readiness to deal with digital transformation is needed. This evaluation is limited to assessing teachers' technical skills in using technology and the extent to which teachers can implement the OBE approach in their geography teaching (Liang et al., 2022). Knowing how much support teachers need regarding training, facilities, and education policies is also important. It is important to note that teachers' readiness is related to technical skills and their attitude toward change. A positive attitude towards using technology in learning is very influential in successfully implementing such technology in the classroom. Therefore, assessing geography teachers' readiness should include affective, cognitive, and conative aspects in facing this educational transformation.

In Indonesia, the application of technology in education still faces challenges despite efforts such as introducing the 2013 Curriculum, which emphasises a competency-based learning approach, and implementing the Merdeka Curriculum, which focuses on achieving learning outcomes by integrating technology into the learning process. However, digital transformation in geography teaching is still relatively slow. Many geography teachers feel hampered by limited facilities and infrastructure and a lack of skills in using existing educational technology (Rombe, 2024). One of the efforts that can be made to accelerate this transformation is to provide more intensive training to geography teachers on the use of technology and the OBE approach (Artacho et al., 2020; Kurniawan & Eva, 2020). However, before implementing the training program, it is necessary to evaluate teachers' readiness. Thus, this

research is relevant in identifying problems and finding appropriate solutions to improve the quality of geography teaching in Indonesia.

The main objective of this research is to evaluate geography teachers' readiness to implement digital technology in their teaching and the extent to which they understand. It can apply the *Outcome-Based Education* (OBE) approach. Knowing this level of readiness, the research results can provide valuable recommendations for education policy, teacher training development, and improvement of education infrastructure that supports digital transformation.

MATERIALS AND METHODS

1. Research Method

This study applies a survey method with a quantitative descriptive approach as described by Creswell (2023), which aims to collect data from respondents through structured instruments such as questionnaires (Ismail & Ilyas, 2023). Surveys are used to obtain in-depth factual information, identify emerging issues, and verify current conditions or activities. The focus of this study is to evaluate the digital readiness of geography teachers, their understanding of Outcome-Based Education (OBE), and the factors that support or hinder its implementation. The instrument used is a closed questionnaire with a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), which covers three main variables: (1) digital readiness, reviewed from the aspects of infrastructure access, technological skills (e.g., GIS and e-learning), and frequency of technology use; (2) understanding of OBE, including outcome-based curriculum planning, competency assessment methods, and integration of collaborative learning; and (3) supporting/hindering factors, such as institutional support, professional training, and availability of educational resources.

The validity of the questionnaire items was tested using SPSS software through Pearson's bivariate correlation analysis. The results showed that the calculated r value was greater than the table r value at a significance level of 0.05 (two-tailed), indicating that each item correlated significantly with the total score, thus validating the questionnaire. The reliability of the instrument was tested for three primary constructs, with the following results: (1) Teachers' digital readiness consists of six statements with a Cronbach's alpha value of 0.711; (2) Understanding and implementation of

Outcome-Based Education (OBE) consists of five statements with an alpha value of 0.776; and (3) Supporting factors and constraints consists of two statements with an alpha value of 0.813. All constructs have alpha values above 0.60, indicating that the instrument has adequate reliability.

2. Data Collection

Data collection in this study was conducted by gathering the perceptions of geography teachers obtained through open-ended questions and in-depth interviews to explore their views comprehensively. Meanwhile, quantitative data were collected based on the responses of geography teachers to the determination of answer criteria through a closed survey method with a structured rating scale. The sampling technique used was cluster sampling, which was based on two main factors: geography and school type. The geographical factor included grouping teachers based on their location in Java and outside Java, while the school type factor included categories of private and public schools.

The research sample consisted of 88 geography teachers from various regions in Indonesia who participated in a serial study. This activity was organised by the Master of Geography Education Study Program at the Indonesian University of Education in collaboration with the Indonesian Geography Educators Association (P3GI). The sample selection aimed to ensure broad representation and reflect the diversity of geographical conditions and school characteristics in Indonesia. The research was conducted in November 2024, using data collection techniques such as distributing questionnaires via Google Forms. The collected data were analysed using descriptive statistical methods. This technique describes the research results without making generalisations or broader conclusions.

3. Data Analysis

Data analysis in this study was conducted using a descriptive statistical approach, by calculating the mean, percentage, and frequency distribution to provide an overview of teachers' perceptions of digital readiness, understanding and implementation of Outcome-Based Education (OBE), and various supporting and inhibiting factors for the integration of digital technology in education. Data processing was carried out using SPSS software to ensure the accuracy of the results, while responses to open-ended questions were analyzed using thematic

techniques. Coding was done manually by identifying narrative patterns and keywords, and validated through triangulation between researchers to ensure consistency of interpretation. This descriptive approach not only aims to explain the characteristics of the data directly and transparently, but also highlights three main focuses, namely the digital readiness of geography teachers, their understanding and implementation of OBE, and the obstacles and support that influence the technology integration process in schools. Furthermore, contextual variables such as location and school type are analysed to describe teacher readiness differences across regions facing digital transformation. With this combined approach, the research findings are expected to provide a comprehensive understanding of geography teachers' readiness and needs in responding to the demands of educational innovation in the digital era.

RESULTS AND DISCUSSION

1. Demographic Profile of Respondents

Respondents in this survey consisted of two groups: geography teachers who teach in Java and outside Java, and who work in both public and private schools. A total of 88 geography teachers participated in this survey, with the majority of respondents being female, at 57% or 50 people, while male respondents accounted for 43% or 38 people. Based on the age group, the age range of 31-40 years is the most dominant, with a percentage of 43% of the total respondents. Regarding teaching location, teachers assigned to Java Island had the highest number of respondents, 55% of the total participants, while teachers from outside Java Island accounted for 45% or 40 people. Based on the level of education, most respondents have S1 academic qualifications, with a percentage of 80% of the total respondents, while the rest, as many as 20% or 18 people, have completed S2 education.

Regarding teaching experience, most respondents have more than 15 years of experience, with a percentage of 40% or 35 people. In contrast, the least experienced teacher, less than 5 years old, is owned by only 15% or 13 people from the total respondents. Overall, the demographic characteristics of geography teachers who participated in this survey can be seen in detail in **Table 1** below.

Table 1. Demographic Profile of Respondents

Category	Sub-Category	Frequency	Percentage (%)
Gender	Female	50	57
	Male	38	43
Age Group	< 30 years	6	7
	31-40 years old	38	43
	41-50 years old	28	32
	> 50 years	16	18
Teaching Location	Java Island	48	55
	Outside Java Island	40	45
Academic Qualifications	S1	70	80
	S2	18	20
Teaching Experience	< 5 years	13	15
	6-10 years	25	28
	11-15 years	15	17
	> 15 years	35	40

2. Geography Teacher Digital Readiness

The study results show that the level of digital readiness of geography teachers in supporting the transformation of education in the digital era is pretty good (see **Table 2**). The data revealed that the basic understanding of using digital tools in geography teaching reached the highest mean value (Mean = 4.25, SD = 0.665), indicating that most teachers have adequate initial knowledge. In addition, confidence in integrating technology into learning was also high (Mean = 4.02, SD = 1.028), indicating that most respondents felt capable of doing so. However, consistent use of technology, such as GIS and e-learning, had a lower average (Mean = 3.41, SD = 1.256), indicating uneven application of technology in learning activities. The high variation in this indicator indicates a significant difference between teachers who regularly use technology and those who rarely use it. Previous research by Ertmer & Ottenbreit-Leftwich (2010) also confirmed that teacher confidence is one of the essential factors in successfully implementing technology in learning. In this context, geography teachers seem to have enough confidence to explore various technologies to support the learning process. Applying technology in geography education, such as Geographic Information Systems (GIS) and e-learning, requires a comprehensive approach and in-depth exploration. High self-confidence in teachers plays a vital role in encouraging them to adopt innovative and flexible teaching methods.

Teachers with confidence in their abilities tend to be more open to trying technology-based approaches despite facing limitations such as a lack of resources or technical constraints. This adaptive attitude is essential to ensure that technology can be used effectively to improve the quality of geography learning. The research conducted by Scherer & Teo (2019) revealed a significant relationship between the level of teacher confidence in using technology and teacher perceptions that the usefulness of technology can improve the quality of learning. Based on these findings, strengthening teacher confidence, which can be achieved through hands-on training and real-life experiences, is one of the top priorities to support the success of digital transformation in education.

The level of availability of digital facilities in schools is moderate (Mean = 3.13, SD = 1.091), which can hinder educational transformation. Technical barriers, such as limited supporting devices and internet access, are often experienced by teachers (Mean = 3.65, SD = 1.223). The high variation in this indicator indicates that technical constraints are highly influenced by the specific situation in each school, especially in areas with limited infrastructure. Although most teachers have attended technology-related training (Mean = 3.95, SD = 0.801), there is still a need for further training that focuses on the practical implementation of technology in learning to improve the quality and consistency of digital-based teaching. The study by Anunti et al. (2020) mentioned that applicative training is more effective in encouraging teachers to integrate technology consistently. In this case, training that includes GIS and technology-based geography applications can significantly improve geography teachers' competencies.

The understanding of Outcome-Based Education (OBE) illustrates that most teachers already have enough essential capital to support the achievement of learning outcomes. Good knowledge of technology and confidence are the foundation for practical implementation in OBE-based learning. However, the lack of consistency in using technology and limited digital facilities are the main challenges in optimising digital transformation. Therefore, strategic steps such as strengthening digital infrastructure in schools, subsidising devices and internet access, and more in-

depth continuous training are needed. These measures will support the digital readiness of geography teachers while facilitating innovative and result-oriented teaching to meet the demands of the digital age.

Table 2. Geography Teacher Digital Readiness

Items	N	Mean	Std. Deviation
I understand the basic use of digital tools in teaching geography	88	4.25	.665
I regularly use technology (e.g., GIS, e-learning) in learning	88	3.41	1.256
Digital facilities in my school support the transformation of geography teaching	88	3.13	1.091
I feel confident integrating technology in learning	88	4.02	1.028
I have received training on the use of technology in teaching	88	3.95	.801
Technical barriers (internet access, devices) often disrupt the learning process	88	3.65	1.223
Valid N (listwise)	**88**		

3. Understanding and Implementation of Outcome-Based Education (OBE)

Based on the data analysis, the understanding and application of the Outcome-Based Education (OBE) approach by geography teachers, several interesting findings are to be analysed further (**Table 3**). Overall, teachers' understanding of the principles of OBE shows an average score of 3.49 with a standard deviation of 1.006. This indicates that the experience is in the good enough category, but there is a significant variation among respondents, which suggests a gap in basic understanding. This difference has the potential to affect consistency in the application of the OBE approach in the field.

Regarding learning planning based on learning outcomes, the average score was also 3.49, with a slightly higher standard deviation of 1.050. This result shows that teachers' ability to design OBE-based learning still needs strengthening, primarily through continuous training and mentoring programs. In contrast, in assessing student learning outcomes, the average score was recorded at 4.16 with a standard deviation of 0.585, which indicates that teachers generally have an outstanding and uniform ability to assess student learning outcomes against predetermined learning outcomes. This aligns with research conducted by Sindhu et al. (2023), who identified several specific technological tools that significantly improve student motivation and learning outcomes within the OBE framework. These findings provide strategic recommendations regarding the optimisation of technology integration in learning. This is important so that

technology can be more aligned with the principles of OBE and maximise the benefits obtained in the educational process. In addition, the school curriculum support for OBE implementation obtained an average score of 3.72, which is in the good enough category. However, the variation in responses indicated by the standard deviation of 0.883 suggests that not all schools have an optimal curriculum to support this approach. This points to the importance of evaluation and alignment between curriculum policy, teacher learning design, and the OBE approach (Berutu et al., 2024). A curriculum responsive to OBE's needs can improve learning effectiveness. Regarding integrating project-based learning or case studies per OBE principles, the average score reached 3.69 with a standard deviation of 0.998. This shows that applying these strategies has often been done, but consistency still needs improvement.

Overall, the findings show that geography teachers have a fairly good level of readiness in understanding and implementing the OBE approach, especially in learning outcome-based assessment. However, there are still challenges in lesson planning and systemic support from the school curriculum. This research underlines the importance of continuous training, intensive mentoring in implementation, and curriculum adjustments to support the optimisation of the OBE approach. These steps are particularly relevant in the context of the digital era, which emphasises the importance of outcome-based learning that focuses not only on content mastery but also on achieving relevant, measurable and timely student learning outcomes.

Table 3. Understanding and Application of Outcome-Based Education (OBE)

Items	N	Mean	Std. Deviation
I understand the principle of Outcome-Based Education (OBE)	88	3.49	1.006
I can design geography learning based on learning outcomes.	88	3.49	1.050
I routinely assess students based on predetermined learning outcomes	88	4.16	.585
The curriculum in my school supports the implementation of the OBE approach	88	3.72	.883
I often integrate project-based learning or case studies as per OBE	88	3.69	.998
Valid N (listwise)	**88**		

4. Supporting Factors and Obstacles

Based on **Table 4**, which discusses the supporting factors and obstacles in the implementation of digital technology and the Outcome-Based Education (OBE) approach in the digital era, there are two main dimensions analyzed: the main obstacles in the implementation of digital technology in geography learning and the level of need and readiness of teachers to implement the OBE approach. The average score in the main constraints dimension was 3.75, with a standard deviation of 1.031. This data shows that many teachers face significant challenges integrating digital technology into learning. The constraints identified include infrastructure limitations, such as inadequate internet access, lack of availability of technological devices, and low institutional support. The high standard deviation value reflects significant differences in context between schools or regions, which is most likely caused by disparities in the distribution of educational resources. This aligns with research conducted by Lukman (2021), which revealed that the lack of training and the use of digital technology hindered teachers' ability to master technology and the difficulty of integrating it into learning. Although these challenges have not completely impeded the implementation of digital technology, they still require attention to ensure optimal learning transformation.

For the variable of geography teachers' needs and readiness to adopt the OBE approach in the digital era, the average score reached 3.99 with a standard deviation of 1.317. This indicates that most teachers realise the importance of preparing themselves to implement OBE. However, the higher standard deviation compared to the previous dimension indicates that such readiness varies greatly among teachers. Some teachers may have better access to training and resources, while others still face limitations in understanding the concept of OBE and its practical application in the classroom. Research conducted by Puspitasari & Utami (2023), Safitri & Ridwan Aziz (2024), and Sarfraz et al. (2023) emphasised that the adoption of an Outcome-Based Education (OBE) approach requires optimal pedagogical readiness from teachers, which can only be achieved through continuous and systematic training programs. Such programs should include a theoretical understanding of OBE and practical skills in designing curriculum, designing learning processes, and evaluating the

achievement of outcome-based learning outcomes.

Overall, this analysis shows that while there is great potential among geography teachers to adapt to digital technology-based learning and the OBE approach, technical challenges and variations in individual readiness remain key constraints. Therefore, strategic measures are needed to overcome these barriers, including equitable provision of technology infrastructure, more focused needs-based training, and intensive and continuous mentoring. These interventions are essential to ensure that the implementation of digital technology and the OBE approach can run effectively, evenly, and consistently throughout the school. With these steps, geography learning can become more relevant, adaptive, and oriented towards measurable learning outcomes, in line with the demands of the digital era.

Table 4. Supporting Factors and Barriers

Items	N	Mean	Std. Deviation
Key barriers to implementing digital technology in geography teaching	88	3.75	1.031
Geography teachers' needs and readiness in implementing the OBE approach in the digital era	88	3.99	1.317
Valid N (listwise)	**88**		

CONCLUSION

This study shows that geography teachers in Indonesia are generally well prepared to face the challenges of digitalisation in education. They have mastered the basic concepts of Outcome-Based Education (OBE) and demonstrated initial abilities in applying digital technology in the learning process, especially in outcome-based evaluation. However, applying more complex technologies such as Geographic Information Systems (GIS), online learning platforms, and project-based approaches still faces various obstacles, including limited infrastructure, limited internet access, and a lack of optimal institutional support. The implementation of OBE has also not been fully effective, particularly in developing outcome-based lesson plans and applying active learning strategies, which are influenced by disparities in teachers' readiness and the lack of alignment between the curriculum and OBE principles. This study has limitations in its geographical coverage and uses a descriptive approach, so

generalisations of the findings should be made with caution. Therefore, it is necessary to strengthen teachers' capacity through continuous training focused on integrating educational technology and implementing OBE, complemented by contextual mentoring programs. Schools must provide supporting facilities like digital devices and adequate internet connections. In addition, government and stakeholders' policy support must be directed towards the equitable distribution of digital infrastructure and improving educators' competencies. With these collective efforts, the transformation of geography education can be developed in a more relevant, outcomes-based, and responsive manner to the dynamics of the 21st century.

REFERENCES

Akramy, S. A. (2021). Implementation of outcome-based education (obe) in Afghan universities: lecturers' voices. *International Journal of Quality in Education*, *5*(2), 27–47. https://orcid.org/0000-0002-7770-4474

Anunti, H., Vuopala, E., & Rusanen, J. (2020). A Portfolio Model for the Teaching and Learning of GIS Competencies in An Upper Secondary School: A Case Study from A Finnish Geomedia Course REVIEW OF INTERNATIONAL GEOGRAPHICAL EDUCATION. *Review Of International Geographical Education*, *10*(3). https://doi.org/10.33403rigeo.741299

Artacho, E. G., Martínez, T. S., Ortega Martín, J. L., Marín Marín, J. A., & García, G. G. (2020). Teacher training in lifelong learning-the importance of digital competence in the encouragement of teaching innovation. *Sustainability (Switzerland)*, *12*(7). https://doi.org/10.3390/su12072852

Baroud, J., & Dharamshi, P. (2020). A Collaborative Self Study of Critical Digital Pedagogies in Teacher Education. *Studying Teacher Education*, *16*(2), 164–182. https://doi.org/10.1080/17425964.2020.1739639

Berutu, N., Damanik, M. R. S., & Kabatiah, M. (2024, February 9). *Evaluation and Development of Outcome-Based Education (OBE) Curriculum: An Analysis of Stakeholder Responses*. https://doi.org/10.4108/eai.24-10-2023.2342189

Cladis, A. E. (2020). A shifting paradigm: An evaluation of the pervasive effects of digital technologies on language expression, creativity, critical thinking, political discourse, and interactive processes of human communications. *E-Learning and Digital Media*, *17*(5), 341–364. https://doi.org/10.1177/2042753017752583

Creswell, J. W. (2023). *Research Design Pendekatan Kualitatif, Kuantitatif, dan Mixed* (A. Fawaid, Trans.; Edisi ketiga). Pustaka Pelajar.

Dias-Trindade, S., & Moreira, J. A. (2020). Assessment of high school teachers on their digital competences. *Magis*, *13*, 01–21.

https://doi.org/10.11144/Javeriana.m13.ahst

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher Technology Change: How Knowledge, Confidence, Beliefs, and Culture Intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284. https://doi.org/https://doi.org/10.1080/15391523.2010.10782551

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Ismail, M. I., & Ilyas, N. I. (2023). *Metodologi Penelitian Kualitatif dan Kuantitatif* (Monalisa, Ed.; Pertama). Rajagrafindo Persada.

Katawazai, R. (2021). Implementing outcome-based education and student-centered learning in Afghan public universities: the current practices and challenges. *Heliyon*, *7*(5). https://doi.org/10.1016/j.heliyon.2021.e07076

Khan, Z. H., & Abid, M. I. (2021). Distance learning in engineering education: Challenges and opportunities during COVID-19 pandemic crisis in Pakistan. *International Journal of Electrical Engineering Education*. https://doi.org/10.1177/0020720920988493

Korkmaz, G., & Toraman, Ç. (2020). Are We Ready for the Post-COVID-19 Educational Practice? An Investigation into What Educators Think as to Online Learning. *International Journal of Technology in Education and Science (IJTES)*, *4*(4), 293–309. https://doi.org/https://doi.org/10.46328/ijtes.v4i4.110

Kurniawan, E., & Eva, B. (2020). A Teaching Based Technology in Geography Learning. *Cypriot Journal of Educational Sciences*, *15*(4), 766–776. https://doi.org/10.18844/cjes.v%vi%i.5058

Liang, L., Huang, X., Huang, F., Yuan, M. Y. X., & Liu, X. (2022). The Reform of GIS Practice Curriculum for Geography Science (Normal) Major Integrating Geographic Big Data and Multi-track Teaching Mode. *The Educational Review, USA*, *6*(9), 473–481. https://doi.org/10.26855/er.2022.09.004

Lubis, M. S. A., Fatmawati, E., Pratiwi, E. Y. R., Sabtohadi, J., & Damayanto, A. (2022). Understanding Curriculum Transformation Towards Educational Innovation In The Era Of All-Digital Technology. *Nazhruna: Jurnal Pendidikan Islam*, *5*(2), 526–542. https://doi.org/https://doi.org/10.31538/nzh.v5i2.2110

Lukman, A. K. (2021). Best Practices and Challenges of Outcomes Based Education (OBE) in Social Sciences Instruction of Junior High School Students in Jolo, Sulu. *Open Access Indonesia Journal of Social Sciences*, *4*(2), 209–218. https://doi.org/10.37275/oaijss.v4i2.49

Morote, Á. F., Hernández, M., & Olcina, J. (2021). Are future school teachers qualified to teach flood risk? An approach from the geography discipline in the context of climate

change. *Sustainability (Switzerland)*, *13*(15). https://doi.org/10.3390/su13158560

Puertas Aguilar, M. Á., Conway, B., De Lázaro Torres, M. L., De Miguel González, R., Donert, K., Linder-Fally, M., Parkinson, A., Prodan, D., Wilson, S., & Zwartjes, L. (2022). A Teaching Model to Raise Awareness of Sustainability Using Geoinformation. *Espacio Tiempo y Forma. Serie VI, Geografía*, *15*, 23–42. https://doi.org/10.5944/etfvi.15.2022.33687

Puertas-Aguilar, M. Á., Sipols, A. E. G., & de Lázaro-Torres, M. L. (2023). Web GIS to Learn Geopolitics in Secondary Education: A case study from Spain. *European Journal of Geography*, *14*(2), 15–31. https://doi.org/10.48088/ejg.m.pue.14.2.015.031

Purwanto, Hidayah, N., & Wagistina, S. (2023). The Effect of Gersmehl's Spatial Learning on Students' Disaster Spatial Literacy. *International Journal of Educational Methodology*, *9*(2), 345–354. https://doi.org/10.12973/ijem.9.2.345

Puspitasari, P. E., & Utami, R. D. (2023). Analysis Of Teachers Readiness In Implementing The Independent Curriculum In Elementary Schools. *Didaktika Tauhidi: Jurnal Pendidikan Guru Sekolah Dasar*, *10*(2), 145–156. https://doi.org/10.30997/dt.v10i2.9761

Revilla, D. M., María Martínez-Ferreira, J., & Sánchez-Agustí, M. (2020). Assessing the digital competence of educators in social studies: An analysis in initial teacher training using the TPACK-21 model. In *Australasian Journal of Educational Technology* (Vol. 2020, Issue 2).

Rombe, S. (2024). Tinjauan Literatur Sistematis: Desain Pembelajaran Geografi di Era digital. *El-Jughrafiyah*, *4*(2). https://ejournal.uin-suska.ac.id/index.php/jughrafia/article/view/31434

Ryan, A. W., & Aasetre, J. (2021). Digital storytelling, student engagement and deep learning in Geography. *Journal of Geography in Higher Education*, *45*(3), 380–396. https://doi.org/10.1080/03098265.2020.1833319

Safitri, M., & Ridwan Aziz, M. (2024). Outcome Based Education (OBE) Design for Prospective Mathematics Teachers. *3rd International Conference on Education*, *3*, 9–13.

Sánchez-Cruzado, C., Santiago Campión, R., & Sánchez-Compaña, M. T. (2021). Teacher digital literacy: The indisputable challenge after covid-19. *Sustainability (Switzerland)*, *13*(4), 1–29. https://doi.org/10.3390/su13041858

Sarfraz, S., Mansoor, Z., & Tariq, U. (2023a). Multicultural Education Analysis of the English Language Teachers' Constraints in Implementing Outcome-Based Educational Approach for Engineering Students. *Multicultural Education*, *9*(3). https://doi.org/10.5281/zenodo.7783402

Sarfraz, S., Mansoor, Z., & Tariq, U. (2023b). Multicultural Education Analysis of the English Language Teachers' Constraints in Implementing Outcome-Based Educational Approach for Engineering Students. *Multicultural*

Education, *9*(3). https://doi.org/10.5281/zenodo.7783402

Scherer, R., & Teo, T. (2019). Unpacking teachers' intentions to integrate technology: A meta-analysis. In *Educational Research Review* (Vol. 27, pp. 90–109). Elsevier Ltd. https://doi.org/10.1016/j.edurev.2019.03.001

Sindhu, S., Khan, R. M. A., & Hussain, S. (2023). Enhancing English Learning through Technology: Assessing the Role of Technological Tools in Advancing Outcomes-Based Education within the English Access Micro Scholarship Program. *International Research Journal of Education and Innovation*, *4*(4), 29–44. https://irjei.com/index.php/irjei/article/view/202

Suharsono, S., Simanjuntak, O. S., Perwira, R. I., Pambudi, S., Fachrurradjie, M., & Aqillasari, Y. P. (2024). Development of a Semester Learning Plans System based on OBE (Outcome-Based Education). *Proceedings of the 2nd International Conference on Advanced Research in Social and Economic Science*, 485–501. https://doi.org/10.2991/978-2-38476-247-7_51

Syvyi, M. J. (2020). Distance learning as innovation technology of school geographical education. *International Workshop on Augmented Reality in Education*, 369–382. https://doi.org/https://doi.org/10.48550/arXiv.2202.08697

Talwelkar, A. S., Uppal, A. G., & Thakarar, G. (2024). Evaluation of digital competency of professional teachers. *Multidisciplinary Science Journal*, *6*. https://doi.org/10.31893/multiscience.2024ss0528

Vojteková, J., Žoncová, M., Tirpáková, A., & Vojtek, M. (2022). Evaluation of story maps by future geography teachers. *Journal of Geography in Higher Education*, *46*(3), 360–382. https://doi.org/10.1080/03098265.2021.1902958

Wilson, M. L., Hall, J. A., & Mulder, D. J. (2022). Assessing digital nativeness in pre-service teachers: Analysis of the Digital Natives Assessment Scale and implications for practice. *Journal of Research on Technology in Education*, *54*(2), 249–266. https://doi.org/10.1080/15391523.2020.1846146

Yunus, Y., & Maksum, H. (2024). Pengaruh Implementasi Kurikulum Outcome Based Education (OBE) terhadap Kemampuan Problem Solving Mahasiswa. *Jurnal Kajian Pendidikan*, *17*(1), 1–12. https://doi.org/10.31332/atdbwv17i1.8807