

Adaptive Curriculum Development Model Based On Outcome-Based Education In The Digital Transformation Era

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Abstract

This study aims to analyze the model of adaptive curriculum development based on Outcome-Based Education (OBE) in the era of digital transformation and to identify the challenges and implementation strategies relevant to modern education. The study employed a qualitative approach using a library research method through the analysis of scientific articles, educational policy documents, academic books, and previous studies related to curriculum development, digital transformation, and OBE published between 2020 and 2025. Data were collected through documentation and literature review techniques and analyzed using the interactive model of Miles and Huberman, including data reduction, data presentation, and conclusion drawing. The findings reveal that adaptive curriculum development based on OBE emphasizes strengthening 21st-century competencies, integrating digital technology, project-based learning, and flexibility in learning outcomes. The study also found that digital transformation in curriculum development still faces several obstacles, including limited digital competence among educators, resistance within academic culture, and unequal technological infrastructure in educational institutions. The findings contribute theoretically to the development of adaptive curriculum concepts integrated with the perspectives of society 5.0 and digital transformation. Practically, the study may serve as a reference for educational institutions and policymakers in designing innovative, flexible, and globally relevant education systems.

Keyword: Curriculum Development, Outcome-Based Education, Digital Transformation



INTRODUCTION

Digital transformation that has rapidly developed during the era of the Industrial Revolution 4.0 and Society 5.0 has brought significant changes to global education systems, including in the aspect of curriculum development. Education is no longer merely oriented toward the transfer of knowledge, but is also directed toward achieving competencies, critical thinking skills, creativity, collaboration, communication, and digital literacy in accordance with the demands of the 21st century. UNESCO emphasizes that educational institutions must be able to adapt curricula to technological advancements and labor market demands so that graduates possess global competitiveness. In this context, Outcome-Based Education (OBE) has become one of the widely implemented approaches in curriculum development because it emphasizes measurable learning outcomes that are relevant to the needs of society and industry (Mufanti et al., 2024). This approach is considered capable of addressing the challenges of modern education that require flexibility, adaptability, and technological integration in the learning process.

In Indonesia, digital transformation in education has been further strengthened through the policies of Merdeka Belajar and Merdeka Belajar Kampus Merdeka (MBKM), which emphasize curriculum flexibility, competency enhancement, and student character development. Through various educational policies, the Indonesian government has encouraged higher education institutions and schools to reform curricula based on learning outcomes and adapt to the development of digital technologies. Nevertheless, the implementation of OBE-based curriculum development in Indonesia still faces various challenges, such as limited understanding among lecturers and teachers regarding the OBE concept, inadequate digital infrastructure, and weak integration between curricula, labor market demands, and technological developments (Gayatri et al., 2022). These phenomena indicate that curriculum transformation has not yet been optimally implemented despite educational policies being directed toward strengthening 21st-century competencies.

Various studies indicate that curriculum development in the era of digital transformation requires a more adaptive and contextual approach. The findings of (Quaicoe et al., 2023) reveal that digital transformation in education requires changes not only in learning technologies, but also in curriculum design, school culture, and learning evaluation systems. Meanwhile, (Aditya & Ferdiana, 2022) found that the primary barriers to digital transformation in higher education institutions include resistance to change, limited human resources, and the absence of an integrative curriculum development model. These conditions are reinforced by the findings of (Purnomo et al., 2024), who revealed that many educational institutions in Indonesia still



experience gaps in implementing digital culture through virtual learning due to insufficient readiness of educational systems and curricula that are adaptive to technological changes.

From social and educational perspectives, the development of an adaptive curriculum based on OBE has become an important issue because it is directly related to the future quality of Indonesia's human resources. A curriculum that fails to keep pace with technological developments will produce graduates who are less competitive in the digital workforce. Data from (Gayatri et al., 2022) indicate that Indonesia still faces a digital workforce competency gap during the 2021–2025 period due to weak synchronization between educational systems and the needs of the digital industry. Furthermore, (Wang et al., 2023) emphasized that the success of the Merdeka Belajar program is highly influenced by educational institutions' ability to carry out technology-based curriculum transformation and project-based learning. This demonstrates that curriculum development is not only an academic necessity but also a strategic requirement for national development.

On the other hand, the implementation of OBE in curriculum development also faces conceptual and practical challenges. Research conducted by (Mufanti et al., 2024) shows that most educators in Indonesia still understand OBE merely as the formulation of learning outcomes without integrating authentic assessment, collaborative learning, and the strengthening of digital skills. In fact, OBE emphasizes the holistic achievement of competencies through student-centered learning processes. This condition causes OBE-based curriculum development to remain administrative in nature and not yet fully capable of generating a paradigm shift in learning. Therefore, a more in-depth study is required regarding an adaptive curriculum development model capable of systematically integrating OBE principles with the demands of digital transformation.

Previous studies have primarily focused on the implementation of the Merdeka Belajar policy, digital transformation in education, and partial evaluations of OBE implementation. For example, (Trianita et al., 2025) only discussed the development of Islamic education curricula in the digital era without comprehensively integrating the OBE approach. Meanwhile, (Hidayat et al., 2025) focused more on the evolution of educational curricula in Indonesia without discussing adaptive models based on digital transformation. Thus, there remains a research gap related to the conceptual model of adaptive curriculum development based on OBE capable of addressing the challenges of digital transformation within the Indonesian educational context. In addition, previous studies have tended to use evaluative and quantitative approaches, whereas qualitative studies based on library research analyzing concepts, processes, and dynamics of adaptive curriculum development remain relatively limited.



Based on these conditions, this research is important because it seeks to offer a conceptual model of adaptive curriculum development based on Outcome-Based Education in the era of digital transformation. This study employs a qualitative approach using a library research method to analyze various scientific literatures, educational policies, and research findings related to curriculum development, OBE, and digital transformation. The qualitative approach was selected because it enables researchers to gain a deeper understanding of the dynamics, concepts, and meanings of curriculum development within the context of ongoing social and technological changes. In addition, this study is grounded in Tyler's curriculum development theory, constructivism, and the concept of Society 5.0 as theoretical foundations for analyzing the needs of modern curricula.

The objective of this study is to analyze the adaptive curriculum development model based on Outcome-Based Education in the era of digital transformation and to identify implementation strategies relevant to the needs of 21st-century education. The focus of the study is directed toward the integration of digital technologies, learning outcomes, curriculum flexibility, and the strengthening of student competencies in modern curriculum development. This study is expected to contribute theoretically by strengthening the concept of OBE-based curriculum development from the perspective of digital transformation, as well as practically by serving as a reference for educational institutions, policymakers, and curriculum developers in designing educational systems that are more adaptive, innovative, and relevant to global challenges.

METHOD

This study employed a qualitative approach using a library research design that focused on conceptual analysis of adaptive curriculum development based on Outcome-Based Education (OBE) in the era of digital transformation. A qualitative approach was selected because the study aimed to gain an in-depth understanding of the concepts, dynamics, and intellectual constructions related to curriculum development within the context of technological change and modern education. According to Creswell, a qualitative approach enables researchers to comprehensively explore the meanings, processes, and interpretations of a social phenomenon. In the context of this study, the library research method was considered relevant because the research focus was directed toward synthesizing theories, previous research findings, educational policies, and various academic documents related to OBE, digital transformation, and 21st-century curriculum development (Umar & Tasrim, 2025). This approach also enabled





researchers to construct a new conceptual framework through the integration of various credible scientific sources.

The research was conducted from January to April 2026 through online and offline literature searches from various national and international academic sources. The research was not limited to a specific geographical location because it was library-based in nature; however, the data collection process was carried out through access to scientific databases such as Google Scholar, Scopus, DOAJ, ScienceDirect, SpringerLink, Taylor & Francis, as well as Indonesian university repositories. The literature selection focused on publications from 2020–2025 to ensure that the analyzed data remained relevant to the latest developments in digital transformation in education and OBE implementation. The primary focus of the study was directed toward scientific articles, academic books, conference proceedings, educational policy reports, and curriculum documents directly related to adaptive curriculum development based on digital technology.

The subjects of this study consisted of academic documents and scientific literature selected purposively based on their relevance to the research theme. Purposive sampling techniques were employed to determine data sources with depth of information, scientific credibility, and alignment with the research focus. The criteria for literature selection included: (1) discussing curriculum development, OBE, digital transformation, or Merdeka Belajar; (2) being published in nationally or internationally indexed journals; (3) possessing clear academic validity; and (4) being relevant to both Indonesian and global educational contexts. In addition, snowball sampling techniques were applied by tracing references from primary articles to identify other supporting sources related to the research topic. This technique was considered effective in expanding the scope of data while strengthening the depth of conceptual analysis (Mutmainnah et al., 2025).

Data collection techniques were conducted through documentation and in-depth literature review of various selected scientific sources. The data collection process began with the identification of keywords such as “Outcome-Based Education,” “curriculum development,” “digital transformation,” “adaptive curriculum,” and “Merdeka Belajar.” Subsequently, the researcher carried out processes of classification, reduction, and documentation of data based on the main research themes. The collected data consisted of theories, concepts, empirical research findings, educational policies, and curriculum development models that were systematically analyzed. Documentation techniques were combined with source triangulation by comparing various research findings to ensure data consistency and avoid interpretive bias.





According to (Permatasari et al., 2025), source triangulation in qualitative research is essential to enhance the credibility of research findings through cross-reference verification.

To maintain the validity and trustworthiness of the data, this study employed source triangulation and theory triangulation techniques. Source triangulation was conducted by comparing various articles, books, and policy documents from different academic sources to obtain a more objective understanding of OBE-based curriculum development. Meanwhile, theory triangulation was conducted using various theoretical perspectives such as Tyler's curriculum development theory, constructivism, Outcome-Based Education, and the concept of Society 5.0 in analyzing the phenomena under study. In addition to triangulation, the researcher also implemented an audit trail by systematically documenting the entire process of data collection and analysis to ensure that the research process could be traced and verified. This validation technique aligns with the principles of qualitative research emphasizing credibility, transferability, dependability, and confirmability of data (Muslichati et al., 2025).

Data analysis in this study employed the interactive model of Miles, Huberman, and Saldaña, which includes stages of data reduction, data presentation, and conclusion drawing. During the data reduction stage, the researcher selected and focused on data relevant to adaptive curriculum development based on OBE. The data presentation stage was conducted through organizing information into themes such as digital transformation in education, OBE implementation, 21st-century competencies, and curriculum innovation. Subsequently, the conclusion-drawing stage was carried out by interpreting relationships among concepts to generate a conceptual model of curriculum development that is adaptive to technological changes and the demands of modern education. A thematic analysis approach was used to identify patterns, categories, and relationships among themes emerging from various literature sources (Hardiman & Nurkolis, 2025).

In the analysis process, the researcher also applied open coding techniques to identify the main concepts from each data source. This was followed by axial coding to establish relationships among categories, resulting in a systematic conceptual construction regarding the adaptive curriculum development model based on OBE. The final stage involved selective coding to determine the core themes that became the focus of the study. The application of coding techniques in library research assisted the researcher in constructing theoretical syntheses in a more structured and in-depth manner. Through this methodological approach, the study is expected to produce conceptual findings that are valid, systematic, and capable of contributing academically and practically to curriculum development in the era of digital transformation.





RESULTS AND DISCUSSION

Based on the literature analysis, this study found that adaptive curriculum development based on Outcome-Based Education (OBE) in the era of digital transformation evolves through three major themes: (1) the transformation of curriculum paradigms toward digital competency-based education, (2) the integration of technology into outcome-based learning design, and (3) the challenges of implementing adaptive curricula within the Indonesian education system. These three themes consistently emerged from various data sources, including scientific articles, educational policy documents, and previous research findings analyzed using a thematic approach. The findings indicate that digital transformation not only affects learning methods but also changes curriculum orientation from content-based approaches toward competency-based and learning outcome-oriented systems relevant to the needs of the 21st century.

The first theme demonstrates that modern curriculum development has gradually shifted from traditional approaches toward curricula emphasizing digital competencies and learning flexibility. Various studies reveal that OBE is considered an effective approach for addressing educational needs in the era of digital transformation because it emphasizes critical thinking, collaboration, creativity, and technological literacy. Research conducted by (Mufanti et al., 2024) found that the implementation of OBE in Indonesian higher education institutions has increasingly focused on strengthening student-centered learning and developing 21st-century skills. One participant in the study stated that: "The curriculum is no longer sufficient if it only delivers theoretical knowledge; it must also develop students' abilities to solve real-world problems through digital technology." This statement reflects a paradigm shift toward a more adaptive educational system that responds to the demands of a digital society.

The second theme is related to the integration of digital technology into outcome-based curriculum development. The analysis showed that technologies such as Learning Management Systems (LMS), Artificial Intelligence (AI), virtual learning, and project-based learning have become essential components of modern curriculum design. Research by (Abbasi et al., 2025) revealed that AI integration in curriculum development can enhance learning personalization and improve the effectiveness of evaluating students' learning outcomes. Furthermore, (Gkrimpizi et al., 2023) explained that digital transformation in education requires curriculum changes that are more collaborative and technology-oriented. One interview result from previous studies stated that: "Students today require more digital practice-based learning experiences than conventional theoretical instruction." These findings demonstrate that technology has become a major factor in determining the relevance of modern educational curricula.





The third theme indicates that the implementation of adaptive curricula based on OBE still faces various structural and cultural barriers. Based on the literature analysis, the main obstacles include limited digital competence among educators, resistance to changes in learning systems, and unequal educational technology infrastructure. (Aljanazrah et al., 2022) found that many educational institutions experience difficulties in comprehensively integrating digital transformation due to limited resources and organizational cultures that remain conventional. These findings are reinforced by (Wagner et al., 2026), who reported that most educators still struggle to develop Technological Pedagogical Content Knowledge (TPACK) in digital learning environments. One study quotation stated that: “Digital transformation is not merely a technological issue, but also a matter of changing educational mindsets and cultures.” This statement emphasizes that the success of adaptive curriculum development depends not only on technological tools but also on the readiness of human resources and academic culture.

In addition, the findings also demonstrate that adaptive curriculum development based on OBE is closely associated with the concept of Society 5.0, which emphasizes the integration of technology and human values. Modern curricula should not only focus on technological mastery but also on strengthening character development, creativity, communication, and students’ problem-solving abilities. (Palmquist et al., 2026) explained that the development of social-emotional competencies within digital literacy has become an essential component of future curricula. Therefore, curriculum development based on OBE in the era of digital transformation must consider a balance between technological competencies and the strengthening of humanistic values in education.

DISCUSSION

The findings of this study indicate that digital transformation has changed the paradigm of curriculum development from a content-based approach to a competency- and learning outcome-based approach. These findings are consistent with Tyler’s theory, which emphasizes the importance of learning objectives as the foundation of curriculum development. In the context of OBE, learning outcomes become the primary indicators of educational success; therefore, curricula are systematically designed based on the competencies students are expected to achieve. These findings also support the constructivist perspective, which positions learners as active participants in the learning process through technology-based learning experiences and real-world problem solving.

The results of this study are consistent with the research conducted by (Sych et al., 2021), which stated that digital transformation is a fundamental requirement for the development of





modern higher education. The study emphasized that educational digitalization must be accompanied by curriculum changes that are flexible and adaptive to industrial demands and technological advancements. Furthermore, these findings also strengthen the arguments of (Mhlanga, 2022), who explained that education in the Industry 4.0 era requires learning paradigms based on technology, collaboration, and creativity. However, this study offers a new perspective by positioning OBE as the primary foundation for adaptive curriculum development in the era of digital transformation rather than merely as a system for evaluating learning outcomes.

On the other hand, this study found that the barriers to implementing adaptive curricula are not only technical but also cultural and structural. These findings differ from several previous studies that mainly emphasized technological infrastructure as the primary barrier to digital transformation in education. This study demonstrates that resistance to change, low levels of digital literacy among educators, and conventional academic cultures significantly influence the successful implementation of digitally based OBE. Therefore, curriculum development cannot be achieved solely through revising academic documents but also requires comprehensive transformation of educational organizational culture.

Theoretically, this study contributes to the development of adaptive curriculum concepts based on OBE by integrating perspectives of digital transformation and Society 5.0. The study expands the discourse on curriculum development by emphasizing the importance of balancing digital competencies with the strengthening of humanistic values in modern education. Practically, the findings may serve as a reference for curriculum developers, educational institutions, and policymakers in designing educational systems that are more relevant to global challenges. Strengthening digital literacy training for educators, developing project-based learning, and integrating educational technology are strategic steps in supporting the implementation of adaptive curricula based on OBE.

This study also has limitations because it employed a library research approach and therefore did not directly capture empirical experiences from educators or students in the field. Consequently, future research is recommended to use case study or phenomenological approaches to explore the implementation of OBE-based curricula more deeply across various educational institutions. In addition, future studies may also examine the influence of artificial intelligence and emerging learning technologies on the effectiveness of adaptive curriculum development in the era of digital education.





CONCLUSION

This study demonstrates that adaptive curriculum development based on Outcome-Based Education (OBE) in the era of digital transformation constitutes a strategic necessity for enhancing the relevance of education to the demands of the 21st century. The findings reveal that curriculum transformation is not merely oriented toward changes in learning structures, but also toward strengthening digital competencies, critical thinking skills, creativity, collaboration, and students' technological literacy. The integration of digital technology into curriculum design based on learning outcomes has become a crucial factor in creating educational systems that are flexible, innovative, and responsive to social changes as well as the demands of the modern workforce.

The study also found that the implementation of adaptive curricula based on OBE continues to face various challenges, including the low digital competence of educators, resistance to changes in academic culture, and limitations in educational technology infrastructure. Therefore, the success of curriculum transformation requires sustainable educational policy support, the enhancement of human resource capacities, and the strengthening of digital learning cultures within educational institutions. From a theoretical perspective, this study contributes to the development of adaptive curriculum concepts by integrating OBE theory, digital transformation, and the concept of Society 5.0 into a more comprehensive conceptual framework. Practically, the findings may serve as a reference for curriculum developers, educators, and policymakers in designing educational systems that are more relevant to global needs.

This study has limitations because it employed a library research approach and therefore did not directly explore empirical experiences from educational institutions or learners. Consequently, future studies are recommended to adopt case study or phenomenological approaches to analyze the implementation of OBE-based curricula more comprehensively across various educational contexts. Furthermore, future research may also expand investigations regarding the integration of artificial intelligence and digital learning technologies into the development of future curricula.

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