Adaptive Learning and Video Learning: Future Learning Trends in The Context of Distance Education

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ABSTRACT

This study aims to analyze the application of connectivism theory in learning using e-learning platforms and its implications for improving the quality of education in the digital era. Connectivism, as a modern learning theory, places social networks, digital technology, and access to various sources of information at the core of the learning process. E-learning platforms, which encompass various applications and online learning technologies, provide opportunities for students to learn flexibly, anytime and anywhere, according to their needs. The results of the study indicate that connectivism-based e-learning not only enhances the accessibility of education but also promotes collaboration, the development of digital skills, and the personalization of learning. Active interaction through digital networks enables students to share ideas, collaborate on group projects, and independently broaden their horizons. Nevertheless, the implementation of connectivism-based e-learning faces several challenges, such as limited access to technology in certain areas, uneven internet infrastructure, and a lack of technical training for educators. To overcome these obstacles, a comprehensive strategy is needed, including the improvement of digital infrastructure, the development of teacher competencies, and policy support that encourages the integration of technology into education. Connectivism-based e-learning holds great potential to create innovative, effective, and relevant learning aligned with the needs of the times.

Keywords
Digital; E-Learning; Educational Innovation; Connectivism; Digital Learning

Introduction

The development of information and communication technology has brought about fundamental changes in various aspects of human life, including the field of education (Berlian, 2021). This digital era demands an education system that is more flexible, personalized, and responsive to the diverse needs of learners (Mardisentosa & Sugiyanti, 2021). Distance education, as one of the manifestations of digital transformation in education, offers a solution to a geographical limitation, time, and cost barriers in accessing quality education. However, distance education has presents its own challenges, such as a lack of social interaction, difficulties in monitoring students' learning progress, and the heterogeneity of students' ability levels. In order to address these challenges, innovative learning approaches that utilize digital learning media such as adaptive learning and video learning are becoming increasingly relevant and important (Subroto et al., 2023). Furthermore, the use of digital learning media contributes to the development of skills such as critical thinking and collaboration.

Based on the background description above, the formulation of the problems in this study is as follows: How can the implementation of adaptive learning and video learning in the context of distance education improve learning effectiveness and efficiency? How can adaptive learning help adjust video learning materials and methods to meet the individual needs of students in distance education? What are the challenges and opportunities in implementing adaptive learning and video learning in distance education, and what strategies can be used to overcome these challenges?

The objective of this study is to analyze the implementation of adaptive learning and video-based learning in the context of distance education, identify the factors that influence the successful implementation of these two approaches, and to formulate recommendations for enhancing the effectiveness and efficiency of learning through their integration. This study is expected to provide both theoretical and practical contributions to the development of higher-quality distance education that is more relevant to the needs of students in the digital era. Furthermore, this study aims to

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explore the potential of adaptive learning in personalizing the video-based learning experience so that each student can gain maximum benefit from the presented material.

This study aims to identify the most effective models for implementing adaptive learning and video-based learning in the context of distance education, as well as to evaluate their impact on learning outcomes, student motivation, and satisfaction. In addition, it seeks to formulate strategies to bridge the digital divide and to ensure fair and equitable access to technology and learning resources for all students, regardless of their social, economic, or geographical backgrounds.

The relevance of this study to expert concepts lies in its integration of modern learning theories, such as constructivism, cognitive theory, and connectivism, in the design and implementation of adaptive learning and video-based learning. Constructivist theory emphasizes the active role of learners in constructing their own knowledge through experience and social interaction (Zai et al., 2024). Cognitive theory highlights the importance of mental processes, such as attention, memory, and problem-solving, in learning. Meanwhile, connectivism underscores the significance of networks and digital connections in the learning process, particularly in the digital era. By incorporating the core of principles of these three theories, this study aims to create a personalized, interactive, and collaborative learning environment that enables students to learn effectively and efficiently according the their individual learning styles and needs.

The concepts of adaptive learning and video-based learning are closely linked to various learning theories and educational concepts developed by experts. Constructivist theory, as developed by Jean Piaget and Lev Vygotsky, serves as a fundamental bases for adaptive learning, in which learning is viewed as an active process to which students construct understanding based on their experiences and interactions with the environment. Adaptive learning applies this principle by adjusting instructional materials according to students' prior interactions and levels of understanding, allowing students to progressively build their knowledge. The theory of multiple intelligences by Howard Gardner is also relevant, as adaptive learning enable the customization of methods and content to accommodate various types of intelligence and learning styles. Meanwhile, video-based learning aligns with Richard Mayer's multimedia learning theory, which posits that students learn more effectively from words and picture than from words alone. This theory highlights the importance of well-designed multimedia element to support learning, incorporating principles such as coherence, redundancy, and spatial contiguity to improve understanding and information retention.

In addition, Vygotsky's concept of the Zone of Proximal Development (ZPD) which describes the gap between what students can do independently and what they can achieve with guidance is highly relevant to adaptive learning. Adaptive learning platforms function as scaffolds, providing the necessary support to help students reach their full learning potential. This concept is also aligned with the idea of Computer-Assisted Learning (CAL), which has long been promoted by educational experts such as B.F. Skinner and Seymour Papert, who emphasized the potential of technology to personalize the learning experience. In the context of distance education, Moore's theory of learner independence and autonomy becomes particularly relevant, as it encourages students to take ownership of their learning process. Adaptive learning and video-based learning support this autonomy by offering flexibility in terms of time, location, and learning pace, as well as by providing timely feedback and instructional support. Furthermore, the theory of connectivism, developed by George Siemens and Stephen Downes, plays a significant role in the digital era, where learning is viewed as the process of connecting various sources of information and building networks of knowledge. In this light, adaptive learning and video-based learning represent practical implementations of multiple educational theories that have been developed by leading scholars.

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Literature Review

Table 1 shows the overview of previous research.

Table 1. Overview of Previous Research

Research Title	Researchers	Year of Publications	Research Methods	Research Findings
The Effectiveness of using Video-Based Learning in Distance education for Early Chilhood Education	Putry et al.	2021	Qualitative case study	Video-based learning is considered effective as an alternative medium for distance education for early childhood, as it can increase students' motivation and understanding of the delivered material.
The Design of Effective Learning Videos in Distance education: A Study at Universitas Terbuka	Anwas et al.	2015	Evaluation-based research design with descriptive quantitative approach	Effective learning videos should include aspects such as content, video duration, type of video media, useof color, music, and illustrations, presenters, language usage, and assignments through video.
Adaptive Learning: Adjusting Education for Every Student	Wijaya & Purnomo	2024	Literature study	Adaptive learning enables education to reach students from diverse backgrounds and abilities, creating a more inclusive experience and enhancing learning independence.
Artificial Intelligence in Adaptive Learning: Potential and Challenges	Dwiyanto & Priyatna	2023	Mixed method	AI has a crucial role in adaptive learning, especially on a large scale, but attention is needed regarding data privacy and the accuracy of AI analysis.
Adaptive Learning: Adaptive Training and Learning Processes Based on Artificial Intelligence and Big Data	Hermawan & Suhartono	2022	Case study	Adaptive learning empowers students to control their professional development by enabling them to learn at their own pace and to build skills and confidence.
Hybrid Learning and Adaptive Learning: Educational Strategies in the Digital Era	Nughroho	2022	Literature study	Hybrid-adaptive learning considers the availability of tools, students' conditions, and learning environments to maximize learning outcomes.

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The Implementation of Video Learning to Enhance Student Engagement in Distance education	Sutrisno & Fitriani	2020	Experiment	Video learning increases student engagement in distance education, especially when video content is designed by considering the principles of multimedia learning.
Personalizing Learning Through Adaptive Learning Systems: A Case Study in Indonesian Higher Education	Setiawan & Widodo	2023	Case study	The implementation of adaptive learning systems in Indonesian higher education shows an improvement in student motivation and learning outcomes, although challenges remain in infrastructures and digital literacy.
Integration of Artificial Intelligence and Big Data in the development of Adaptive Learning Platforms	Gunawan & Kuswandi	2023	Design-based research	The integration of AI and big data in adaptive learning platforms enables in depth analysis of students' learning patterns and provides a personalized learning experience.
The Role of Learning Videos in Supporting Distance education in the Digital Era	Nadeak & Naibaho	2021	Survey	Learning videos have significant benefits in context of distance education, including more engaging learning experiences, flexibility, and clear visualization.
Adaptive Learning Technologies: Implementation and Impact on Higher Education	Hasanah & Malik	2024	Mixed method	Adaptive learning technologies improve student learning outcomes and engagement, but require institutional support and professional development for lecturers.
Evaluation of the Implementation of Video-Based Learning Education During the Pandemic	Purwanto & Asbari	2022	Evaluation based research	Video-based learning became an effective solution for education during the pandemic, but attention must be given to aspects of interactivity and video durations.
The Utilization of Artificial Intelligence in Personalized Learning: A Case Study in Mathematics Education	Ahmad & Nurhaman	2023	Case study	The application of AI in mathematics education enhances students' conceptual understanding by adjusting learning materials and methods according to individual needs.
Content Development Strategies for Learning Videos in Distance education	Pakhapan & Simarmata	2020	Research and Development	The development of learning video content must consider pedagogical aspects, technology, and visual communication design to produce effective videos.

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The Implementation of Adaptive Learning to Adress the Diversity of Students' Learning Styles	Wijayanti & Putri,	2022	Action research	Adaptive learning is effective in accommodating the diversity of students' learning styles, increasing motivation, and reducing achievement gaps.

Adaptive Learning

Adaptive learning is an instructional approach that adjusts learning materials, pace, and methods to meet the individual needs of students. This approach leverages algorithms and data analysis to monitor students' progress in real time and to provide personalized, relevant feedback (Hidayat & Khotimah, 2019). Adaptive learning systems can identify students' strengths and weaknesses and deliver content that aligns with each learner's ability level and preferred learning style. By doing so, adaptive learning promotes independent and effective learning, while also enhancing students' motivation and engagement. In the context of distance education, adaptive learning helps address the challenge of learner heterogeneity and ensures that each student receives an optimal and tailored learning experience. Furthermore, the implementation of adaptive learning supports educators in monitoring individual student progress and providing timely, data-driven interventions when needed.

Video Learning

Video learning, on the other hand, is an instructional approach that utilizes video as the primary medium for delivering educational content. Compared to traditional media such as text or audio, video offers several advantages. It can convey information both visually and auditorily, making the content more engaging and easier for students to comprehend. In addition, video can effectively illustrate abstract or complex concepts and provide practical examples of their application. In the context of distance education, video learning can help address the lack of direct social interaction and offer a more interactive and stimulating learning experience. Learning through video-based media encourages students to become more active and critical in engaging with the material (Setiyana et al., 2022). The use of interactive videos, in particular, enables students to participate actively in the learning process for instance, by answering questions, completing tasks, or engaging in discussions with peers (Zai et al., 2024).

Integration of Adaptive Learning and Video Learning in the Context of Distance education

The integration of adaptive learning and video-based learning offers significant synergistic potential in improving the effectiveness and efficiency of distance education. Adaptive learning can help identify the most relevant video content tailored to each student's individual needs, as well as provide personalized and timely feedback after video engagement. Conversely, video-based learning serves as a powerful medium for delivering complex and abstract concepts through visual and auditory formats, thereby enhancing students' understanding. The combination of these two approaches can foster a personalized, interactive, and engaging learning experience, particularly in the context of digital education. As emphasized by Zai et al. (2024), educators are expected to integrate information and communication technology into all learning activities to meet the demands of 21st-century education.

Methods

This study employed a qualitative approach using a literature review method to analyze and synthesize information from various sources relevant to the research topic. The literature review was conducted in a systematic and comprehensive manner to identify, evaluate, and interpret previous research findings, theoretical frameworks, and best practices related to the implementation of adaptive learning and video learning in the context of distance education (Hidayat & Khotimah, 2019). The data sources utilized in this review include peer-reviewed journals, academic books, conference proceedings, research reports, online publications, and other credible and relevant materials.

The literature review process consisted of several stages, including the formulation of research questions, literature search, selection, analysis, synthesis, and report writing. The research questions were derived from the previously formulated problem statements, which focus on the implementation of adaptive learning and video learning in the context of distance education. The literature search was conducted through various online databases, such as Scopus,

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Web of Science, Google Scholar, and other relevant academic platforms.

The literature selection was conducted based on predetermined inclusion and exclusion criteria, namely relevance to the research topic, methodological quality, and the novelty of information. The literature analysis was carried out by reading and understanding the content of each data source, as well as identifying the main themes, key concepts, important findings, and research gaps.

Results

The results of the literature review indicate that adaptive learning is an innovative instructional approach that allows the learning experience to be tailored to the individual needs and abilities of each student. This concept is grounded in the understanding that every learner possesses a unique learning style, pace of comprehension, and level of prior knowledge. Adaptive learning enables students to follow differentiated learning paths based on their specific need some may require additional time to grasp certain concepts, while others can progress more rapidly (Wijaya & Purnomo, 2024). This view is supported by Hermawan and Suhartono (2022), who emphasize that adaptive learning empowers students to take ownership of their professional development by allowing them to learn at their own pace and build the necessary skills and confidence. In the context of distance education, the implementation of adaptive learning has become increasingly relevant and necessary, particularly due to the limited face-to-face interaction between educators and learners. Adaptive learning helps bridge this gap by offering a personalized and responsive learning environment that addresses students' individual needs, even in remote settings. Moreover, it has proven effective in accommodating diverse learning styles, enhancing student motivation, and reducing achievement disparities challenges that are often encountered in distance education.

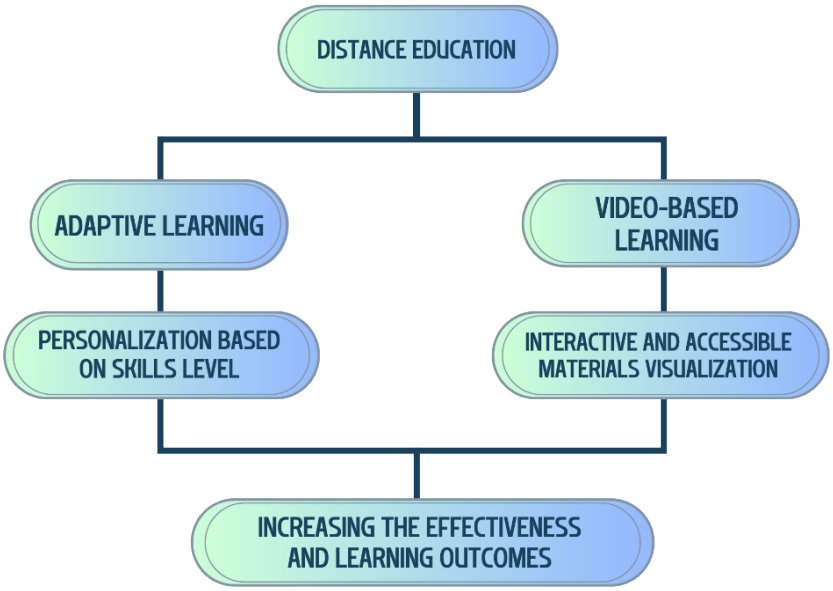

Figure 1. The structural components of technology-based distance learning

Discussions

Artificial intelligence (AI) plays a significant role in adaptive learning, particularly within the context of distance education. Its importance becomes especially apparent at scale, where AI can rapidly analyze large volumes of data and generate personalized learning recommendations for each student (Dwiyanto & Priyatna, 2023). Gunawan and Kuswandi (2023) further emphasize that the integration of AI and big data in adaptive learning platforms enables a deeper analysis of students' learning patterns, thereby facilitating more individualized learning experiences. In distance education where educators are unable to directly observe students' responses and levels of understanding AI serves as a valuable tool to monitor learners' interactions with educational content and to identify specific areas requiring

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additional support. However, the implementation of AI in adaptive learning is not without challenges. Key concerns include data privacy, the need for reliable technological infrastructure, and the risk of algorithmic bias. As such, a balanced and ethical approach is essential in the development and deployment of AI-driven adaptive learning systems.

Video learning, or video-based learning, has become a key component of distance education, particularly with the advancement of technology that facilitates the production and dissemination of high-quality educational videos. It is considered an effective alternative medium for remote learning because it enhances student motivation and improves comprehension of the instructional content (Putry et al., 2021). Video-based learning offers several significant advantages in the context of distance education, including increased engagement, greater flexibility, wider accessibility, and clearer visualization of abstract or complex concepts. Its strength lies in the ability to present information both visually and auditorily, which has been shown to enhance comprehension and memory retention compared to text-based learning alone. Furthermore, video content enables the direct demonstration of procedures or ideas that are difficult to convey through written explanations (Nadeak & Naibaho, 2021). To maximize its effectiveness, the design of educational videos must take into account various elements, including content quality, video duration, media type, visual design (e.g., color, music, illustrations), the presence and delivery style of the presenter, language use, and the inclusion of interactive tasks or assignments (Anwas et al., 2015).

However, the implementation of video learning also presents several challenges, including the requirement for adequate internet bandwidth, access to suitable devices for viewing videos, and the capacity to produce high-quality instructional content. Despite these obstacles, the integration of adaptive learning and video learning in distance education holds significant potential to enhance learning effectiveness. In the context of Indonesian higher education, the implementation of adaptive learning systems has demonstrated improvements in student motivation and learning outcomes, particularly when combined with diverse instructional media such as video content (Setiawan & Widodo, 2023). These findings are reinforced by Sutrisno and Fitriani (2020), who found that video learning increases student engagement in distance education, especially when the content is designed in accordance with multimedia learning principles.

The integration of adaptive learning and video learning has the potential to create a more comprehensive and effective learning experience. In this approach, adaptive learning systems analyze students' interactions with video content and adjust subsequent materials based on their level of understanding. For instance, when a student encounters difficulty with a particular concept, the system can recommend supplementary videos that explain the material in a different or simpler way. However, the successful implementation of this integration requires careful consideration of several factors, including the availability of technological infrastructure, the level of digital literacy among students and educators, and the quality of instructional design. Although adaptive learning technologies have been shown to improve student outcomes and engagement, effective implementation also depends on institutional support and ongoing professional development for educators (Hasanah & Malik, 2024).

The utilization of adaptive learning and video learning in the context of distance education offers numerous benefits, while also presenting several challenges. Based on the literature review, the primary benefits of these approaches include personalized learning tailored to the individual needs and abilities of students, flexibility in terms of time and location, more engaging and interactive learning experiences, and the ability to monitor student progress and provide real-time feedback. Wijayanti and Putri (2022) emphasize that adaptive learning effectively accommodates diverse learning styles, enhances student motivation, and helps to reduce achievement gaps issues that are particularly pressing in distance education. Similarly, Putry et al. (2021) found that video learning serves as an effective medium in distance education due to its capacity to improve student motivation and comprehension. However, the implementation of both adaptive learning and video learning is not without challenges. These include limited technological infrastructure and internet access, concerns over data privacy, the demand for high-quality content development, and the need for educator training in utilizing these technologies effectively. While video-based learning emerged as a viable solution during the COVID-19 pandemic, Purwanto and Asbari (2022) highlight the importance of maintaining interactivity and optimizing video length to ensure its effectiveness.

The importance of appropriate instructional design in the development and implementation of adaptive learning and video learning in distance education also emerged as a key theme in the literature review. Anwas et al. (2015) emphasize that effective instructional videos must consider various elements, including content quality, video duration, media format, use of color, music, and illustrations, as well as the role of the presenter, language clarity, and the inclusion of meaningful tasks or assignments. Furthermore, Pakpahan and Simarmata (2020) argue that the development of video learning content should integrate pedagogical principles, technological considerations, and

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visual communication design in order to produce instructional videos that are both engaging and educationally effective.

In the context of adaptive learning, the application of artificial intelligence (AI) in mathematics education has been shown to enhance students' conceptual understanding by tailoring learning materials and methods to individual needs. This finding underscores the importance of instructional design that accommodates the diverse learning needs of students (Ahmad & Nurjaman, 2023). Furthermore, the hybrid-adaptive learning strategy—which takes into account the availability of technological tools, students' individual circumstances, and learning environments—emerges as a relevant approach for optimizing learning outcomes in distance education (Nugroho, 2022). This approach acknowledges that not all students have equal access to technology or ideal learning conditions, thereby necessitating flexibility in the design and implementation of distance education programs.

Future trends in adaptive learning and video learning within the context of distance education indicate a promising trajectory. The literature highlights several key developments, including the increasing use of artificial intelligence (AI) and big data for personalized learning, the integration of virtual and augmented reality to create more immersive video-based learning experiences, the advancement of user-friendly and integrated adaptive learning platforms, and a growing emphasis on addressing students' social and emotional needs. Gunawan and Kuswandi (2023) note that the integration of AI and big data enables deeper analysis of learning patterns and more personalized instruction capabilities that are expected to expand alongside technological innovation. These trends suggest that adaptive and video learning will remain integral to the evolution of distance education. However, Hasanah and Malik (2024) emphasize the importance of maintaining a student-centered and pedagogically sound approach, cautioning against the overemphasis on technological sophistication at the expense of educational quality. Ensuring institutional support and continuous professional development for educators will also be critical to the effective implementation of these emerging technologies.

Conclusion

Based on the literature review, it can be concluded that adaptive learning and video learning represent emerging trends in education with significant potential to enhance the effectiveness of distance learning. Adaptive learning, through its ability to tailor instructional content and methods to the individual needs and abilities of students, addresses the challenge of personalization in distance education, where direct interaction with educators is limited. The role of artificial intelligence (AI) in adaptive learning is increasingly prominent, particularly in analyzing large datasets, identifying learning patterns, and delivering personalized feedback and recommendations. Meanwhile, video learning contributes by presenting content visually and auditorily, thereby enriching the learning experience and facilitating a deeper understanding of complex concepts. The integration of adaptive learning and video learning offers a powerful synergy: adaptive systems can assess students' interactions with video content and dynamically adjust subsequent material based on their comprehension levels. This combination enables a more comprehensive, flexible, and effective learning experience. Key benefits include personalized instruction, increased flexibility in time and location, enhanced student engagement, and the capacity for real-time progress monitoring and feedback.

Future trends in adaptive learning and video learning indicate a promising trajectory for enhancing the quality and effectiveness of distance education. The increasing use of artificial intelligence (AI) and big data analytics will continue to support personalized learning by enabling deeper analysis of students' learning behaviors and delivering more tailored instructional experiences. The integration of virtual reality (VR) and augmented reality (AR) technologies into video learning is expected to create more immersive and interactive environments, allowing students to engage with abstract or complex concepts in a more tangible way. Additionally, the development of more user-friendly and integrated adaptive learning platforms will facilitate wider adoption across diverse educational settings. Another emerging focus is the consideration of students' social and emotional well-being, acknowledging the critical role of emotional support and social interaction in effective learning. With these advancements, adaptive learning and video learning are poised to become essential pillars of future distance education. However, it is imperative that these innovations remain grounded in pedagogical principles and centered on the learners' needs, rather than being driven solely by technological advancement, in order to ensure meaningful, inclusive, and effective learning experiences for all students.

Limitations and Future Studies

This study has several limitations, primarily its reliance on a literature review rather than empirical data collection, which may limit the generalizability of the findings. The scope of available literature on the integration of adaptive

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learning and video learning in distance education—particularly within specific regional or socio-cultural contexts remains relatively limited. Additionally, due to the rapid pace of technological advancement, some of the most recent innovations in educational technology may not have been fully captured in this review. Future research should consider employing empirical methods, such as surveys, experiments, or case studies, to validate and extend the findings presented here. Further studies could also investigate the long-term effects of adaptive and video-based learning on academic performance and student engagement, as well as the moderating influences of socio-economic, cultural, and technological factors. Moreover, exploring the integration of emerging technologies such as artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) could offer deeper insights into how distance education can be further optimized in response to evolving learner needs.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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