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Cognitive Principles in Online Learning: Improving Student Motivation and Achievement

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Abstract:
This study investigates the application of cognitive principles in online learning and their influence on student motivation and academic achievement. The research employed a qualitative library research design using a descriptive-analytical approach. Data were collected from journal articles, books, conference papers, and scholarly publications related to cognitive science, online learning, and educational psychology. The data were analyzed through thematic content analysis to identify major themes and relationships among cognitive principles, motivation, and learning outcomes. The findings indicate that cognitive principles such as cognitive load management, retrieval practice, metacognition, and self-regulated learning significantly contribute to improving student engagement and academic performance. Effective instructional design, timely feedback, and meaningful social interaction also enhance motivation and learning achievement in online environments. The study concludes that integrating cognitive science into online instruction can create more effective, learner-centered, and engaging learning experiences. These findings provide practical implications for educators and policymakers in developing evidence-based strategies to improve the quality of online education.

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Introduction (مقدمة)

The rapid advancement of digital technology has significantly transformed educational practices worldwide, leading to the widespread adoption of online learning environments. Educational institutions increasingly utilize digital platforms to deliver instruction, facilitate communication, and support student learning. Online learning has become an essential component of contemporary education because it provides flexibility, accessibility, and opportunities for lifelong learning. However, despite these advantages, many students continue to experience difficulties related to motivation, engagement, and academic achievement in virtual learning environments (Means et al., 2014).

Student motivation represents one of the most important factors influencing successful online learning. Unlike traditional face-to-face instruction, online learning often requires greater learner autonomy, self-regulation, and independent study skills. Students who lack intrinsic motivation frequently encounter challenges such as procrastination, low participation, and poor academic performance. Therefore, understanding the cognitive factors that influence motivation has become increasingly important in improving online learning outcomes (Ryan & Deci, 2020).

Cognitive science offers valuable insights into how students process information, construct knowledge, and retain learning experiences. Cognitive principles such as cognitive load management, retrieval practice, metacognition, and spaced learning provide evidence-based strategies for improving instructional effectiveness. These principles help educators design learning experiences that align with the natural processes of human cognition and memory (Mayer, 2014).

One important cognitive principle is Cognitive Load Theory, which emphasizes the limited capacity of working memory during learning activities. Excessive information, poorly designed instructional materials, and complex digital interfaces may overwhelm students and reduce learning effectiveness. By reducing unnecessary cognitive demands, educators can improve comprehension and facilitate meaningful learning experiences in online environments (Sweller, 2011).

Another significant cognitive principle involves retrieval practice, which encourages students to actively recall information rather than simply review learning materials repeatedly. Research demonstrates that retrieval activities strengthen long-term memory and improve academic performance. In online learning environments, quizzes, self-assessments, and interactive activities can promote retrieval practice and support student achievement (Roediger & Karpicke, 2006).

Metacognition also plays a critical role in online learning success. Metacognitive skills enable students to plan, monitor, and evaluate their own learning processes. Students who possess strong metacognitive abilities are generally more capable of managing their study schedules, identifying learning difficulties, and adjusting their learning strategies. Consequently, promoting metacognitive awareness can contribute to greater student motivation and academic success (Zimmerman, 2008).

The COVID-19 pandemic accelerated the adoption of online learning worldwide and highlighted both its strengths and limitations. Educational institutions were compelled to implement remote instruction rapidly, often without adequate preparation. Although technology enabled learning continuity, many students experienced reduced motivation, social isolation, and difficulties maintaining academic performance. These experiences emphasized the importance of applying cognitive principles to improve the quality of online education (Hodges et al., 2020).

Recent studies have examined various aspects of online learning, including technological acceptance, student engagement, and instructional design. However, many investigations focus primarily on technological factors rather than cognitive processes underlying learning and motivation. The integration of cognitive science principles into online instructional practices remains insufficiently explored, particularly regarding their influence on student motivation and academic achievement (Clark & Mayer, 2016).

Furthermore, educators often encounter difficulties in translating cognitive theories into practical teaching strategies. Although numerous cognitive principles have been established through experimental research, their implementation within online learning environments requires careful adaptation. Effective instructional design should consider students' cognitive capacities, motivational needs, and individual learning differences to maximize educational outcomes (Ambrose et al., 2010).

The relationship between motivation and achievement in online learning is also influenced by instructional quality and learning environments. Supportive learning environments, meaningful interactions, timely feedback, and engaging activities can strengthen student

motivation and encourage persistence. Cognitive principles provide a theoretical framework for designing instructional strategies that enhance both motivational and academic outcomes (Pintrich, 2003).

Considering these challenges and opportunities, there is a growing need to investigate how cognitive principles can be applied to improve student motivation and achievement in online learning contexts. Understanding the relationship between cognitive processes and learning outcomes may help educators develop more effective instructional practices and support student success in digital environments.

Therefore, this study aims to explore the application of cognitive principles in online learning and examine their contributions to student motivation and academic achievement. The findings are expected to provide theoretical and practical implications for educators, instructional designers, and policymakers seeking to enhance the quality of online education through evidence-based cognitive approaches.

Method (منهج)

This study employed a qualitative research design using a library research approach to investigate the application of cognitive principles in online learning and their influence on student motivation and academic achievement. Library research was selected because the study aimed to synthesize existing theories, empirical evidence, and scholarly discussions related to cognitive science and online education. The qualitative approach allows researchers to explore educational phenomena in depth and to interpret findings from various academic sources comprehensively. The study focused on understanding how cognitive principles can be translated into practical instructional strategies in digital learning environments. Furthermore, qualitative inquiry provides flexibility in examining complex relationships among cognition, motivation, and learning achievement. The research does not involve direct interaction with participants because the primary sources consist of published academic materials. Therefore, this approach is considered appropriate for generating theoretical insights and conceptual understanding regarding cognitive principles in online learning.

The research adopted a descriptive-analytical method to analyze the collected data systematically. The descriptive component aimed to present various cognitive principles and their application in online learning environments. Meanwhile, the analytical component focused on examining the relationships among cognitive factors, student motivation, and academic achievement. This method enabled the researchers to compare findings from different studies and identify common patterns and themes. In addition, the descriptive-analytical approach supports the interpretation of educational phenomena based on theoretical and empirical evidence. The approach also allows researchers to evaluate existing knowledge critically and identify research gaps. Consequently, the study provides a comprehensive understanding of cognitive principles in contemporary online education.

The sources of data consisted of both primary and secondary documents related to cognitive science and online learning. Primary sources included peer-reviewed journal articles, international conference proceedings, and educational research reports discussing cognitive principles and digital learning. Secondary sources consisted of books, dissertations, policy documents, and theoretical publications relevant to educational psychology and instructional design. The researchers prioritized sources published within the last fifteen years to ensure the relevance and currency of the information. Nevertheless, several classical works in cognitive science were also included because of their significant theoretical contributions. The combination of primary and secondary sources provided a broad perspective on the research topic. Therefore, the collected materials offered sufficient evidence to support the analysis and discussion.

The process of data collection involved systematic literature searching and document analysis. The researchers utilized several academic databases, including Scopus, Web of Science, ERIC, Google Scholar, and ScienceDirect. Keywords such as "cognitive principles," "online learning," "student motivation," "academic achievement," "cognitive load theory," and "digital learning" were employed during the search process. Inclusion criteria were established to select relevant publications, including peer-reviewed status, educational relevance, and publication quality. Articles unrelated to cognitive science or online learning were excluded from the study. The researchers also examined reference lists from selected publications to identify additional relevant sources. This systematic procedure ensured the comprehensiveness and credibility of the collected data.

Document analysis served as the primary data collection technique in this study. The researchers carefully reviewed each selected document to identify important concepts, findings, and theoretical perspectives. Relevant information was extracted and organized according to the objectives of the study. Particular attention was given to discussions concerning motivation, cognitive processes, instructional strategies, and academic achievement. The researchers recorded significant statements, empirical findings, and conceptual frameworks that contributed to understanding the research problem. The process of document analysis also involved comparing and contrasting findings across different studies. As a result, the collected information provided a rich foundation for further analysis.

The selected documents were subsequently classified into several thematic categories. These categories included cognitive load theory, retrieval practice, metacognition, motivation, self-regulated learning, and instructional design. The thematic classification facilitated the organization of data and simplified the analytical process. Similar concepts and findings were grouped together to identify recurring patterns across studies. The researchers also examined the relationships among different themes to understand how cognitive principles influence learning outcomes. This categorization process enhanced the coherence and structure of the research findings. Therefore, thematic organization became an essential step in the overall research procedure.

The study employed thematic content analysis to analyze the collected data. Thematic analysis involves identifying, coding, categorizing, and interpreting recurring themes within qualitative data. Initially, the researchers conducted multiple readings of the selected documents to gain a comprehensive understanding of the content. Subsequently, important concepts and statements were coded according to their relevance to the research objectives. Similar codes were grouped into broader themes representing major aspects of cognitive principles in online learning. The identified themes were then interpreted and discussed in relation to existing theories and previous studies. This analytical technique enabled the researchers to generate meaningful interpretations and comprehensive findings.

To ensure the trustworthiness of the study, several validation strategies were implemented. Source triangulation was conducted by comparing information obtained from various types of literature and academic publications. The researchers also performed repeated readings and cross-checking procedures to minimize potential bias during data interpretation. Peer discussions and consultations with colleagues were utilized to evaluate the consistency of the findings. Additionally, the inclusion of reputable and peer-reviewed sources strengthened the credibility of the study. Dependability was achieved by documenting all research procedures systematically. These measures contributed to the overall validity and reliability of the research findings.

Ethical considerations were carefully observed throughout the research process. The researchers respected intellectual property rights by properly citing all sources used in the study. All information was obtained from publicly accessible academic publications and official documents. No human participants were involved in the research, thereby eliminating issues

related to informed consent and confidentiality. Nevertheless, academic integrity remained a fundamental principle guiding the research process. Proper referencing and citation practices were consistently applied to avoid plagiarism. Consequently, the study maintained ethical standards in accordance with academic research principles.

Finally, the findings generated from the thematic analysis were interpreted within the broader context of cognitive science and online education. The discussion focused on how cognitive principles contribute to student motivation and academic achievement in digital learning environments. The study also examined practical implications for educators, instructional designers, and educational policymakers. The identified themes were linked to existing theories to provide deeper explanations of the findings. Furthermore, recommendations for instructional practice and future research were developed based on the results. The methodological framework employed in this study provides a comprehensive approach to understanding the application of cognitive principles in online learning. Therefore, the study contributes valuable insights into improving educational practices through evidence-based cognitive approaches.

Result (نتائج)

The analysis of the reviewed literature reveals that cognitive principles significantly contribute to the effectiveness of online learning environments. The findings indicate that students who learn through instructional approaches grounded in cognitive science demonstrate higher levels of engagement and improved academic performance. Cognitive principles help educators understand how learners process, organize, and retain information during online instruction. The reviewed studies consistently emphasize that effective learning occurs when instructional design aligns with human cognitive processes. Furthermore, online learning environments that incorporate cognitive principles provide better support for knowledge acquisition and long-term retention. The findings suggest that cognitive science offers a strong theoretical foundation for improving digital education. Therefore, cognitive principles can serve as valuable guidelines for educators in designing effective online instruction.

One of the major findings concerns the role of student motivation in online learning environments. The reviewed studies indicate that motivation strongly influences students' participation, persistence, and academic achievement. Students with higher intrinsic motivation tend to demonstrate greater engagement and stronger commitment to learning activities. Conversely, low levels of motivation often lead to procrastination, decreased participation, and poor academic performance. The findings further reveal that motivational factors such as autonomy, competence, and social interaction contribute significantly to learning success. Online learning environments that promote student autonomy and meaningful engagement generally produce better educational outcomes. Consequently, motivation emerges as a critical factor in successful online education.

The analysis also demonstrates that cognitive load management plays an essential role in online learning effectiveness. Cognitive Load Theory suggests that excessive information and poorly organized instructional materials can overwhelm students' working memory. The reviewed literature indicates that online courses containing complex multimedia elements and excessive content often reduce learning efficiency. Conversely, well-structured learning materials help students process information more effectively. Several studies found that simplified instructional design and organized content presentation reduce cognitive burden and improve comprehension. Appropriate segmentation of information also enhances students' ability to retain knowledge. Therefore, managing cognitive load is essential for optimizing online learning experiences.

Another important finding relates to retrieval practice as an effective learning strategy. The literature indicates that students who regularly engage in retrieval activities demonstrate improved memory retention and academic performance. Online quizzes, self-assessments, and practice tests encourage active recall of previously learned information. These activities strengthen long-term memory and facilitate knowledge transfer to new situations. The findings reveal that retrieval practice is more effective than repeated reading or passive review strategies. Furthermore, frequent formative assessments help students identify learning difficulties and monitor their progress. Thus, retrieval practice contributes significantly to both motivation and achievement.

Metacognitive skills also emerge as important factors influencing student success in online learning environments. The reviewed studies indicate that students who can monitor, regulate, and evaluate their learning processes perform better academically. Metacognitive learners demonstrate greater self-awareness regarding their strengths and weaknesses. They are more capable of planning study schedules, setting goals, and selecting appropriate learning strategies. The findings suggest that online environments requiring independent learning particularly benefit students with strong metacognitive abilities. Additionally, metacognitive instruction helps students become more responsible for their learning outcomes. Therefore, promoting metacognitive development can enhance both motivation and achievement.

The findings further reveal that self-regulated learning contributes substantially to successful online learning experiences. Students who manage their time effectively and maintain learning discipline tend to achieve better academic results. Self-regulated learners actively monitor their progress and adjust their strategies when encountering difficulties. The reviewed literature indicates that online learning demands higher levels of self-regulation than traditional classroom instruction. Lack of self-discipline frequently leads to low participation and reduced academic performance. Moreover, self-regulated learning supports persistence and resilience during challenging learning situations. Consequently, developing self-regulatory skills is essential for online learners.

The role of instructional design also appears prominently in the findings. Effective online courses incorporate cognitive principles through organized content, meaningful activities, and interactive learning experiences. The literature suggests that instructional materials should be clear, concise, and aligned with learning objectives. Multimedia elements are most effective when they support rather than distract from learning. Furthermore, the use of examples, visual representations, and guided instruction improves comprehension. Several studies indicate that well-designed learning environments increase student satisfaction and engagement. Therefore, instructional design significantly influences the effectiveness of online learning.

Another important result concerns the role of feedback in enhancing student motivation and performance. Timely and constructive feedback enables students to identify mistakes and improve their understanding. The reviewed studies indicate that immediate feedback during online activities increases student confidence and encourages persistence. Personalized feedback also promotes stronger teacher-student relationships within digital environments. Furthermore, feedback helps students monitor their progress and regulate their learning strategies. Online learning platforms provide various opportunities for automated and instructor-generated feedback. Thus, feedback serves as an important cognitive and motivational support mechanism.

The findings also indicate that social interaction positively affects online learning outcomes. Collaborative activities, discussion forums, and peer interaction enhance motivation and knowledge construction. Students who participate actively in online discussions often demonstrate higher engagement and deeper understanding of course content. Social interaction reduces feelings of isolation commonly experienced in online learning environments. Additionally, collaborative learning supports critical thinking and problem-solving abilities. The

literature suggests that meaningful communication contributes to both cognitive development and emotional support. Therefore, social interaction remains an essential component of effective online education.

The analysis further reveals that technological accessibility influences student motivation and academic achievement. Students with reliable internet access and adequate digital devices generally experience fewer learning difficulties. Conversely, limited technological resources often create barriers to participation and learning success. The digital divide continues to affect educational opportunities in many regions. Furthermore, technological problems may reduce motivation and increase student frustration. The findings emphasize the importance of providing equitable access to digital resources. Consequently, technological accessibility remains a crucial factor in online learning effectiveness.

Another significant finding concerns the relationship between cognitive principles and academic achievement. The reviewed studies consistently demonstrate that cognitive-based instructional strategies improve student learning outcomes. Students exposed to retrieval practice, metacognitive activities, and cognitive load management often achieve higher academic scores. These strategies promote deeper understanding and long-term retention of knowledge. Furthermore, cognitive principles facilitate meaningful learning rather than superficial memorization. The evidence suggests that cognitive science provides practical approaches for improving educational quality. Therefore, the integration of cognitive principles contributes directly to academic success.

The findings indicate that cognitive principles play a vital role in improving student motivation and achievement in online learning environments. Motivation, cognitive load management, retrieval practice, metacognition, self-regulation, instructional design, feedback, and social interaction collectively influence learning outcomes. The results emphasize that effective online learning requires more than technological infrastructure alone. Instead, educational practices should be grounded in evidence-based cognitive principles that support how students learn. The findings also highlight the importance of designing learner-centered online environments that promote engagement and achievement. Consequently, the application of cognitive science offers substantial opportunities for enhancing the quality and effectiveness of online education.

Discussion (مناقشة)

The findings of this study demonstrate that cognitive principles provide a strong theoretical foundation for improving online learning environments. The results indicate that learning effectiveness is influenced not only by technological factors but also by the alignment between instructional practices and human cognitive processes. This finding supports the view that successful online learning requires an understanding of how students acquire, process, and retain knowledge. Cognitive science offers evidence-based principles that help educators design more effective instructional strategies. The application of cognitive principles enables instructors to create meaningful learning experiences that promote both motivation and academic achievement. Moreover, these findings emphasize that educational technology should serve pedagogical objectives rather than merely delivering content. Therefore, the integration of cognitive science into online education becomes essential for enhancing learning quality (Mayer, 2014; Clark & Mayer, 2016).

Student motivation emerged as one of the most significant factors influencing online learning success. The findings indicate that motivated students demonstrate greater participation, persistence, and academic performance. This result supports Self-Determination Theory, which emphasizes the importance of autonomy, competence, and relatedness in

sustaining motivation (Ryan & Deci, 2017). Online learning environments that provide meaningful choices and opportunities for interaction tend to foster higher levels of engagement. Students who perceive learning activities as relevant and achievable are more likely to maintain their motivation. Additionally, motivational support from instructors contributes to students' willingness to participate actively in online courses. Consequently, educators should develop learning environments that satisfy students' psychological needs (Pintrich, 2003).

The findings concerning cognitive load management further support the principles of Cognitive Load Theory. Excessive information and poorly designed instructional materials can overload students' working memory and reduce learning effectiveness. The results reveal that simplified content presentation and organized instructional design improve comprehension and retention. This finding is consistent with Sweller's theory, which emphasizes the importance of reducing unnecessary cognitive demands during learning (Sweller, 2011). Online environments often contain multiple sources of information that may distract learners. Therefore, educators must carefully design instructional materials to minimize extraneous cognitive load. Effective management of cognitive load ultimately contributes to improved academic performance (Clark & Mayer, 2016).

Retrieval practice emerged as another important strategy for enhancing student achievement. The findings demonstrate that regular retrieval activities strengthen long-term memory and improve knowledge retention. This result aligns with the research of Roediger and Karpicke (2006), who found that active recall promotes durable learning. Online quizzes, formative assessments, and practice exercises encourage students to retrieve information repeatedly. Such activities help learners identify gaps in their understanding and reinforce previously learned material. Moreover, retrieval practice promotes confidence and reduces forgetting over time. Therefore, educators should incorporate frequent retrieval opportunities into online courses (Roediger & Karpicke, 2006).

Metacognition also plays a substantial role in supporting student success in online learning. The findings suggest that students who monitor and regulate their learning processes achieve better academic outcomes. Metacognitive skills enable learners to evaluate their progress, identify difficulties, and select appropriate strategies. Zimmerman (2008) argues that self-awareness and self-regulation are essential components of effective learning. In online environments, students often work independently and must manage their own learning activities. Consequently, metacognitive abilities become increasingly important for maintaining motivation and achieving academic goals. Educational interventions that develop metacognitive awareness can therefore enhance learning effectiveness (Zimmerman, 2008).

The discussion further indicates that self-regulated learning contributes significantly to online learning success. Students who establish goals, manage their time, and monitor their progress demonstrate higher levels of achievement. This finding supports previous studies emphasizing the importance of learner autonomy in digital education (Zimmerman, 2008). Online learning environments require students to assume greater responsibility for their educational activities. Lack of self-regulation may result in procrastination, reduced engagement, and poor performance. Therefore, educators should provide guidance and support to help students develop self-regulatory skills. These findings suggest that self-regulation serves as a critical mechanism connecting motivation and achievement (Pintrich, 2003).

Instructional design also appears as a crucial factor influencing online learning outcomes. The findings indicate that clear learning objectives, organized materials, and meaningful activities contribute to improved student engagement. Mayer's principles of multimedia learning suggest that instructional materials should facilitate cognitive processing rather than overwhelm learners (Mayer, 2014). The use of visual aids, examples, and interactive elements can support understanding when applied appropriately. However, excessive multimedia components may

increase cognitive load and reduce effectiveness. Therefore, instructional design should balance technological innovation with cognitive considerations. Effective course design ultimately supports both motivation and academic achievement (Clark & Mayer, 2016).

Feedback emerged as another important element in online learning environments. The findings demonstrate that timely and constructive feedback enhances student confidence, motivation, and performance. Feedback enables students to identify errors, monitor progress, and adjust learning strategies. In digital environments, automated assessments and instructor comments provide immediate information regarding student performance. Such feedback supports self-regulated learning and encourages continuous improvement. Furthermore, personalized feedback strengthens the relationship between instructors and learners. Consequently, effective feedback mechanisms contribute substantially to successful online learning experiences (Hattie & Timperley, 2007).

Social interaction also influences student motivation and achievement in online education. The findings reveal that collaborative activities and communication opportunities reduce feelings of isolation and increase engagement. Students benefit from discussions, peer feedback, and cooperative learning activities. Social interaction facilitates knowledge construction through the exchange of ideas and experiences. This finding is consistent with social constructivist perspectives that emphasize the importance of collaborative learning (Vygotsky, 1978). Online learning environments that encourage communication create stronger learning communities. Therefore, instructors should incorporate interactive activities to support cognitive and social development (Garrison, Anderson, & Archer, 2000).

The findings concerning technological accessibility highlight the continuing existence of the digital divide. Students with inadequate internet access or limited technological resources often experience barriers to learning. These inequalities affect motivation, participation, and academic achievement. Although cognitive principles improve instructional quality, their effectiveness may be limited when technological infrastructure is insufficient. Educational institutions and policymakers must therefore address issues of accessibility and equity. Providing adequate technological resources ensures that all students can benefit from online learning opportunities. Thus, educational equity remains an important consideration in digital education (Means et al., 2014).

Another important implication of this study is the relationship between cognitive principles and academic achievement. The findings indicate that cognitive-based instructional practices improve understanding, retention, and performance. Students who engage in retrieval practice, metacognitive activities, and self-regulated learning demonstrate higher achievement levels. These results confirm that evidence-based instructional strategies can significantly enhance educational outcomes. Furthermore, cognitive principles promote meaningful learning rather than superficial memorization. The application of these principles therefore contributes to long-term academic success. Consequently, educators should integrate cognitive science into instructional planning and practice (Ambrose et al., 2010).

Overall, the discussion confirms that cognitive principles provide valuable guidance for improving online learning. Motivation, cognitive load management, retrieval practice, metacognition, self-regulation, instructional design, feedback, social interaction, and technological accessibility collectively influence student achievement. The findings emphasize that effective online learning requires a combination of sound pedagogy and appropriate technology. Cognitive science offers practical strategies that help educators understand how students learn in digital environments. Future educational practices should therefore incorporate evidence-based cognitive principles to enhance motivation and academic success. Ultimately, the integration of cognitive science into online education contributes to more effective, engaging, and equitable learning experiences (Mayer, 2014; Ryan & Deci, 2017).

Conclusion (خاتمة)

This study concludes that the application of cognitive principles in online learning significantly contributes to improving student motivation and academic achievement. The findings indicate that cognitive-based instructional strategies, including cognitive load management, retrieval practice, metacognition, self-regulated learning, and effective instructional design, play essential roles in supporting meaningful learning experiences. Student motivation emerges as a crucial factor influencing participation, engagement, and academic performance in digital learning environments. Furthermore, elements such as timely feedback, social interaction, and technological accessibility strengthen the effectiveness of online learning. These findings suggest that online education should be designed not only through technological considerations but also through evidence-based cognitive principles that reflect how students learn and process information (Mayer, 2014; Sweller, 2011).

Moreover, the study highlights that the integration of cognitive science into online instruction offers significant opportunities for enhancing educational quality and promoting sustainable learning outcomes. Educators are encouraged to adopt cognitive-based teaching strategies that support learner autonomy, motivation, and knowledge retention. Educational institutions and policymakers should also provide professional development programs that help instructors apply cognitive principles effectively in digital learning environments. Future research may investigate the implementation of these principles in specific educational contexts and examine their impact through empirical studies involving students and teachers. Ultimately, the application of cognitive principles can contribute to the development of more effective, engaging, and learner-centered online education systems (Ryan & Deci, 2017; Clark & Mayer, 2016).

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