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AI Based Criting E-Modul as a Learning Innovation for Digital and Critical Thinking Literacy: Its Relevance to Transformative Counseling

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Abstract: The integration of digital and critical thinking skills is crucial in 21st-century education and counseling. Transformative counseling, which aims to facilitate profound change through critical self-reflection, requires innovative media to achieve its goals. The AI-Based CRITING E-Modul was developed to enhance these competencies, but its conceptual alignment with transformative counseling principles needed systematic validation. Objective: This study aimed to analyze and prioritize the relevance of the CRITING E-Modul's components to the core principles of transformative counseling using the Analytic Hierarchy Process (AHP). Methods: This evaluative study involved five experts in transformative counseling and educational technology. Through pairwise comparison questionnaires, experts judged the relative importance of four main criteria: Critical Reflection, Self-Direction, Disorienting Dilemma, and Contextualization. Results: The AHP analysis revealed that Critical Reflection (weight: 0.415) was the most significant principle, followed by Self-Direction (0.285), Disorienting Dilemma (0.185), and Contextualization (0.115). All consistency ratios (CR < 0.1) indicated acceptable judgment consistency. Conclusions: The AHP method provides a robust framework for validating the relevance of an educational innovation to a theoretical counseling paradigm. The CRITING E-Modul is deemed highly relevant to transformative counseling, primarily through its mechanism of stimulating critical reflection via AI-generated feedback, offering a structured medium for clients or counselor trainees to engage in critical self-examination and cognitive restructuring. This Study provides both a methodological framework and practical guidance for integrating AI tools in counseling context.

Keywords: Analytic Hierarchy Process, Transformative Counseling, AI in Education, E-Module, Critical Thinking

INTRODUCTION

The 21st century has witnessed an unprecedented digital transformation that has fundamentally reshaped educational landscapes and counseling practices across the globe (Holmes et al., 2019). This technological revolution, characterized by the pervasive integration of artificial intelligence and digital platforms, has created new opportunities and challenges for educational systems worldwide (Chen et al., 2020). The current generation of students and clients navigates a complex digital ecosystem where information abundance coexists with misinformation challenges, requiring sophisticated skills to critically evaluate content (Tinmaz et al., 2022). This evolving landscape demands innovative approaches that can effectively bridge technological advancements with fundamental human development needs.

Within this digital paradigm shift, the cultivation of digital literacy and critical thinking skills has emerged as an urgent necessity rather than merely a desirable educational outcome (OECD, 2021). Digital literacy now

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encompasses far more than basic technical competence, extending to the ability to responsibly access, evaluate, manage, and communicate information through digital media platforms (Aysu, 2023). Simultaneously, critical thinking represents the capacity to analyze, evaluate, and solve problems through logical and systematic reasoning processes grounded in evidence and sound argumentation (Marudut et al., 2020). These complementary competencies form the essential foundation for effective functioning in modern society.

The field of counseling, particularly transformative counseling approaches, faces significant opportunities and challenges within this digital transformation context (Ellis et al., 2025). Transformative counseling represents a therapeutic approach that aims to facilitate profound change in clients by challenging their existing assumptions, beliefs, and meaning perspectives through critical self-reflection and experiential learning (Mezirow, 2018). This theoretical framework emphasizes the process of meaning-making through disorienting dilemmas, critical reflection, and dialogic engagement, requiring careful adaptation to digital environments (Sardi et al., 2025). The digital age presents both new avenues for implementing transformative processes and new complexities that require innovative counseling tools.

Despite the clear potential for synergy between digital learning innovations and transformative counseling principles, a significant research gap persists in systematically integrating these domains (Akgün & Greenhow, 2022). While educational technology has advanced rapidly with the development of various e-learning platforms and AI-driven educational tools, their application within counseling contexts remains relatively unexplored (Zhai et al., 2024). Similarly, while transformative counseling has established strong theoretical foundations, its practical implementation has often relied on traditional face-to-face modalities without fully leveraging digital innovations (Vasconcelos & dos Santos, 2023). This gap represents a missed opportunity for enhancing counseling effectiveness.

The AI-Based CRITING (Critical Thinking) E-Modul was developed specifically to address this research-practice gap by creating a structured digital platform that synergizes technological innovation with pedagogical and therapeutic principles (Rahmayani et al., 2023). This e-module represents an interactive learning environment that leverages artificial intelligence to provide personalized feedback, adaptive learning scenarios, and critical thinking challenges tailored to individual user needs and capabilities (Chai et al., 2025). By integrating AI capabilities with carefully designed educational content, the CRITING E-Modul aims to foster both digital literacy and critical thinking skills through engaging, self-paced learning experiences that can be utilized in both educational and counseling contexts (Aladin et al., 2024).

Previous research has demonstrated the effectiveness of various e-learning approaches in educational settings, with studies showing positive outcomes for student engagement, knowledge acquisition, and skill development (Puspitaningrum & Witanto, 2024). Similarly, research on AI in education has highlighted its potential for creating personalized learning experiences, providing immediate feedback, and adapting content to individual learning patterns (VanLehn, 2011; Woolf, 2010). However, the existing literature reveals limited investigation into how such technological innovations specifically align with and support theoretical counseling frameworks, particularly transformative counseling approaches that emphasize profound personal change through critical reflection (Kosmyna et al., 2025).

This study therefore employs the Analytic Hierarchy Process (AHP) methodology to systematically evaluate the relevance of the CRITING E-Modul to transformative counseling principles (Saaty, 2008). The AHP approach provides a robust multi-criteria decision-making framework that enables structured analysis of complex relationships through expert judgments and pairwise comparisons (Spatioti et al., 2022). By applying this methodological framework, the study aims to address the research question: "How do experts prioritize the relevance of CRITING E-Modul components to transformative counseling principles using the AHP framework?" The findings will provide valuable insights for counselors, educators, and educational technology developers seeking to integrate digital innovations with theoretical counseling approaches.

METHOD

This study employed the Analytic Hierarchy Process (AHP) as the primary methodological framework to systematically evaluate the relevance of the CRITING E-Modul to transformative counseling principles. The AHP approach, developed by Saaty (2008), provides a robust multi-criteria decision-making technique that enables the decomposition of complex problems into hierarchical structures. This methodology was particularly suitable for this study as it allows for the synthesis of expert judgments through pairwise comparisons, transforming qualitative assessments into quantitative priority scales (Spatioti et al., 2022). The systematic nature of AHP ensured a rigorous evaluation process that could effectively bridge theoretical counseling concepts with technological innovation features.

The research utilized purposive sampling to select five experts who met stringent criteria including doctoral qualifications in Guidance and Counseling or Educational Psychology, substantial experience in transformative counseling practice or research, and demonstrated familiarity with technology integration in educational contexts (Creswell & Plano Clark, 2018). The expert panel comprised both academic scholars and practicing professionals with an average of 12.4 years of relevant experience, ensuring comprehensive perspectives from both theoretical and practical viewpoints. This careful selection process guaranteed that the participants possessed the necessary expertise to provide informed judgments about the congruence between the e-module features and transformative counseling principles (Braun & Clarke, 2006).

The primary research instrument consisted of a structured AHP pairwise comparison questionnaire developed based on Saaty's (2008) fundamental scale. The questionnaire was designed to measure four main criteria derived from transformative counseling theory: Critical Reflection, Self-Direction, Disorienting Dilemma, and Contextualization. Instrument validation was conducted through a two-stage process: First, content validity was established through expert review by three counseling methodologies who assessed the relevance, clarity, and comprehensiveness of each criterion. Second, construct validity was verified through pilot testing with two counseling practitioners, which confirmed the instrument's ability to adequately capture the theoretical constructs being measured. The validation process resulted in an Aiken's V coefficient of 0.82, indicating high content validity, while pilot testing showed excellent inter-rater reliability (Cohen's $\kappa = 0.85$) for the pairwise comparison items.

Data collection was conducted through a structured process involving multiple phases to ensure comprehensive understanding and reliable responses. Initially, experts received detailed documentation about the CRITING E-Modul's architectural design, AI capabilities, and learning components, along with theoretical frameworks of transformative counseling (Branch, 2009). Subsequently, a structured briefing session was conducted to explain the AHP methodology and the pairwise comparison procedure using Saaty's 1-9 scale. Finally, experts independently completed the pairwise comparison matrices, comparing four main criteria: Critical Reflection, Self-Direction, Disorienting Dilemma, and Contextualization over a four-week data collection period.

Data analysis followed the standard AHP procedure, beginning with the construction of individual pairwise comparison matrices for each expert. Priority vectors were calculated using the eigenvector method, and the geometric mean was employed to synthesize individual judgments into group priorities (Saaty, 2008). The consistency of expert judgments was verified through Consistency Ratio (CR) calculations, with a threshold of $CR \leq 0.1$ indicating acceptable consistency levels. Sensitivity analysis was subsequently performed to test the robustness of the results against potential variations in expert judgments, ensuring the reliability and stability of the derived priority weights (Spatioti et al., 2022).

RESULTS AND DISCUSSION

3.1 AHP Results: Priority Weights and Consistency Analysis

The Analytic Hierarchy Process yielded clear prioritization among the transformative counseling principles in relation to the CRITING E-Modul, as systematically presented in Table 1. The synthesized results from expert judgments demonstrated that Critical Reflection emerged as the most significant criterion with a priority weight of 0.415, establishing it as the cornerstone of the e-module's relevance to transformative counseling. Self-Direction followed with a substantial weight of 0.285, indicating its crucial role in supporting autonomous learning processes, while Disorienting Dilemma and Contextualization received moderate weights of 0.185 and 0.115 respectively (Saaty, 2008). The consistency ratios for all judgments remained below the 0.1 threshold, with an overall CR of 0.057, confirming the logical coherence and reliability of expert assessments throughout the evaluation process.

Table 1. AHP Priority Weights for Transformative Counseling Criteria

Criteria	Priority Weight	Ranking	Consistency Ratio
C1: Critical Reflection	0.415	1	0.04
C2: Self-Direction	0.285	2	0.06
C3: Disorienting Dilemma	0.185	3	0.08
C4: Contextualization	0.115	4	0.05
Overall CR	0.057		

3.2 Critical Reflection as the Cornerstone of Transformation

The predominant weight assigned to Critical Reflection (0.415) strongly aligns with Mezirow's (2018) theoretical emphasis on critical self-examination as the fundamental mechanism for perspective transformation. The CRITING E-Modul facilitates this process through its sophisticated AI-generated feedback system that systematically challenges users to reflect on their cognitive patterns and argumentation structures (Akgün & Greenhow, 2022). Expert evaluations highlighted that the immediate, non-judgmental feedback provided by the AI creates a psychologically safe environment conducive to examining deeply held assumptions without triggering defensive mechanisms commonly encountered in traditional counseling settings. This finding is corroborated by recent research indicating that structured digital reflection activities significantly enhance transformative outcomes in technology-mediated counseling interventions (Sardi et al., 2025).

3.3 Self-Direction and Learner Autonomy in Digital Counseling

The substantial priority weight for Self-Direction (0.285) underscores the critical importance of client autonomy within transformative counseling processes, particularly in digital learning environments. The e-module's self-paced, adaptive architecture empowers users to exercise control over their learning trajectory, making informed decisions about content engagement and skill development sequencing (Chai et al., 2025). This finding resonates with contemporary research demonstrating that self-directed learning capabilities are strong predictors of successful counseling outcomes in technology-enhanced therapeutic contexts (Ellis et al., 2025). The modular design enables users to navigate educational content according to their specific needs, readiness levels, and learning preferences, thereby facilitating personalized transformative experiences that honor individual differences.

3.4 Disorienting Dilemma as Catalytic Mechanism

The moderate yet significant weight for Disorienting Dilemma (0.185) confirms its essential role as a catalytic trigger rather than the primary change mechanism within transformative processes. The e-module incorporates carefully engineered scenarios and problem-based learning activities designed to generate productive cognitive conflicts, thereby initiating the discomfort necessary for perspective transformation (Vasconcelos & dos Santos,

2023). Expert feedback emphasized that the AI's capacity to generate paradoxical scenarios and intellectually challenging questions provides precisely calibrated disorientation that can be tailored to individual users' current conceptual understanding. This approach aligns with established practices in transformative counseling that utilize structured cognitive challenges to stimulate developmental growth while maintaining appropriate psychological safety boundaries.

3.5 Contextualization for Meaningful Learning Transfer

Although receiving the lowest weight (0.115), Contextualization remains an indispensable element for ensuring learning relevance and practical application within transformative counseling frameworks. The e-module's utilization of authentic real-life examples and customizable scenarios serves as a crucial bridge connecting abstract critical thinking competencies with personally significant experiences (Tinmaz et al., 2022). This finding reinforces the pedagogical principle that for transformative learning to genuinely occur, educational content must resonate with learners' lived experiences and cultural frameworks (OECD, 2021). The system's capability to adapt examples to specific user demographics and personal contexts enhances both the personal relevance and practical transferability of developed skills, thereby supporting meaningful application in real-world situations.

3.6 Theoretical Implications for Counseling Practice

The AHP results provide substantial theoretical implications for advancing counseling practices in increasingly digitalized environments. The clear prioritization of criteria offers empirical validation for Mezirow's (2018) theoretical proposition that critical reflection constitutes the core engine of transformative learning, while simultaneously highlighting the supportive roles of self-direction, cognitive dissonance, and contextual relevance. This hierarchical validation enables more precise targeting of counseling interventions when utilizing digital tools, allowing practitioners to allocate resources toward the most impactful elements (Aysu, 2023). Furthermore, the findings contribute to bridging the theoretical-practical divide that often characterizes technology integration in counseling contexts, providing evidence-based guidance for optimizing digital counseling tool design.

3.7 Practical Applications in Counseling and Education

From a practical perspective, the established criteria weights offer actionable guidance for counselors and educators seeking to effectively implement the CRITING E-Modul in diverse professional contexts. Counselors can leverage the module's strong critical reflection components during the initial phases of therapeutic intervention to facilitate clients' examination of maladaptive thought patterns and belief systems (Zhai et al., 2024). Educators in counselor training programs can utilize the self-direction features to foster professional autonomy and clinical decision-making skills among trainees, while the disorienting dilemma elements can be strategically employed to challenge entrenched theoretical perspectives. The contextualization capabilities enable both counselors and educators to tailor content to specific client populations or educational objectives, enhancing relevance and engagement.

3.8 Integration with Contemporary Educational Technologies

The findings demonstrate significant alignment with emerging trends in educational technology, particularly regarding AI-mediated learning and adaptive educational systems. The strong performance of critical reflection and self-direction criteria resonates with current research on intelligent tutoring systems that emphasize metacognitive development and learner agency (Woolf, 2010; VanLehn, 2011). The CRITING E-Modul's AI-driven feedback mechanism represents an advancement in delivering personalized scaffolding that promotes reflective thinking, while its adaptive learning pathways support the development of self-regulated learning strategies essential for lifelong professional development (Chen et al., 2020). This integration positions the e-module at the forefront of technology-enhanced counseling education tools that balance technological sophistication with pedagogical effectiveness.

3.9 Addressing Implementation Challenges and Limitations

While the results demonstrate strong theoretical alignment, several implementation challenges warrant consideration in future applications. The heavy reliance on critical reflection presupposes a certain level of cognitive maturity and verbal proficiency that may not be equally present across all client populations (Kosmyna et al., 2025). Additionally, the successful implementation of the self-direction components requires adequate technological infrastructure and digital literacy levels that may vary across different educational and counseling contexts (Tinmaz et al., 2022). These limitations highlight the importance of complementary support systems and differentiated implementation strategies when deploying the e-module in diverse settings, ensuring equitable access and effectiveness across varying user capabilities and resource environments.

3.10 Future Research Directions and Development Opportunities

The current findings illuminate several promising avenues for future research and development in AI-enhanced counseling tools. Longitudinal studies examining the sustained impact of the CRITING E-Modul on transformative counseling outcomes would provide valuable insights into its long-term effectiveness (Spatioti et al., 2022). Comparative research investigating the module's efficacy across different counseling approaches and client demographics could elucidate boundary conditions and optimal application contexts. Furthermore, development of enhanced natural language processing capabilities could strengthen the AI's ability to engage in more nuanced reflective dialogues, while integration with multimodal analytics could provide richer assessment of users' critical thinking development (Chai et al., 2025). These directions represent exciting opportunities for advancing both counseling practice and educational technology innovation.

CONCLUSIONS

This study successfully demonstrates the application of the Analytic Hierarchy Process (AHP) in validating the strong conceptual alignment between the AI-Based CRITING E-Modul and transformative counseling principles. The systematic expert evaluation yielded a clear hierarchical prioritization, establishing Critical Reflection (0.415) as the most significant criterion, followed by Self-Direction (0.285), Disorienting Dilemma (0.185), and Contextualization (0.115). The acceptable consistency ratios ($CR < 0.1$) across all judgments confirm the reliability of these findings. This prioritization not only empirically validates the e-module's theoretical relevance but also highlights its core strength in facilitating critical self-examination through AI-generated feedback, which is the cornerstone of transformative change.

The findings offer significant theoretical and practical contributions. Theoretically, this study bridges the gap between digital learning innovations and counseling theory by providing a rigorous, quantitative framework for evaluation. Practically, the clear criteria weights serve as an actionable guide for counselors and educators to optimize the module's implementation. Counselors can leverage its strong critical reflection components to help clients examine underlying assumptions, while the self-direction features support the development of learner autonomy essential for lasting change. This positions the CRITING E-Modul as a potent supplementary tool in modern, technology-enhanced counseling practice.

For future work, it is recommended to move from conceptual validation to empirical testing. Longitudinal studies examining the module's impact on actual counseling outcomes and comparative research with traditional methods are crucial next steps. Further development could focus on enhancing the AI's conversational capabilities for more nuanced reflective dialogues. This research establishes a solid foundation for the CRITING E-Modul's use in fostering the digital and critical thinking literacies that are indispensable for transformative counseling in the 21st century.

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