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# Blending creativity and connectivity: A Treffinger-based cooperative learning model using Facebook

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## Abstract

This study develops and evaluates a cooperative learning model based on Treffinger's framework, integrated with blended learning and Facebook, to enhance the creative thinking of university students. Addressing challenges in traditional instruction—limited flexibility, low interactivity, and minimal support for creativity- the model follows a structured educational design research approach, including validation, prototyping, and field testing phases. Conducted within a physics education course at Universitas Adzkia, the study involved 72 undergraduate students and five expert validators. The model combines face-to-face and online components, utilizing Facebook as a platform for accessible interaction, collaboration, and reflection. Findings indicate high content validity (Cronbach's $\alpha = 0.894$), strong practicality ratings, and significant improvement in creative thinking skills fluency, flexibility, originality, and elaboration based on pre- and post-test comparisons ($p < 0.001$). Qualitative insights further reveal enhanced student engagement, confidence, and collaborative behavior, with Facebook's asynchronous discussion features fostering a more inclusive and student-centered learning experience. The study concludes that integrating the Treffinger model within a Facebook-based blended framework presents an effective, scalable, and cost-efficient approach to fostering creativity in higher education, with broad applicability across disciplines. This research contributes to digital pedagogy, instructional innovation, and 21st-century skills development in teacher education.

**Keywords:** Blended learning, Creative thinking, Digital pedagogy, Instructional innovation, Treffinger model.

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## 1. Introduction

In today's dynamic educational landscape, creative thinking is not merely an added value but a fundamental competency that enables students to navigate uncertainty, address complex challenges, and drive innovation across diverse fields. As industries continue to evolve at an unprecedented pace, educational institutions must equip learners with the ability to think divergently, adapt swiftly, and develop solutions beyond conventional frameworks. The increasing demands of the 21st century call for a paradigm shift from traditional lecture-based instruction, often rigid and content-focused, to pedagogical approaches that are more flexible, student-centered, and seamlessly integrated with technology. Modern learners, immersed in digital ecosystems, require instructional strategies that foster critical inquiry, collaboration, and real-world application. By leveraging digital tools, social media platforms, and blended learning environments, educators can create dynamic spaces where students not only consume knowledge but actively construct, question, and refine ideas in ways that align with contemporary societal and professional demands. Thus, promoting creative thinking within educational frameworks is no longer optional, it is imperative for cultivating future-ready graduates capable of leading and innovating in an increasingly complex world [1-3]. However, evidence suggests that higher education institutions, particularly in teacher education, still predominantly rely on transmissive teaching methods that do little to stimulate students' creativity [4-6]. As students increasingly live in a digitally connected world, educators must leverage tools and platforms that align with their digital behavior. Social media, especially Facebook, presents a promising yet underutilized medium for educational engagement [7]. While Facebook is often perceived merely as a platform for social interaction, its features, such as group forums, multimedia sharing, and real-time communication can be harnessed for collaborative and reflective learning experiences [8-10].

In parallel, the Treffinger model of creative learning offers a structured and evidence-based framework to develop creative thinking. It involves three progressive stages: basic tools (developing divergent thinking), practice with process (applying creativity in structured scenarios), and working with real problems (solving authentic, complex challenges) [11, 12]. Integrating this model with digital platforms allows educators to scaffold student creativity both cognitively and affectively. This study builds upon these insights by proposing and testing a blended learning model that merges Treffinger's creative thinking approach with cooperative learning, delivered through Facebook. The model responds to key pedagogical needs in higher education: promoting active engagement, fostering higher-order thinking skills, and providing flexible access to learning [13]. Unlike previous models of blended learning that often rely on institutional Learning Management Systems (LMS), this approach leverages a widely used, familiar social media platform to reduce technological barriers and improve participation. Recent studies have shown the efficacy of social media in enhancing collaborative learning and student motivation. For example, Al-Dheleai et al. [14] found that Facebook groups improved students' self-regulation and interaction quality in higher education settings. Similarly, Alraih et al. [15] observed that students involved in Facebook-based discussions demonstrated higher engagement and deeper reflection than those using traditional LMS. Yet, few studies have systematically combined this potential with structured models for developing creative thinking.

Furthermore, the COVID-19 pandemic accelerated the adoption of remote learning and highlighted the need for pedagogical innovations that combine both synchronous and asynchronous methods. Blended learning, which integrates face-to-face instruction with online components has emerged as a sustainable approach post-pandemic [16]. The model proposed in this study not only embraces this flexibility but also enriches it by embedding creativity-enhancing strategies into the online environment. This article aims to (1) introduce a cooperative learning model that integrates Treffinger's creativity framework with Facebook-based blended learning, (2) examine its validity, practicality, and effectiveness in enhancing creative thinking skills among university students, and (3) offer empirical insights into how social media can be leveraged to support 21st-century learning outcomes in teacher education.

By embedding this model within a physics education course at Universitas Adzkia, this study examines how structured creative tasks and collaborative digital environments reshape students' learning experiences. The integration of Treffinger's framework with Facebook-based blended learning not only promotes creative thinking but also fosters active engagement and deeper cognitive processing. This research contributes to the expanding discourse on digital pedagogy, highlighting the potential of social media as an instructional tool. Furthermore, it offers practical insights for educators striving to cultivate creativity through accessible, student-friendly technologies, demonstrating how digital platforms can serve as effective learning spaces that bridge theoretical knowledge with real-world applications.

## 2. Methodology

This study employed a research and development (R&D) approach to systematically design, develop, and evaluate a blended learning model based on Treffinger's creative thinking framework, integrated with cooperative learning and the Facebook platform. The methodology followed the three-stage model proposed by Nieveen and Folmer [17]; Plomp [18] and Plomp et al. [19], which includes: (1) Preliminary Research, (2) Prototyping Phase, and (3) Assessment Phase. This multi-stage process allowed for iterative refinement of the learning model and provided comprehensive data on its validity, practicality, and effectiveness in real learning contexts.

### *2.1. Research Design*

The R&D approach was selected due to its appropriateness for educational innovation and model development. It focuses on generating a practical product (in this case, a blended learning model) and validating its functionality and Letelay et al. [20]. This design is highly compatible with the goals of instructional design in higher education, where adaptation and testing of pedagogical models are central to advancing teaching practice.

*2.2. Participants and Setting*

The study was conducted at Universitas Adzkia in Padang, Indonesia, within the Department of Physics Education. Participants were 72 undergraduate students enrolled in a general physics course during the academic year 2023/2024. The sample was purposively selected to reflect students with typical academic backgrounds and learning challenges related to conceptual understanding and creativity. Additionally, five expert lecturers and instructional designers participated in the validation phase, offering professional feedback on the content, pedagogy, and technical design of the model.

Ethical clearance was obtained from the institutional review board, and informed consent was secured from all participants. The study emphasized voluntary participation, data confidentiality, and the right to withdraw at any stage without academic penalty.

*2.3. Development Procedure*

*2.3.1. Preliminary Research*

This phase involved a needs analysis through a literature review and field observations. The review revealed several challenges in existing teaching methods, including low student engagement, limited support for creativity, and a lack of technological integration [3]. An analysis of the university's digital infrastructure and student media usage habits also indicated that Facebook was widely used and familiar among students, making it a viable platform for blended learning.

*2.3.2. Design and Prototyping*

Building on the findings, a prototype model was systematically developed by integrating Treffinger's three stages of creative learning Basic Tools, Practice with Process, and Working with Real Problems into a structured blended learning framework. The face-to-face component emphasized collaborative problem-solving, fostering interactive group discussions, and hands-on engagement. Meanwhile, the online component, hosted within closed Facebook groups, facilitated continuous asynchronous interaction, enabling students to engage in reflective dialogue, peer feedback, and extended discourse beyond the classroom setting.

To ensure instructional coherence and usability, the model was meticulously documented in a comprehensive guidebook for instructors and students. The guidebook included weekly lesson plans, activity instructions, assessment rubrics, and digital interaction protocols, providing a structured roadmap for seamless implementation. Before field testing, the prototype underwent rigorous expert validation using a structured assessment sheet covering content relevance, pedagogical alignment, design consistency, and instructional clarity.

*2.3.3. Assessment and Field Testing*

Following validation, the model was piloted in a small group trial involving 20 students, assessing its practicality and identifying areas for refinement. Constructive feedback from this phase led to targeted revisions, including streamlining instructional language and optimizing the frequency and structure of Facebook-based activities to maximize engagement and accessibility.

Subsequently, a full-scale field test was conducted over eight weeks with the entire class (n = 72), allowing for a comprehensive evaluation of student participation, engagement levels, and creative thinking development. Throughout the implementation, data were systematically collected through observations, interaction logs, and pre-post assessments to measure learning impact. The course lecturer, equipped with prior training in Treffinger's approach and Facebook group management, facilitated the learning process, ensuring effective guidance and meaningful integration of digital collaboration within the educational framework.

*2.4. Data Collection Instruments*

Three types of data were collected:

Validity data**,** obtained through expert validation sheets using a 5-point Likert scale.

Practicality data**,** collected using lecturer and student response questionnaires post-implementation.

Effectiveness data, measured through a creative thinking test adapted from the Torrance Tests of Creative Thinking (TTCT), encompasses indicators of fluency, flexibility, originality, and elaboration.

Qualitative data from interviews and observation logs supplemented quantitative findings by capturing student perceptions, difficulties, and interactions during the learning process.

*2.5. Data Analysis*

Quantitative data were analyzed using descriptive statistics (mean scores, percentages) and inferential statistics (paired sample t-tests) to determine significant improvements in students' creative thinking before and after the intervention. A significance level of $p < 0.05$ was used to test hypotheses regarding model effectiveness.

Validation scores were interpreted based on categories suggested by Van et al. [21]: 4.20–5.00 (very valid), 3.40–4.19 (valid), 2.60–3.39 (moderately valid), and so on. Similarly, practicality and effectiveness scores followed standard interpretation guidelines to determine model feasibility.

Qualitative data were thematically analyzed following [22-25]. Model: Data reduction, data display, and conclusion drawing. Themes related to student creativity, interaction patterns, and learning motivation were identified to enrich the discussion.

*2.6. Trustworthiness and Limitations*

To ensure trustworthiness, the research adhered to the triangulation of data sources (tests, observations, interviews), member checking with participants, and peer debriefing among academic colleagues. Instrument reliability was tested with a Cronbach's alpha coefficient, ensuring internal consistency of over 0.80 for the creative thinking assessment.

Nonetheless, the study had limitations. It focused on a single subject (physics) and a single institution, which may affect generalizability. Additionally, the use of Facebook, while beneficial, may have excluded students with limited internet access. These aspects are acknowledged as areas for future research and model refinement.

## 3. Results

*3.1. Creative Thinking and the Need for Innovation in Higher Education*

Creative thinking is an essential 21st-century competency, equipping students with the ability to navigate uncertainty, solve complex problems, and drive innovation across disciplines. However, traditional lecture-based approaches in higher education particularly within teacher training programs often fail to foster creativity due to rigid instructional structures, passive learning environments, and limited opportunities for active exploration. To bridge this gap, this research develops and validates a Treffinger-based cooperative learning model, seamlessly integrated with Facebook-supported blended learning to provide a dynamic, flexible, and interactive framework for enhancing student creativity.

*3.2. Research Focus and Methodological Approach*

The study systematically evaluates the model across three key dimensions:

Model Validation – Expert review assessing theoretical alignment, instructional design, and technological integration.

Practicality Testing – Small group and field trials measuring usability, accessibility, and student engagement.

Effectiveness Evaluation – Empirical analysis of the model's impact on students' creative thinking skills, supported by qualitative insights into Facebook's role in learning.

*3.3. Model Validation: Expert Assessment of Educational Viability*

To ensure rigor and applicability, validation was conducted by five experts across diverse domains:

Physics Education (2) – Evaluating subject matter relevance and conceptual integrity.

Educational Technology (1) – Assessing digital pedagogical feasibility and platform suitability.

Instructional Language (1) – Ensuring clarity, accessibility, and effectiveness of academic communication.

Information Technology (1) – Examining platform efficiency, usability, and alignment with learning objectives.

The validation process focused on four critical aspects:

Content Accuracy – Confirmed alignment with the physics education curriculum, ensuring integration of core topics such as Newton's laws, momentum, and measurement systems.

Pedagogical Feasibility – Affirmed coherence with Treffinger's creative learning model, validating its efficacy in fostering divergent and convergent thinking through structured learning phases.

Instructional Clarity – Ensured accessibility and ease of comprehension for both students and instructors, supporting seamless engagement.

Technological Integration – Verified the effective implementation of Facebook as a collaborative learning platform, emphasizing its interactive features for discussion, peer review, and reflection.

*3.4. Validation Results and Statistical Reliability*

Quantitative analysis revealed high expert agreement, reinforcing the model's robustness and readiness for implementation:

Cronbach's Alpha = 0.894, indicating strong internal consistency and reliability across validation metrics.

Intraclass Correlation Coefficient (ICC) = 0.894, confirming high inter-rater agreement among the expert panel.

These results affirm that the developed learning model is theoretically sound, pedagogically effective, and technologically viable, providing a scalable and accessible solution for fostering creativity in higher education.

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*3.5. Practicality Evaluation*

The practicality of the model was initially assessed through a small group trial involving nine students, strategically selected to represent high, medium, and low academic performance levels. The evaluation focused on three instructional tools:

Instructor Guidebook – Providing educators with structured methodologies for implementation.

Student Activity Guidebook – Offering learners detailed instructions and engagement strategies.

Model Handbook – Documenting the theoretical and practical framework guiding the blended learning approach.

Key findings from this phase include:

Instructional clarity and usability received positive ratings, with students reporting ease of navigation across learning activities.

Facebook integration was perceived as highly effective, facilitating collaboration and sustained engagement beyond classroom interactions.

Quantitative assessments revealed practicality scores of 3.55/4 for the student guide, 3.48/4 for implementation feasibility, and 3.55/4 for linguistic clarity, confirming accessibility and user-friendliness.

Qualitative insights emphasized that the model encouraged active participation, fostering both face-to-face and online collaboration.

### *3.6. Field Test Evaluation*

*To evaluate large-scale applicability, the model was subsequently tested in a full-classroom setting involving 22 students over several weeks.*

#### *3.6.1. Findings Indicate*

Consistently high practicality ratings across all criteria reaffirm usability in larger academic environments.

Instructor Guidebook evaluations yielded clarity scores of 3.8, implementation feasibility of 3.7, and linguistic clarity of 3.9, demonstrating strong instructional alignment.

Model Handbook assessments ranged between 3.4 to 3.6, confirming pedagogical suitability and ease of implementation.

Feedback from instructors and students emphasized minimal revisions required, supporting seamless integration into real-world teaching contexts.

These results strongly affirm the practicality, accessibility, and instructional coherence of the model across different academic proficiency levels and classroom scales. The Treffinger-based cooperative learning approach, complemented by Facebook-mediated interactions, proves effective in fostering engaged, collaborative, and creative learning experiences. Minor refinements, such as language simplification and optimized activity pacing, ensure the model remains adaptable for broader educational applications.

### *3.7. Effectiveness Testing*

The effectiveness of the learning model was evaluated based on students' improvements in creative thinking skills, measured through pre-test and post-test assessments. These tests focused on four key indicators derived from Treffinger's model: fluency, flexibility, originality, and elaboration. In the small-group evaluation, involving nine students of varying academic performance levels, results indicated substantial development in creative thinking across all categories. High-performing students achieved scores ranging from 90 to 91, while medium-performing students scored between 83 and 86. Lower-performing students, despite initial challenges, demonstrated meaningful progress with scores between 71 and 75. The average group score of 83.7 suggests that students, irrespective of their initial proficiency, were able to achieve a deeper conceptual understanding and enhanced creative capacity.

Further validation of the model's effectiveness was confirmed through a broader field test involving 22 students in a full classroom setting. Statistical comparisons between pre-test and post-test scores revealed a significant improvement, with an average increase of 17.59 points and a standard deviation of 0.50. The paired sample t-test yielded a t-value of 163.96 and a p-value of 0.000004039, which falls far below the threshold of 0.05, leading to the rejection of the null hypothesis and the acceptance of the alternative hypothesis. These results affirm the model's strong impact on fostering students' creative thinking abilities, demonstrating its pedagogical effectiveness and capacity to stimulate cognitive engagement.

Beyond quantitative assessments, qualitative observations further reinforced the model's value, particularly in the integration of Facebook as a learning platform. Student reflections indicated that Facebook contributed significantly to enhancing their confidence in asking questions, fostering collaborative work beyond scheduled class hours, and mitigating intimidation often experienced in traditional face-to-face discussions. The platform's asynchronous communication features provided flexibility in learning, enabling students to participate in discussions at their own pace, revisit materials, and engage in deeper reflection. Many students expressed that the familiar and widely used interface of Facebook facilitated ease of interaction, reducing the need to adapt to a new digital platform while maintaining active participation in academic discourse. Additionally, instructors reported notable benefits in managing group activities, sharing educational resources, and monitoring student participation. The integration of Facebook proved instrumental in bridging the gap between structured in-class learning and independent study, supporting real-time feedback, peer collaboration, and access to diverse academic resources. These findings highlight the model's effectiveness in enhancing both cognitive and social dimensions of learning, reinforcing the role of digital platforms in fostering creativity and engagement in higher education.

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### *3.8. Summary of Key Findings*

**Table 1.**
Summary of Key Findings.

| Aspect | Key Indicator | Outcome |
|---|---|---|
| Validation | Content, pedagogy, tech, language | Highly valid (Cronbach's $\alpha = 0.894$) |
| Practicality | Guidebooks, implementation, language | Very practical (avg. 3.5–3.9) |
| Effectiveness | Creative thinking pre vs post | Statistically significant improvement ($p < 0.001$) |
| Facebook Use | Engagement, interaction, collaboration | High impact on participation and idea generation |

### *3.7. Student Voices (Qualitative Feedback)*

Quotes from reflective journals and interviews: *"I feel more confident in expressing ideas when discussing on Facebook than in class." "This model makes me think more deeply because the question doesn't have just one answer." "Discussions on Facebook open up a lot of insights from friends, even after lecture hours."* These insights provide evidence that the

combination of Treffinger's structure and Facebook's digital environment supports a shift from passive reception to active and reflective learning.

## 4. Discussion

The present study has successfully developed and evaluated a cooperative learning model integrating Treffinger's creative thinking approach with a blended learning system supported by Facebook. This integration responds to the growing demand for flexible, innovative pedagogical models that not only deliver content but also develop students' creative capacities and digital literacy [13, 26]. The findings demonstrate that the model developed through systematic validation, practicality testing, and effectiveness trials is both theoretically sound and pedagogically relevant in the context of higher education, particularly in the training of prospective physics teachers. The validation process, involving experts from various domains such as instructional design, physics education, and digital learning, confirmed that the model possesses high content validity. Experts agreed that the learning materials, activities, and strategies used were appropriate to university-level physics education and aligned with the competencies targeted by the curriculum. Furthermore, the design and syntax of the model were found to be coherent with the core principles of Treffinger's framework, which encourages fluency, flexibility, originality, and elaboration as indicators of creative thinking [11, 12]. The fact that the experts recommended no major revisions is an indication of the model's robustness and readiness for implementation. Cronbach's alpha and the interclass correlation coefficient (ICC) further support this assertion, both pointing to a high level of consistency and agreement among validators [21].

Practicality testing revealed equally promising results. When applied in both small-scale and full-classroom trials, the model proved to be highly implementable, well-received, and adaptable to diverse student groups. Students participating in the trials noted that the use of Facebook as a learning platform helped them overcome communication barriers often experienced in conventional classroom discussions. The asynchronous nature of Facebook allowed students to engage in reflective thinking, revisit learning materials, and participate in meaningful dialogue beyond scheduled class hours [14]. Students across academic performance levels were able to navigate and benefit from the model, and particularly those with lower prior achievements showed increased motivation and active involvement. This supports the idea that digital environments, when structured with intentional pedagogy, can democratize learning and accommodate varied learner profiles [16]. Moreover, lecturers who applied the model in their classrooms found the instructor guidebook and the student activity book practical and supportive. The guidebooks facilitated ease of implementation and reduced the cognitive load typically associated with new instructional designs. Lecturers appreciated how the model balanced digital engagement with structured learning outcomes and how the flow of learning sessions pre-discussion, face-to-face interaction, Facebook-based online discussion, and preparation for subsequent face-to-face sessions created a rhythm that fostered continuity and depth in learning. From the instructional point of view, the model's practicality also lies in its minimal requirement for new technology or LMS infrastructure, making it particularly suitable for institutions with limited resources [8-10].

The effectiveness of the model in improving creative thinking skills was evident in both the statistical data and qualitative observations. Students showed significant increases in their creative thinking test scores after the implementation of the model. Statistical analysis using paired sample t-tests confirmed that the differences in pre- and post-test scores were not due to chance but were attributable to the learning intervention. Notably, the improvement was observed not only in one or two dimensions of creativity but across all four: fluency, flexibility, originality, and elaboration, suggesting that the learning experiences provided by the model were comprehensive and cognitively enriching [3]. Students demonstrated increased ability to generate diverse and relevant ideas, shift perspectives when faced with new problems, create unique solutions, and develop detailed responses to academic challenges. These improvements affirm the suitability of Treffinger's model in higher education contexts, especially when implemented through cooperative learning methods. One of the most critical components of this study is the use of Facebook as the central platform for blended learning. While Facebook is widely regarded as a social communication tool, its features, such as group pages, threaded discussions, media sharing, and comment functions were effectively repurposed in this study to serve academic goals. The use of a familiar platform lowered the entry barrier for students and encouraged voluntary participation. Observations during the trial phases revealed that students who were typically passive in face-to-face settings became more expressive and engaged in online discussions. The platform enabled students to collaborate, share ideas, provide feedback, and build upon one another's contributions in a non-threatening environment [27-29]. These dynamics are crucial in creative learning, where openness and peer support often lead to deeper intellectual engagement.

However, while Facebook contributed significantly to the success of the model, its use also necessitated structured guidance and moderation. Instructors had to provide clear expectations, maintain an academic tone, and guide students toward focused discussion to prevent distractions and maintain relevance. The study found that with appropriate instructional design and facilitation, Facebook can serve as an effective alternative or complement to institutional LMS platforms, particularly in contexts where such systems are either unavailable or underutilized [7]. The model's digital flexibility integrating face-to-face and online components supports the blended learning paradigm that has gained prominence, especially in post-pandemic education [16]. The model developed in this research is also consistent with the Technological Pedagogical Content Knowledge (TPACK) framework. Instructors who implemented the model were able to combine their subject matter knowledge (physics), pedagogical strategies (cooperative learning and creativity development), and technological tools (Facebook and digital communication) to create a cohesive learning experience [30-33]. The Facebook platform served not just as a delivery medium but as a learning space that supported interaction, collaboration, and creative output. The integration of the Treffinger stages into this digital format allowed for scaffolded development of creative competencies, with each phase

building upon the last and culminating in real problem-solving tasks that required students to synthesize and apply what they had learned.

Additionally, the study contributes to the growing literature on creativity in teacher education. Creative thinking is often cited as a critical skill for teachers, who are expected to design engaging learning experiences, adapt to diverse classroom contexts, and respond innovatively to educational challenges. However, teacher training programs frequently emphasize theoretical knowledge over creativity development [4-6]. This model offers an applied framework that not only teaches content but also provides prospective teachers with firsthand experience in creative, digital, and collaborative learning. The use of the model in a general physics course exemplifies how even content-heavy, structured subjects can be taught creatively without sacrificing academic rigor. The study also has broader implications for curriculum development, especially in settings where conventional infrastructure is limited. The success of the model illustrates that high-tech solutions are not always necessary to achieve high-impact learning outcomes. By leveraging widely accessible platforms and grounding instruction in sound pedagogical theory, educators can create meaningful, scalable, and cost-effective innovations. Institutions may consider adopting similar models in other subjects and disciplines, as the underlying principles cooperation, creativity, and digital integration are widely transferable.

While the results of this study are compelling, they must be interpreted with consideration of the study's limitations. The research was conducted in a single institution within a specific academic program, and as such, generalizations must be made cautiously. Moreover, the model was applied in a subject (physics) that has unique characteristics, and replication in humanities or social science courses may yield different outcomes. In addition, although Facebook was effective in this context, the platform has limitations in terms of privacy, commercial algorithms, and user distractions. Future research could explore comparative studies involving other social media or educational platforms such as Discord, Telegram, or even WhatsApp, each of which offers distinct affordances and constraints. Finally, it is important to consider the sustainability and scalability of this model. While it works well in small to medium-sized classes, its effectiveness in large, multi-section courses needs further examination. Instructor readiness, digital competence, and institutional support are also critical factors in determining the broader applicability of the model. Nevertheless, the findings from this research provide a strong foundation for future exploration and adoption of blended learning innovations grounded in creativity and supported by familiar digital tools. In conclusion, the model developed and tested in this study demonstrates that creative thinking can be significantly enhanced when instructional design combines cooperative learning strategies with digital media integration. By utilizing the structured processes of the Treffinger model and leveraging the interactive capabilities of Facebook, the learning experience becomes more engaging, reflective, and transformative. This study contributes to educational innovation by showing how accessible technologies, when used with intentional pedagogy, can redefine the way creativity is taught and learned in higher education.

## 5. Conclusion

This study set out to develop an instructional model that effectively integrates creativity development with digital tools in higher education. Through the systematic design, validation, and implementation of a Treffinger-based cooperative learning model, supported by blended learning and Facebook, this research has made significant contributions to both pedagogical theory and instructional practice. The success of the model in fostering creative thinking, enhancing academic interaction, and providing scalable solutions for resource-limited educational contexts highlights its potential as a transformative innovation for teacher education and beyond. Grounded in the theoretical integration of Treffinger's model and cooperative learning, this framework responds to the realities of contemporary digital learning by leveraging Facebook as the primary online learning platform. This approach proved not only pragmatic but also revolutionary, addressing fundamental challenges in higher education student passivity, lack of engagement, and limited opportunities for creative exploration by fostering an interactive, student-centered learning environment. The use of Facebook, an application already embedded in students' daily lives, lowered barriers to participation and provided a level of familiarity absent in conventional Learning Management Systems (LMS). Quantitative results demonstrated that the model significantly enhanced students' creative thinking across multiple dimensions fluency, flexibility, originality, and elaboration. The findings validate the pedagogical premise that creativity is not an innate talent but a skill that can be actively cultivated through structured and immersive learning environments. Importantly, the model exhibited inclusive potential, with lower-performing students showing the most pronounced improvement, reinforcing its capacity to level the learning field and provide equitable opportunities for intellectual growth.

Beyond statistical outcomes, qualitative analysis revealed profound shifts in student behavior, engagement, and learning ownership. Students reported heightened confidence in expressing ideas, increased motivation to participate in discussions, and a strengthened sense of personal agency over their academic development. These behavioral changes underscore a broader pedagogical transformation, where learning transcends the passive reception of knowledge and becomes an active, reflective, and collaborative process. The practicality of the model was further affirmed by both students and instructors, who found the structure, materials, and activity sequence highly accessible and implementable. The guidebooks provided a clear instructional roadmap, facilitating an intuitive transition from offline preparation to face-to-face interaction, online Facebook discussions, and final reflective synthesis. This cyclical learning flow reinforced continuity, depth, and sustained engagement, ensuring that students were consistently immersed in both cognitive and creative processes. Significantly, the model's success did not rely on expensive technologies or proprietary LMS, making it exceptionally suitable for resource-constrained institutions seeking effective educational innovations.

From a theoretical standpoint, this research contributes to the evolving discourse on creativity in instructional design. The successful integration of Treffinger's creative problem-solving model within a blended learning framework reinforces

the idea that digital environments, when strategically structured, can serve as catalysts for cognitive growth and creative exploration. This aligns seamlessly with 21st-century educational imperatives, which emphasize creativity, collaboration, digital competence, and innovation as core competencies for future professionals. Furthermore, the model aligns with the Technological Pedagogical Content Knowledge (TPACK) framework, underscoring its instructional robustness. Educators successfully integrated disciplinary knowledge, pedagogical principles, and technological tools in ways that enriched student learning experiences beyond content delivery. By utilizing Facebook as a dynamic platform for peer collaboration and knowledge co-construction, the model extended learning beyond traditional boundaries, demonstrating how digital spaces can function as sites of cognitive and social development. Despite its successes, the study also highlights certain challenges and limitations. While Facebook proved to be an effective medium, its academic applicability depends on structured instructional planning, clear moderation strategies, and ethical considerations related to privacy and institutional oversight. Additionally, while the model demonstrated effectiveness in small to medium-sized groups, its scalability in larger and more diverse classrooms remains an open question an area for future exploration.

Moving forward, future research should focus on longitudinal studies to assess the sustained impact of the model on students' creativity, engagement, and digital literacy. Investigating cross-disciplinary applications would reveal how the model functions beyond physics education, particularly in the humanities, social sciences, and discussion-based disciplines. Comparative studies leveraging alternative digital platforms, such as Discord, Telegram, or institutional LMS, could provide deeper insights into platform-specific affordances and student engagement patterns. Additionally, extending the model to incorporate assessment tools measuring digital literacy and collaborative problem-solving skills would further strengthen its relevance in contemporary education. In sum, this study demonstrates the feasibility and transformative potential of combining established pedagogical frameworks with accessible digital tools. The success of the Treffinger-based blended learning model in improving creative thinking, fostering academic interaction, and ensuring instructional practicality marks a significant step toward redefining higher education for the digital age. As universities continue to innovate and adapt to evolving educational landscapes, this research provides both a theoretical foundation and a practical blueprint for future instructional advancements. By bridging the gaps between traditional and digital learning, structure and flexibility, cognition and connectivity, this model exemplifies a future in which education becomes more human, more creative, and more responsive to student needs. It is hoped that this work will inspire educators, curriculum designers, and policymakers to reimagine learning spaces both physical and virtual, where creativity thrives, collaboration flourishes, and students are empowered to succeed in an ever-changing world.

## References


[1] B. Trilling and C. Fadel, *21st century skills: Learning for life in our times*. San Francisco, CA: John Wiley & Sons, 2009.

[2] R. Asmara, S. Zubaidah, S. Mahanal, and N. Sari, "Levels of inquiry and reading-questioning-answering (LoIRQA) to enhance high school students' critical and creative thinking," *International Journal of Instruction*, vol. 16, no. 3, pp. 325–342, 2023.

[3] S. Zubaidah, E. Angraini, and H. Susanto, "TPACK-based active learning to promote digital and scientific literacy in genetics," *Pegem Journal of Education and Instruction*, vol. 13, no. 2, pp. 50-61, 2023. https://doi.org/10.47750/pegegog.13.02.07

[4] E. Supriyadi, "Exploring the use of ChatGPT in writing mathematics education articles," *Papanda Journal of Mathematics and Science Research*, vol. 1, no. 2, pp. 54-68, 2022. https://doi.org/10.56916/pjmsr.v1i2.252

[5] Y. Supriani, F. Meliani, A. Supriyadi, S. Supiana, and Q. Y. Zaqiah, "The process of curriculum innovation: Dimensions, models, stages, and affecting factors," *Nazhruna: Jurnal Pendidikan Islam*, vol. 5, no. 2, pp. 485-500, 2022. https://doi.org/10.31538/nzh.v5i2.2235

[6] S. Supriyadi, R. M. Lia, A. Rusilowati, W. Isnaeni, E. Susilaningsih, and S. Suraji, "Preparation of diagnostic assessment instruments for the preparation of the independent curriculum," *Journal of Community Empowerment*, vol. 2, no. 2, pp. 67-73, 2022. https://doi.org/10.15294/jce.v2i2.61886

[7] Z. Almahasees, K. Mohsen, and M. O. Amin, "Faculty's and students' perceptions of online learning during COVID-19," *Frontiers in Education*, vol. 6, p. 638470, 2021. https://doi.org/10.3389/feduc.2021.638470

[8] S. Ghavifekr and M. I. Ramzy, "Exploring effective leadership practices of private school principals to improve teachers' academic excellence and students' learning achievement," *Journal of Research in Education Sciences*, vol. 65, no. 3, p. 123, 2020. https://doi.org/10.6209/JORIES.202009_65(3).0005

[9] S. Ghavifekr, "Collaborative learning: A key to enhance students'social interaction skills," *Malaysian Online Journal of Educational Sciences*, vol. 8, no. 4, pp. 9-21, 2020.

[10] C. K. Chia, S. Ghavifekr, and A. Z. A. Razak, "Online interview tools for qualitative data collection during Covid-19 pandemic; Riview of web conferencing platforms' functionality," *Malaysian Journal of Qualitative Research*, vol. 7, no. 1, pp. 95-106, 2020.

[11] H. Treffinger, "An algebraic approach to Harder-Narasimhan filtrations," *arXiv preprint arXiv:1810.06322*, 2018. https://doi.org/10.1016/j.jpaa.2024.107817

[12] T. Brüstle, D. Smith, and H. Treffinger, "Stability conditions and maximal green sequences in abelian categories," *arXiv preprint arXiv:1805.04382*, 2018. https://doi.org/10.48550/arXiv.1805.04382

[13] R. Yusof, N. H. M. Harith, A. Lokman, M. F. Abd Batau, Z. M. Zain, and N. H. Rahmat, "A study of perception on students' motivation, burnout and reasons for dropout," *International Journal of Academic Research in Business and Social Sciences*, vol. 13, no. 7, pp. 403-432, 2023. http://dx.doi.org/10.6007/IJARBSS/v13-i7/17187

[14] Y. M. Al-Dheleai *et al.*, "Rasch model for measuring the validity and reliability of the peers online learning interaction questionnaire (Poli-Q) for higher education course," *Journal of Institutional Research South East Asia*, vol. 19, no. 1, pp. 1-21, 2021.

[15] S. Alraih *et al.*, "Revolution or evolution? Technical requirements and considerations towards 6G mobile communications," *Sensors*, vol. 22, no. 3, p. 762, 2022. https://doi.org/10.3390/s22030762

[16] A. Sharma *et al.*, "CRISPR-Cas9 editing of the HBG1 and HBG2 promoters to treat sickle cell disease," *New England Journal of Medicine*, vol. 389, no. 9, pp. 820-832, 2023.
[17] N. Nieveen and E. Folmer, "Formative evaluation in educational design research," *Design Research*, vol. 153, no. 1, pp. 152-169, 2013.
[18] T. Plomp, "Educational design research: An introduction," *Educational Design Research*, vol. 1, pp. 11-50, 2013.
[19] G. Plomp, A. Hervais-Adelman, L. Astolfi, and C. M. Michel, "Early recurrence and ongoing parietal driving during elementary visual processing," *Scientific reports*, vol. 5, no. 1, p. 18733, 2015. https://doi.org/10.1038/srep18733
[20] A. M. Letelay, H. S. P. Manalu, F. P. Senewe, K. L. Tobing, S. Shinta, and M. Wahidin, "Community perception in preventing cases of COVID-19 in Bogor City in 2020," *Global Medical & Health Communication*, vol. 11, no. 2, pp. 87-94, 2023. https://doi.org/10.29313/gmhc.v11i2.10419
[21] D. A. J. Van, R. M. Branch, K. Gustafson, N. Nieveen, and T. Plomp, *Design approaches and tools in education and training*. Dordrecht, Netherlands: Springer Science & Business Media, 2012.
[22] M. B. Miles and A. M. Huberman, *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage, 1994.
[23] A. J. Onwuegbuzie and R. K. Weinbaum, "Mapping Miles and Huberman's within-case and cross-case analysis methods onto the literature review process," *Journal of Educational Issues*, vol. 2, no. 1, pp. 265-288, 2016.
[24] I. Muda, "Educational institution performance measurement based on Miles and Huberman models using balanced scorecard approach," *Calitatea*, vol. 20, no. 170, pp. 32-41, 2019.
[25] M. Huberman and M. B. Miles, *The qualitative researcher's companion*. Thousand Oaks, CA: Sage, 2002.
[26] C. K. Yap *et al.*, "Usability of university websites as information sources: A review and synthesis based on 2021 publications indexed in Scopus database," *Cloud Computing and Data Science*, vol. 4, no. 1, pp. 60-76, 2023. https://doi.org/10.37256/ccds.4120232019
[27] M. Misanchuk and T. Anderson, "Building community in an online learning environment: Communication, cooperation and collaboration," presented at the Middle Tennessee State University Instructional Technology Conference, Murfreesboro, TN, 2001.
[28] A. P. Schmitz and J. Foelsing, *Social collaborative learning environments: A means to reconceptualise leadership education for tomorrow's leaders and universities? In The Disruptive Power of Online Education*. Bingley, UK: Emerald Publishing Limited, 2018.
[29] M. Keppell, E. Au, A. Ma, and C. Chan, "Peer learning and learning-oriented assessment in technology-enhanced environments," *Assessment & Evaluation in Higher Education*, vol. 31, no. 4, pp. 453-464, 2006. https://doi.org/10.1080/02602930600679159
[30] M. Umar and I. Ko, "E-learning: Direct effect of student learning effectiveness and engagement through project-based learning, team cohesion, and flipped learning during the COVID-19 pandemic," *Sustainability*, vol. 14, no. 3, p. 1724, 2022. https://doi.org/10.3390/su14031724
[31] Y. H. Chen, S. J. Jang, and P. J. Chen, "Using wikis and collaborative learning for science teachers' professional development," *Journal of Computer Assisted Learning*, vol. 31, no. 4, pp. 330-344, 2015.
[32] J. Bidarra and E. Rusman, "Towards a pedagogical model for science education: Bridging educational contexts through a blended learning approach," *Open Learning: The Journal of Open, Distance and e-Learning*, vol. 32, no. 1, pp. 6-20, 2017. https://doi.org/10.1080/02680513.2016.1265442
[33] J. L. Ramos, A. A. Cattaneo, F. P. de Jong, and R. G. Espadeiro, "Pedagogical models for the facilitation of teacher professional development via video-supported collaborative learning. A review of the state of the art," *Journal of Research on Technology in Education*, vol. 54, no. 5, pp. 695-718, 2022.