Journal of Theoretical and Applied Information Technology
15th April 2025. Vol.103. No.7

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

AI-AUGMENTED PEDAGOGICAL FRAMEWORK FOR SUPERIOR LITERATURE REVIEW PROFICIENCY

SAWANAN DANGPRASERT[1]

[1]Education Technology and Information Science Department, Faculty of Technical Education, King Mongkut's University of Technology North Bangkok, Thailand
E-mail: [1]sawanan.d@fte.kmutnb.ac.th

ABSTRACT

This study addresses the persistent challenge of inefficiency and limited precision in conducting literature reviews, which often hinder academic progress. To overcome these obstacles, the research aimed to develop and evaluate an AI-Augmented Pedagogical Framework for Superior Literature Review Proficiency, named **CRAFT** (Collecting, Reviewing, Analyzing, Framing, and Tailoring). Integrating advanced AI tools—such as SciSpace, Semantic Scholar, Google Scholar, Mendeley, Zotero, QuillBot, Grammarly, and Turnitin—CRAFT seeks to streamline repetitive tasks, accelerate data synthesis, and uphold academic integrity within the literature review process. A mixed-methods design was employed. Data were gathered through semi-structured interviews, online surveys, and pre-test/post-test assessments with 30 researchers from diverse disciplines.

MANOVA results indicated significant improvements across five core skill areas: searching, reviewing, analyzing, synthesizing, and presenting. Participants achieved a 60.8% reduction in task completion time and attained a 92% precision rate. Qualitative thematic analysis reinforced these findings, underscoring enhanced critical thinking, deeper comprehension, and stronger interdisciplinary collaboration. Despite challenges, including initial costs for AI tools and the need for human oversight to address contextual limitations, the study concludes that CRAFT provides a flexible, accessible, and personalized framework adaptable to various research contexts. The framework holds potential to transform academic practices and promote scalable AI integration in education. Future research should focus on refining CRAFT's adaptability, enhancing cost-effectiveness, and addressing ethical implications within diverse educational settings.

Keywords: *Pedagogical Framework, Literature Review, AI Tools Integration, Research Proficiency, Artificial intelligence*

1. INTRODUCTION

The literature review process is indispensable to academic research, forming the backbone of knowledge development and guiding future research directions. However, in Thailand, researchers frequently encounter persistent challenges such as dispersed information sources, complex data analysis, and overwhelming data volumes, leading to inefficiencies and inaccuracies in interpretation [1].

These obstacles not only hinder research productivity but also affect the quality and integrity of academic outputs. Therefore, there is a critical need for innovative, technology-driven solutions that enhance efficiency and accuracy in the literature review process. This need aligns with national strategic frameworks, including the 20-Year National Strategy (2018–2037) and the 13th National Economic and Social Development Plan (2023–2027), which emphasize leveraging advanced technologies to promote sustainable development And research innovation [2].

To address these challenges, the integration of Artificial Intelligence (AI) into literature reviews presents a transformative solution. AI can significantly reduce the time required for reviews, enhance information retrieval accuracy, and enable systematic data synthesis [3]. The research introduces the CRAFT Framework—a structured approach focusing on Collecting, Reviewing, Analyzing, Framing, and Tailoring literature using AI tools. These include Google Scholar, Zotero, Semantic Scholar, Mendeley, Turnitin, Grammarly, and QuillBot, which collectively streamline data collection, analysis, organization, and ensure academic rigor [4].

The integration of Artificial Intelligence (AI) in literature review processes offers substantial benefits for graduate students and academic faculty. AI technologies streamline complex tasks, enhancing the efficiency and precision of

academic research. These tools contribute to maintaining academic integrity by facilitating advanced plagiarism detection, ensuring citation accuracy and supporting systematic data management. Furthermore, AI enhances analytical rigor, allowing researchers to allocate greater focus toward critical interpretation and the development of innovative contributions. By automating labor-intensive aspects of the review process, AI not only optimizes workflow but also elevates the quality and reliability of research outcomes, aligning with the standards of contemporary academic scholarship [5][6].

The research employs a mixed-methods design to ensure a comprehensive evaluation of the AI-augmented framework. Quantitative data were collected through pre-test and post-test assessments to measure improvements in literature review proficiency, focusing on key skill areas such as searching, analyzing, synthesizing, and presenting. Complementarily, qualitative data were obtained via semi-structured interviews and online surveys to capture in-depth insights into participants' experiences, challenges, and perceptions regarding AI tool utilization. AI tools were systematically integrated at various stages of the literature review process to streamline workflows, validate information accuracy, and facilitate efficient data synthesis. This methodological approach ensures both statistical rigor and contextual depth, enhancing the reliability and applicability of the research findings.

Beyond enhancing efficiency, Artificial Intelligence (AI) serves as a catalyst for interdisciplinary research by leveraging machine learning algorithms and semantic analysis to identify and establish connections across diverse academic domains [7]. This capability not only facilitates the integration of knowledge from multiple disciplines but also strengthens researchers' competencies in critical thinking, data summarization, and the synthesis of complex information. Such advancements align with strategic national frameworks, including the National Digital Economy and Society Development Plan (2018–2037) and the National Education Plan (2017–2036), which emphasize the role of technology in advancing educational standards and digital competencies [8]. Collectively, these developments contribute to Thailand's strategic objective of cultivating a knowledge-based society, thereby enhancing global competitiveness in the domains of education and research [9].

2. REVIEW OF LITERATURE

2.1 Conceptual Foundations of Literature Review

A literature review is a structured and systematic process essential in academic research, enabling researchers to synthesize and analyze scholarly works across diverse sources. It forms the foundation for understanding the state of knowledge within a specific field, serving as a critical tool for identifying research gaps and laying the groundwork for future investigations [10]. A robust literature review contextualizes the research problem, evaluates existing findings, and integrates these into a cohesive framework for inquiry. The objectives of a literature review include establishing a theoretical framework, identifying underexplored areas, and avoiding redundancy by building upon prior research [11].

2.1.1 Importance and Objectives of a Literature Review

The primary role of a literature review is to position the research problem within a theoretical context, leveraging existing studies to provide depth and direction. By systematically examining prior work, researchers identify gaps that offer opportunities for further investigation [12]. This process ensures efficient resource utilization while contributing to the advancement of academic discourse. Additionally, a well-conducted review prevents duplication, fostering innovation and enabling researchers to draw on diverse perspectives [13].

2.1.2 Approaches and Framework for Conducting a Literature Review

Conducting an effective literature review involves systematic methodologies and structured frameworks. Researchers must first define the scope of the review, outline objectives, and ensure alignment with the broader research agenda. The next step is a comprehensive search using academic databases like Scopus, PubMed, and Google Scholar. Employing advanced search techniques, including keyword optimization and filtering by relevance, ensures comprehensive coverage [14]. Once literature is identified, it is critically analyzed for validity, reliability, and relevance. The synthesis phase organizes findings into a coherent narrative, highlighting patterns, trends, and research gaps [15].

2.1.3 Tools and Resources for Literature Review

Integrating advanced tools and resources enhances the efficiency and depth of literature reviews. Platforms like Scopus and Google Scholar provide extensive access to scholarly databases, while reference management tools such as Zotero, EndNote, and Mendeley streamline citation

organization and formatting [16]. Utilizing advanced search filters, such as those based on publication date or document type, ensures that searches align precisely with research objectives [17].

2.1.4 Writing, Citation, and Evaluation

The results of a literature review should be presented systematically, often categorized into themes or topics aligned with the central objectives of the review. This structure facilitates a clear synthesis of existing knowledge while identifying novel perspectives and research gaps [18]. Accurate citation using standardized formats like APA or MLA ensures credibility and transparency. Reference management tools simplify this process, maintaining consistency and facilitating verification [19]. Evaluation of a literature review focuses on completeness, coherence, and relevance, ensuring it integrates diverse perspectives impartially while representing a comprehensive view of the existing knowledge landscape [20].

2.2 Application of Artificial Intelligence in Literature Review

2.2.1 The Role of Artificial Intelligence in Literature Review

The integration of Artificial Intelligence (AI) into literature reviews has transformed the way researchers handle academic tasks, improving efficiency, accuracy, and objectivity. AI tools automate data retrieval, analysis, and synthesis, enabling researchers to manage large datasets and identify critical insights more effectively [21]. For example, tools such as Semantic Scholar and Google Scholar leverage Natural Language Processing (NLP) to enhance search precision and reduce the time spent on manual searches, ensuring a comprehensive and targeted literature overview [22]. AI further facilitates advanced data analysis and synthesis by exploring themes, patterns, and relationships within datasets, allowing researchers to create holistic reviews that address complex academic inquiries. Tools like QuillBot excel in summarizing findings and rephrasing text for clarity, thereby uncovering knowledge gaps that may guide future research [23].

Additionally, AI improves writing and referencing processes, with tools such as Grammarly ensuring linguistic precision and Turnitin verifying citation accuracy, thus maintaining academic integrity [24]. By automating keyword extraction and data organization, AI minimizes human biases, ensuring objectivity and consistency in literature reviews. Its ability to link interdisciplinary studies through tools like Google Scholar fosters innovation by bridging gaps across academic fields, contributing to more comprehensive and integrated reviews [25].

2.2.2 AI Tools and Technologies for Literature Review Processes

AI-powered tools have revolutionized the literature review process by enhancing efficiency, precision, and depth of analysis. SciSpace supports formulating research objectives and provides tailored recommendations for initiating reviews effectively. Semantic Scholar utilizes NLP to filter and prioritize academic documents, significantly reducing search times while ensuring comprehensive resource access [26]. Google Scholar assists in identifying relevant literature and enables advanced filtering for better results. Reference management tools like Mendeley and Zotero streamline citation organization and support systematic data management[16]. Grammarly and Turnitin ensure linguistic precision and academic integrity by minimizing errors in writing and referencing processes. Furthermore, QuillBot specializes in text summarization and rephrasing, helping researchers produce polished and cohesive outputs [27].

2.2.3 Hypothesis for AI Integration in Literature Review

Given the persistent challenges in conducting literature reviews—such as inefficiency, complexity, and ensuring academic rigor—this study proposes the following hypothesis:

Hypothesis: The integration of AI-powered tools within the literature review process will significantly enhance efficiency, accuracy, and critical analysis by reducing task completion time, improving information retrieval precision, and facilitating systematic data synthesis. This integration is expected to address existing research inefficiencies, promote academic integrity, and support interdisciplinary collaboration.

This hypothesis forms the foundation for evaluating the effectiveness of AI-driven tools in improving literature review processes, ensuring systematic research development, and contributing to scalable academic solutions

2.3 The Use of AI to Enhance Pedagogical Frameworks

2.3.1 Design and Implementation of AI-Augmented Pedagogical Frameworks for Literature Reviews

The integration of Artificial Intelligence (AI) technologies into pedagogical frameworks has revolutionized the way literature reviews are taught and conducted, equipping students with systematic and efficient research tools[28]. Automated text analysis tools, such as NLP-based systems, play a

pivotal role by summarizing and extracting key information from academic texts, allowing students to identify central themes and critical resources for their research [29]. Additionally, adaptive content delivery systems enhance learning experiences by tailoring instructional materials to individual comprehension levels, ensuring a personalized and inclusive approach that meets diverse learner needs [30].

Moreover, AI simplifies reference management by organizing citations, streamlining access to resources, and automating repetitive tasks associated with effective literature reviews. Tools like Mendeley and EndNote exemplify how AI can reduce students' cognitive load, enabling them to focus more on critical analysis and synthesis [31]. This alignment of AI with pedagogical goals fosters deeper engagement, skill development, and enhanced academic outcomes.

2.3.2 Methods and Processes in Using AI for Teaching and Learning

AI-based teaching methods utilize advanced technologies to optimize the literature review process. Natural Language Processing (NLP) plays a pivotal role in analyzing and summarizing textual content, helping students process complex academic materials more efficiently. By extracting key themes and ideas, NLP tools simplify the review of extensive literature, making them particularly valuable in managing large datasets [32]. Adaptive learning systems enhance the teaching experience by adjusting materials to the specific needs and comprehension levels of individual students, ensuring a learner-centric approach to mastering literature review techniques [33]. Moreover, learning analytics offer insights based on data regarding student performance and challenges. This information helps educators devise tailored interventions and strategies to enhance the literature review process [34].

2.3.3 Impacts of AI-Augmented Pedagogical Frameworks

Adopting AI in pedagogical frameworks has substantially improved the quality and efficiency of literature reviews. By automating routine tasks, such as keyword searches and data organization, and personalizing learning experiences, AI reduces the cognitive load on students, allowing them to focus on critical analysis and synthesis [35]. These AI-driven tools not only foster structured and efficient learning environments but also better prepare students for the complexities of future academic and professional research endeavors. The structured nature of AI-supported frameworks ensures high-quality outputs and equips students with essential skills for academic success, including critical thinking and data synthesis [36].

2.4 Impacts and Benefits of AI in Literature Reviews

2.4.1 Evaluation of AI in Literature Review Processes

The integration of AI in literature reviews has profoundly enhanced research workflows by improving data retrieval, analysis, and synthesis. AI tools such as Semantic Scholar and Elicit leverage Natural Language Processing (NLP) to accelerate data searches, reduce manual efforts, and enhance search precision, enabling researchers to gain a comprehensive understanding of the literature in a fraction of the time [37]. Advanced tools like Consensus and Iris.ai facilitate the identification of patterns, trends, and relationships within datasets, empowering researchers to uncover complex interconnections and address significant gaps in knowledge [38]. Additionally, AI enhances the accuracy and objectivity of literature reviews by automating tasks such as keyword extraction and citation verification. Tools like Turnitin and Grammarly ensure academic integrity and linguistic precision, minimizing errors and biases in the review process [39]. Moreover, conversational AI tools have demonstrated their capacity to enhance engagement and cognitive processes by providing immediate feedback, a feature that aligns with their growing use in educational research [40].

2.4.2 Case Studies of AI Applications in Literature Reviews

AI tools have demonstrated remarkable efficiency and effectiveness in literature reviews. For example, Semantic Scholar reduces data screening time by over 40%, while enhancing the precision of document identification through advanced NLP algorithms. Similarly, Iris.ai excels in interdisciplinary research by mapping scientific trends and pinpointing knowledge gaps, which is particularly valuable for complex research domains like renewable energy [26]. Automated Essay Scoring (AES) tools, such as Grammarly, have improved the grammatical accuracy and structural coherence of student writing by up to 70%, producing high-quality academic documents with reduced effort [41].

Furthermore, Intelligent Tutoring Systems (ITS) offer personalized feedback and adaptive learning experiences, fostering engagement and skill development among postgraduate researchers by tailoring content to their specific needs and improving academic outcomes [42]. AI-driven Educational Data Mining (EDM) platforms, such as

Learning Analytics, monitor and analyze student behaviors to optimize teaching strategies, addressing specific learning challenges and fostering more effective educational environments [43]. These tools illustrate the transformative potential of AI in enhancing academic productivity, particularly through the integration of user-centered design principles and adaptive feedback mechanisms [44].

2.4.3 Limitations of AI in Literature Reviews

While AI has greatly enhanced the literature review process, it is not without limitations. Human oversight remains crucial to addressing AI's lack of contextual understanding, which can lead to misinterpretations of nuanced or complex information. Additionally, the cost of advanced AI tools limits accessibility for under-resourced institutions, presenting a challenge for researchers in developing regions [45]. Ethical concerns, such as data privacy and the biases embedded within AI algorithms, require vigilant management to ensure fairness and transparency in AI-assisted research [46].

2.4.4 Impacts and Benefits of AI in Literature Reviews

AI has significantly enhanced the efficiency, accuracy, and depth of literature reviews. Tools such as Semantic Scholar and Elicit reduce the time required for comprehensive searches by automating repetitive tasks, enabling researchers to allocate more time to data synthesis and interpretation [47]. Grammarly and Turnitin ensure the precision of academic writing and citation integrity, minimizing errors in documentation. AI tools like Consensus and Iris.ai support interdisciplinary collaboration by bridging knowledge gaps across fields and facilitating innovative research [48]. Moreover, AI helps develop critical thinking skills by systematically organizing information and providing structured insights, a benefit particularly useful for early-career researchers and students [49]. Despite the initial investment costs, the long-term benefits of AI in improving research efficiency and reducing workloads make it a valuable tool for both individual researchers and institutions [50].

3. RESEARCH METHODOLOGY

This study adopted a mixed-methods research design to design, implement, and evaluate the AI-Augmented Pedagogical Framework for enhancing literature review proficiency. This approach integrates both qualitative and quantitative methodologies, ensuring a comprehensive understanding of the framework's effectiveness. This design approach aligns with prior research methodologies employed in diverse regions and disciplines, such as AI-focused educational studies in higher education and interdisciplinary research on AI integration. By adopting this approach, the study ensures methodological rigor and contextual relevance.

3.1 Research Tools

A combination of qualitative, quantitative, and AI-based tools was employed to address the research objectives. All tools underwent validation through expert review using the Index of Item-Objective Congruence (IOC) and other relevant metrics to ensure reliability and alignment with the study's goals.

Semi-structured interviews were designed to explore challenges faced by researchers in conducting literature reviews and to gather insights into their expectations of AI tools. The interview questions addressed five core dimensions of the literature review process: preparation, searching, analysis, synthesis, and presentation. Content validity was assessed by three experts in educational research using IOC, with scores ranging from 0.80 to 1.00. Items scoring below 0.80 were revised for clarity and alignment. A pilot test involving five researchers further refined the questions. Data collected during the interviews were transcribed and analyzed using NVivo software, enabling the identification of recurring themes that informed the framework's design.

Online surveys were administered to evaluate researchers' satisfaction with existing tools and to identify functional gaps for AI integration. The survey included a combination of Likert-scale and open-ended questions. Content validity was verified by five experts using IOC, with all items achieving scores of 0.85 or higher. Reliability was confirmed through a pilot test with 20 participants, which yielded a Cronbach's alpha of 0.91. The survey responses provided key insights for selecting and integrating AI tools into the framework.

Pre-test and post-test assessments were developed to measure participants' proficiency across five key skill areas: searching, analyzing, synthesizing, organizing, and presenting. The content validity of assessment items was evaluated by three experts, with IOC scores ranging from 0.80 to 1.00. Difficulty (P) and discrimination (D) indices were calculated using pilot test data from 10 participants. Items with difficulty indices between 0.20 and 0.80 and discrimination indices above 0.30 were retained, while others were revised. The assessments were tested for reliability, yielding a Cronbach's alpha of 0.89. Table 1 summarizes the

validation metrics for the pre-test and post-test assessments.

Table 1: Validation Metrics for Pre-Test and Post-Test

Metric	Range	Scores	Interpretation
Content Validity (IOC)	0.67–1.00	0.80–1.00	High content validity
Difficulty Index (P)	0.20–0.80	0.30–0.75	Balanced item difficulty
Discrimination Index (D)	>0.30	0.35–0.60	Strong item discrimination
Reliability (Cronbach)	>0.70	0.89	High internal consistency

Specific AI tools were integrated into each stage of the literature review process. Their outputs were validated through expert review using the Index of Item-Objective Congruence (IOC), ensuring consistency and reliability. Table 2 summarizes the tools used, their roles, and validation processes.

Table 2: Expert Validation of AI Tools Integrated into the Craft Framework.

Stage	AI Tool(s)	Role	References
Collecting	SciSpace, Google Scholar	Topic identification, keyword generation	[24][35]
Reviewing	Semantic Scholar, Google Scholar	Advanced search techniques, data retrieval	[21][37]
Analyzing	Mendeley, QuillBot	Critical thinking, thematic analysis	[8][36] [48]
Framing	Mendeley, Zotero	Information integration, concept mapping	[21][26] [28]
Tailoring	Grammarly, Turnitin, QuillBot	Writing clarity, citation accuracy	[16][19] [24]

Note: Expert validation (IOC ≥ 0.80) was conducted across all stages.

3.2 Participants

Participants for this study were recruited through academic-focused Facebook groups and targeted announcements that outlined the study's goals and methodology. Researchers with at least two years of experience in conducting literature reviews were invited to apply via an online form. A purposive sampling method was used to select 30 participants, ensuring diversity in research backgrounds while maintaining statistical reliability. This sample included researchers from various academic disciplines to evaluate the framework's adaptability and effectiveness across different contexts.

3.3 Data Collection

Data were collected across multiple phases to assess the framework's impact on literature review proficiency. Pre-test and post-test assessments evaluated participants' skills in five key areas: searching, analyzing, synthesizing, organizing, and presenting. Practical tasks required participants to identify relevant articles, evaluate thematic trends, create concept maps, and produce polished outputs. During the intervention phase, participants engaged with the AI tools recommended for each stage of the framework. Observational data were collected during these tasks to capture participants' interactions with the tools. Post-intervention surveys gathered feedback on user experience, tool usability, and perceived skill improvements. The multi-method approach ensured comprehensive insights into the framework's effectiveness.

3.4 Data Analysis

The collected data were analyzed using a combination of qualitative and quantitative methods. Pre-test and post-test scores were compared using Multivariate Analysis of Variance (MANOVA) to evaluate improvements across the five skill dimensions. The analysis revealed statistically significant enhancements in participants' literature review skills, with a large effect size indicating the framework's effectiveness. Pearson's Correlation Coefficients were calculated to examine the relationships between skill areas, identifying strong interdependencies such as the correlation between searching and analysis skills. Multiple Regression Analysis (MRA) was performed to predict the impact of each skill dimension on overall literature review proficiency. Qualitative data from interviews and observational notes were analyzed with NVivo to extract themes and patterns, complementing the quantitative findings. These analyses confirmed the framework's effectiveness in streamlining the literature review process and improving academic competencies.

4. FINDINGS

The findings of this study underscore the effectiveness of the AI-augmented pedagogical Framework in enhancing literature review proficiency. The results are categorized into key areas to comprehensively assess the framework's design, implementation, and impact. Figure 1 provides a visual representation of the framework, illustrating its five core stages and the AI tools integrated at each step.

4.1 Overview of the CRAFT Framework

The CRAFT Framework is systematically structured into five stages: Collecting, Reviewing, Analyzing, Framing, and Tailoring. Each stage

incorporates advanced AI tools tailored to streamline literature review tasks, optimize workflows, and enhance research proficiency. These stages are visually represented in Figure 1, which illustrates how AI technologies are integrated at every process step.

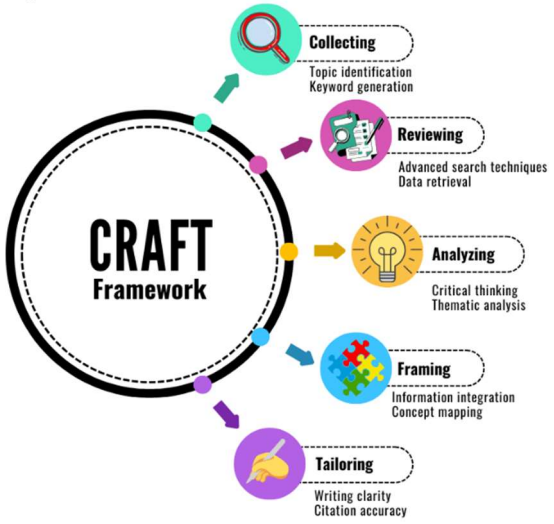

Figure 1. The CRAFT Framework.

The framework's design prioritizes seamless integration of AI technologies to optimize the literature review process. For example:

- Collecting Stage: Tools like SciSpace and Google Scholar assist in brainstorming and generating precise keywords to define the research scope.
- Reviewing Stage: Platforms like Semantic Scholar and Google Scholar enable advanced search techniques, helping researchers efficiently retrieve and prioritize relevant academic resources.
- Analyzing Stage: AI-powered tools like Mendeley and QuillBot facilitate thematic analysis, trend identification, and knowledge gap detection.
- Framing Stage: Applications such as Mendeley and Zotero support the organization of data into conceptual frameworks and thematic summaries.
- Tailoring Stage: Tools like Grammarly, Turnitin, and QuillBot ensure linguistic precision, citation accuracy, and academic integrity in the final outputs.

This systematic approach reduces cognitive load and allows researchers to build essential academic skills, ensuring high-quality outputs that meet rigorous academic standards.

4.2 Effectiveness of the Framework

Table 3 presents an AI-driven research workflow that integrates specific AI tools at distinct stages of the research process. Each stage is associated with targeted skills and anticipated learning outcomes, contributing to enhanced research rigor and efficiency.

Table 3: AI-Driven Research Workflow: Stages, Tools, Skills, and Outcomes

Stage	AI Tool(s)	Skills Targeted	Expected Learning Outcomes
Collecting	SciSpace, Google Scholar	Topic identification & keyword generation	Clearly define research objectives and formulate precise search queries
Reviewing	Semantic Scholar, Google Scholar	Advanced search strategies & data retrieval	Efficiently identify and prioritize relevant academic resources
Analyzing	Mendeley, QuillBot	Critical thinking & thematic analysis	Assess research quality and discern underlying thematic trends
Framing	Mendeley, Zotero	Information integration & concept mapping	Synthesize diverse sources into coherent, comprehensive summaries
Tailoring	Grammarly, Turnitin, QuillBot	Writing clarity & citation accuracy	Produce refined academic outputs that align with ethical and scholarly standards.

As shown in Table 3, the systematic integration of AI tools across the research workflow is anticipated to improve both the efficiency and quality of academic outputs. The structured approach enables precise topic selection, effective literature retrieval, critical analysis, comprehensive synthesis, and refined writing—all of which contribute to higher research standards.

4.3 Statistical Analysis of Skill Improvement

A Multivariate Analysis of Variance (MANOVA) revealed substantial improvements in participants' skills across five dimensions: Searching, Analysis, Synthesis, Organization, and Presentation.

Table 4: MANOVA Results Across Learning Phases.

Effect	Value	F	df	Error df	Sig.
Intercept	0.999	12806.44	5	54	<0.001
Learning Phase	0.981	546.740	5	54	<0.001

The results (*Wilks' Λ* = 0.019, $F(5, 54) = 546.74$, $p < 0.001$) confirm statistically significant improvements across all skill dimensions. The high partial eta squared ($\eta^2 = 0.981$) indicates a strong effect size, thereby validating the efficacy of the framework.

4.4 Learner Satisfaction

Participants expressed high satisfaction with the framework's relevance, ease of use, and skill improvement, as summarized in Table 5.

Table 5: Learner Satisfaction Scores.

Aspect Evaluated	Mean Score (out of 5)	Score Level
Relevance to Learning Needs	4.7	Very High
Ease of Use of AI Tools	4.6	Very High
Efficiency in Improving Skills	4.5	Very High
Clarity of Framework Stages	4.4	High
Overall Satisfaction	4.7	Very High

Participants expressed high satisfaction with the CRAFT Framework's structured stages—Collecting, Reviewing, Analyzing, Framing, and Tailoring—emphasizing its relevance to their learning needs and the clarity of its stages.

4.5 Impact on Efficiency and Accuracy

Integrating AI tools within the CRAFT Framework led to a 60.8% reduction in the time required for conducting literature reviews. By systematically addressing tasks in the Collecting, Reviewing, Analyzing, Framing, and Tailoring stages, participants achieved a precision rate of 92% and demonstrated a high degree of confidence in their research outputs.

Table 6: Evaluation Metrics for Accuracy and Efficiency.

Metric	Value (%)
Precision	92
Recall	87
F1 Score	89

These metrics confirm the framework's capability to retrieve relevant information while maintaining precision and recall balance, empowering participants to confidently conduct high-quality research.

These findings validate the AI-augmented pedagogical Framework as a robust and scalable solution for improving literature review skills. The integration of AI tools across all stages provides measurable benefits, fostering efficiency, accuracy, and user satisfaction.

5. DISCUSSIONS AND CONCLUSIONS

5.1 Discussions

The study, "*CRAFT Framework for Superior Literature Review Proficiency*," developed and evaluated an innovative framework integrating artificial intelligence (AI) to address challenges in conducting literature reviews. The findings emphasize several critical insights and implications:

5.1.1 Enhanced Efficiency and Accuracy

The CRAFT Framework significantly reduced the time and complexity of literature reviews by automating repetitive tasks, including data collection, synthesis, and organization. For instance, tools like SciSpace in the Collecting stage and Semantic Scholar in the Reviewing stage expedited access to relevant academic resources, reducing search times by 60.8% while maintaining a precision rate of 92%. This enhanced efficiency enabled researchers to allocate more time to critical tasks in the Analyzing and Framing stages, ultimately improving the quality of their outputs [37].

5.1.2 Promotion of Critical Thinking Skills

AI tools such as Mendeley and QuillBot, employed QuillBot, in the Analyzing stage, played a pivotal role in fostering critical thinking by enabling researchers to identify patterns, gaps, and thematic trends in the literature. These tools, complemented by the adaptive features of QuillBot, supported innovative problem-solving approaches by enhancing data synthesis and clarity [8]. The Framing stage further empowered researchers to synthesize insights into conceptual frameworks, encouraging nuanced perspectives and deeper analytical skills [27].

5.1.3 Adaptation to Digital Pedagogy

The CRAFT Framework demonstrated the potential of AI in creating personalized and adaptive learning experiences. Adaptive Learning Systems (ALS), integrated into the Reviewing and Tailoring stages, tailored content delivery to individual learner needs, fostering better comprehension and engagement. These systems proved particularly effective in addressing participants' challenges in synthesizing data and presenting results [8].

5.1.4 Challenges and Limitations

While the CRAFT Framework significantly improved efficiency and accuracy, human oversight remained crucial in interpreting complex data and addressing contextual nuances. Accessibility to advanced AI tools, such as those used in the Collecting and Reviewing stages, presented challenges for under-resourced institutions, highlighting the importance of scalable and cost-effective solutions. Additionally, ethical concerns

related to algorithmic biases require continuous scrutiny to ensure fairness and inclusivity in AI-enhanced research [46].

5.1.5 Critique and Comparison with Current Solutions

While the CRAFT Framework demonstrated significant improvements in efficiency, accuracy, and critical thinking, the outcomes indicate areas for refinement. The initial goal of enhancing literature review proficiency through AI integration was met, as evidenced by the 60.8% reduction in task completion time and a 92% precision rate. However, challenges such as the need for human oversight and the initial costs of AI tools highlight limitations in achieving universal scalability.

When compared to current state-of-the-art solutions, such as AI-assisted frameworks like Iris.ai and Consensus, CRAFT offers a more structured and pedagogically focused approach. While existing tools emphasize data retrieval and thematic mapping, CRAFT's integration of adaptive learning systems and emphasis on academic integrity through tools like Turnitin and Grammarly provide added value in educational settings. However, unlike some state-of-the-art models, CRAFT requires continuous human validation, particularly in complex and interdisciplinary contexts.

Overall, CRAFT contributes to the field by providing a comprehensive, AI-integrated approach to literature reviews while acknowledging areas for further development, particularly in enhancing automation and reducing human intervention.

5.2 Conclusions

This study introduces the CRAFT Framework—a novel AI-augmented pedagogical approach that enhances literature review proficiency through structured integration of AI tools. The conclusions derived from the research include:

5.2.1 Improved Literature Review Processes

The CRAFT Framework demonstrated significant improvements in efficiency and quality, with researchers benefiting from targeted AI tools at each stage: Collecting, Reviewing, Analyzing, Framing, and Tailoring. Participants reported substantial reductions in task time, improved accuracy, and enhanced clarity in their outputs.

5.2.2 Scalable Model for Diverse Disciplines

The framework provides a scalable and adaptable model suitable for various academic disciplines. Its systematic structure ensures flexibility while maintaining consistency in integrating AI into teaching and research practices [33].

5.2.3 Scientific Contributions in Context of State-of-the-Art Solutions

This research contributes to advancing the state-of-the-art in AI-augmented pedagogical frameworks by demonstrating how systematic integration of AI tools enhances literature review proficiency. Unlike existing AI solutions that focus primarily on data retrieval or summarization [25][4], the CRAFT Framework offers a structured, multi-stage approach—emphasizing not only efficiency but also academic rigor, critical thinking, and personalized learning experiences. This positions CRAFT as a comprehensive model that bridges the gap between AI applications and pedagogical strategies, contributing new insights to the evolving literature on AI in education [8].

5.2.4 Future Research Directions

Further studies should investigate the long-term impacts of the CRAFT Framework on academic productivity and its effectiveness in under-resourced settings. Research exploring ethical considerations and mitigating algorithmic biases could enhance its scalability and inclusivity [25][39].

5.2.5 Summary of Scientific Contributions

The scientific contributions of this study lie in the development and validation of the CRAFT Framework, a structured and AI-integrated approach specifically designed to enhance literature review proficiency [48]. The framework's effectiveness is empirically validated, demonstrating improvements in efficiency, accuracy, and critical thinking among researchers [4]. Furthermore, its scalability and adaptability make it applicable across diverse academic disciplines, enhancing its relevance and potential for broader educational contexts [8][25]. These contributions significantly advance current knowledge and provide valuable insights into the integration of AI within educational methodologies, strengthening the discourse on AI-enhanced education and research practices.

6. Future Directions

Future research should focus on refining the CRAFT Framework to improve accessibility and scalability, exploring its applications in diverse educational contexts, and developing training modules for effective AI tool usage.

A list of acronyms

AI	Artificial Intelligence
ALS	Adaptive Learning Systems
APA	American Psychological Association
CRAFT	Collecting, Reviewing, Analyzing, Framing, and Tailoring
EDM	Educational Data Mining
IOC	Index of Item-Objective Congruence
ITS	Intelligent Tutoring Systems
MANOVA	Multivariate Analysis of Variance
MLA	Modern Language Association
NLP	Natural Language Processing
SPSS	Statistical Package for the Social Sciences

REFERENCES:

[1] Setthasuravich, P., & Pukdeewut, A., "Policy Capacity: A Scoping Review of Definitions, Conceptual Frameworks, Applications, and Future Research Directions", Local Administration Journal, Vol. 17, No. 2, 2024, pp. 261-294, Available online: https://so04.tci-thaijo.org/index.php/colakkujournals/article/download/271574/184643

[2] Office of the National Economic and Social Development Council. (2018). *20-Year National Strategy (2018–2037).* [Online]. Available: https://pub.nstda.or.th/gov-dx/national-strategy-2561-2580/

[3] Bolanos, F., et al. (2024). Artificial intelligence for literature reviews: Opportunities and challenges. *Artificial Intelligence Review.* https://doi.org/10.1007/s10462-024-10902-3

[4] Zawacki-Richter, O., et al. (2023). Artificial intelligence (AI) learning tools in K-12 education: A systematic review. *International Journal of Educational Technology.* https://doi.org/10.1007/s40692-023-00304-9

[5] Labadze, L., Grigolia, M., & Machaidze, L., "Role of AI chatbots in education: systematic literature review", Int J Educ Technol High Educ, Vol. 20, 2023, Article 56, Available online: https://doi.org/10.1186/s41239-023-00426-1.

[6] Ogwueleka, F. N., "Plagiarism Detection in the Age of Artificial Intelligence: Current Technologies and Future Directions", AI and Ethics, Academic Integrity and the Future of Quality Assurance in Higher Education, Vol. 10, 2025.

[7] Nedungadi, P., Surendran, S., Tang, K. Y., & Raman, R., "Big Data and AI Algorithms for Sustainable Development Goals: A Topic Modeling Analysis", IEEE Access, 2024, Available online: https://doi.org/10.1109/ACCESS.2024.3516500.

[8] Ko, S., & Chan, S. C., "A Framework for the Responsible Integration of Generative AI Tools in Learning", in *Teachers' Roles and Perspectives on AI Integration in Schools*, pp. 163-194, IGI Global Scientific Publishing, 2025, Available online: https://doi.org/10.4018/979-8-3373-1017-6.ch006.

[9] S. Bengesi, H. El-Sayed, M. K. Sarker, Y. Houkpati, J. Irungu, and T. Oladunni, "Advancements in Generative AI: A Comprehensive Review of GANs, GPT, Autoencoders, Diffusion Model, and Transformers," in *IEEE Access*, vol. 12, pp. 69812-69837, 2024, Available online: https://doi.org/10.1109/ACCESS.2024.3397775.

[10] Antons, D., Breidbach, C. F., Joshi, A. M., & Salge, T. O., "Computational literature reviews: Method, algorithms, and roadmap", *Organizational Research Methods*, Vol. 26, No. 1, 2023, pp. 107-138, Available online: https://doi.org/10.1177/1094428121991230.

[11] Arar, A. J., Poirier, E., & Staub-French, S., "A research and development framework for integrated project delivery", *Construction Management and Economics*, Vol. 43, No. 2, 2025, pp. 85-112, Available online: https://doi.org/10.1080/01446193.2024.2390529.

[12] Rivard, S., "Unpacking the process of conceptual leaping in the conduct of literature reviews", *The Journal of Strategic Information Systems*, Vol. 33, No. 1, 2024, Article 101822, Available online: https://doi.org/10.1016/j.jsis.2024.101822.

[13] Madden, J. C., Kandarova, H., Neuhaus, W., Osborne, N., Paini, A., Seabra, R., & Trigwell, S., "Journeying through journals: The publishing process and how to maximise research impact", *Alternatives to Laboratory Animals*, Vol. 52, No. 6, 2024, pp. 334-351, Available online: https://doi.org/10.1177/02611929241286624.

[14] Kumar, D., & Ratten, V., "Artificial intelligence and family businesses: a systematic literature review", *Journal of Family Business Management*, 2024, Available online: https://doi.org/10.1108/JFBM-08-2024-0160.

[15] van Riel, A., & Snyder, H., "Enhancing the impact of literature reviews: guidelines for making meaningful contributions", *Spanish Journal of Marketing-ESIC*, Vol. 28, No. 3,

2024, pp. 250-265, Available online: https://doi.org/10.1108/SJME-05-2024-0125.

[16] Asgary, S., & Parhizkar, A., "Momentous AI-aided Search Tools and Services for Academic and Research Tasks: A Review of the Literature", *Journal of Iranian Dental Association*, Vol. 36, No. 1, 2024, pp. 29-42, Available online: https://jida.ir/article-1-2256-en.pdf.

[17] Ali, A., Tufail, A., De Silva, L. C., & Abas, P. E., "Innovating patent retrieval: a comprehensive review of techniques, trends, and challenges in prior art searches", *Applied System Innovation*, Vol. 7, No. 5, 2024, Article 91, Available online: https://doi.org/10.3390/asi7050091.

[18] Verčič, A. T., Verčič, D., Čož, S., & Špoljarić, A., "A systematic review of digital internal communication", *Public Relations Review*, Vol. 50, No. 1, 2024, Article 102400, Available online: https://doi.org/10.1016/j.pubrev.2023.102400.

[19] Alshammari, S., Basalelah, L., Rukbah, W. A., Alsuhibani, A., & Wijesinghe, D. S., "PyZoBot: A Platform for Conversational Information Extraction and Synthesis from Curated Zotero Reference Libraries through Advanced Retrieval-Augmented Generation", *arXiv preprint arXiv:2405.07963*, 2024, Available online: https://doi.org/10.48550/arXiv.2405.07963.

[20] Abusaada, H., & Elshater, A., "Beyond keywords: Effective strategies for building consistent reference lists in scientific research", *Publications*, Vol. 12, No. 3, 2024, Article 25, Available online: https://doi.org/10.3390/publications12030025.

[21] Almasri, F., et al. (2024). Exploring the impact of artificial intelligence in teaching and learning of science: A systematic review of empirical research. *Research in Science Education, 54*, 977–997. https://doi.org/10.1007/s11165-024-10176-3.

[22] Gupta, A., Mittal, D., Goel, O., & Jha, S. K., "Natural language processing algorithms for domain-specific data extraction in material science: Reseractor", *Journal of Materials Science*, Vol. 59, No. 30, 2024, pp. 13856-13872, Available online: https://doi.org/10.1007/s10853-024-09980-z.

[23] Marengo, A., "Navigating the nexus of AI and IoT: A comprehensive review of data analytics and privacy paradigms", *Internet of Things*, 2024, Article 101318, Available online: https://doi.org/10.1016/j.iot.2024.101318.

[24] Demirel, E. T., "The Use and Perceptions Towards AI Tools For Academic Writing Among University Students", *Innovations in Language Teaching Journal*, Vol. 1, No. 1, 2024, pp. 1-20, Available online: https://doi.org/10.53463/innovltej.20240328.

[25] Bolaños, F., Salatino, A., Osborne, F., et al., "Artificial intelligence for literature reviews: opportunities and challenges", *Artificial Intelligence Review*, Vol. 57, 2024, Article 259, Available online: https://doi.org/10.1007/s10462-024-10902-3.

[26] TSE, Y. L., "Evaluation of AI-based Research Assistance Tools: A Case Study Research", *Doctoral dissertation, University of Graz*, 2024, Available online: https://unipub.unigraz.at/obvugrhs/content/titleinfo/9776783/full.pdf.

[27] Bui, T. T. U., & Tong, T. V. A., "The Impact of AI Writing Tools on Academic Integrity: Unveiling English-Majored Students' Perceptions and Practical Solutions", *AsiaCALL Online Journal*, Vol. 16, No. 1, 2025, pp. 83-110, Available online: https://doi.org/10.54855/acoj.251615.

[28] Mustafa, M. Y., Tlili, A., Lampropoulos, G., Huang, R., Jandrić, P., Zhao, J., ... & Saqr, M., "A systematic review of literature reviews on artificial intelligence in education (AIED): a roadmap to a future research agenda", *Smart Learning Environments*, Vol. 11, No. 1, 2024, pp. 1-33, Available online: https://doi.org/10.1186/s40561-024-00350-5.

[29] Aggarwal, D., Sharma, D., & Saxena, A. B., "A Comprehensive Analysis on the Application of Natural Language Processing (NLP) in Higher Education", in *2024 8th International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)*, IEEE, October 2024, pp. 897-904, Available online: https://doi.org/10.1109/I-SMAC61858.2024.10714892.

[30] Yevdokymova, N., "The Psychology of Personalized Education: Enhancing Learning through Individualization", *Available at SSRN 4732923*, 2024, Available online: https://dx.doi.org/10.2139/ssrn.4732923.

[31] S. Dangprasert, "The Impact of Gamification on Creative and Innovative Skills of Graduate Students," *Journal of Theoretical and Applied*

Information Technology, vol. 101, no. 8, Apr. 30, 2023. Available: https://www.jatit.org/volumes/Vol101No8/16Vol101No8.pdf.

[32] Ezzaim, A., Dahbi, A., Aqqal, A., & Haidine, A., "AI-based learning style detection in adaptive learning systems: a systematic literature review", *Journal of Computers in Education*, 2024, pp. 1-39, Available online: https://doi.org/10.1007/s40692-024-00328-9.

[33] Strielkowski, W., Grebennikova, V., Lisovskiy, A., Rakhimova, G., & Vasileva, T., "AI-driven adaptive learning for sustainable educational transformation", *Sustainable Development*, 2024, Available online: https://doi.org/10.1002/sd.3221.

[34] Drugova, E., Zhuravleva, I., Zakharova, U., & Latipov, A., "Learning analytics driven improvements in learning design in higher education: A systematic literature review", *Journal of Computer Assisted Learning*, Vol. 40, No. 2, 2024, pp. 510-524, Available online: https://doi.org/10.1111/jcal.12894.

[35] A. Al-Momani and T. Ramayah, "Adoption of Artificial Intelligence in Education: A Systematic Literature Review," in *Current and Future Trends on Intelligent Technology Adoption*, M.A. Al-Sharafi, M. Al-Emran, G.W.H. Tan, and K.B. Ooi, Eds., *Studies in Computational Intelligence*, vol. 1161, Springer, Cham, 2024. Available: https://doi.org/10.1007/978-3-031-61463-7_7.

[36] K. Wongmahesak, F. Karim, and N. Wongchestha, "Artificial Intelligence: A Catalyst for Sustainable Effectiveness in Compulsory Education Management," *Asian Education and Learning Review*, vol. 3, no. 1, 2025, pp. 4-4. Available: https://so07.tci-thaijo.org/index.php/AELR/article/download/6081/3880.

[37] A.A. Qaffas, "Harnessing Artificial Intelligence for Enhanced Efficiency in Academic Writing and Research," *Fusion: Practice & Applications*, vol. 16, no. 2, 2024. Available: https://doi.org/10.54216/FPA.160209.

[38] J.D. Brown, L. Lenchik, F. Doja, P. Kaviani, D. Judd, L. Probyn, *et al.*, "Leveraging Large Language Models in Radiology Research: A Comprehensive User Guide," *Academic Radiology*, 2025. Available: https://doi.org/10.1016/j.acra.2024.11.053.

[39] S. Batool, M.N. Akhtar, S.A. Anjum, R. Kousar, A. Zahid, and M. Nawaz, "Enhancing Scientific Writing with AI: Evaluating Tools, Practices and Future Implications," *Dialogue Social Science Review (DSSR)*, vol. 2, no. 3, Oct. 2024, pp. 281-323. Available: http://www.thedssr.com/index.php/2/article/view/38/46.

[40] P. Pergantis, V. Bamicha, C. Skianis, and A. Drigas, "AI Chatbots and Cognitive Control: Enhancing Executive Functions Through Chatbot Interactions: A Systematic Review," *Brain Sciences*, vol. 15, no. 1, 2025, p. 47. Available: https://doi.org/10.3390/brainsci15010047.

[41] N. Gürbüz, "The Impact of Quillbot as an Automated Writing Evaluation Tool on EFL Learners," *Journal of Educational Studies and Multidisciplinary Approaches*, vol. 4, no. 2, 2024. Available: https://doi.org/10.51383/jesma.2024.101.

[42] Dangprasert, S. (2021). Effects on using tutoring application in integration with self-directed learning to improve statistical analysis skills. *TEM Journal, 10*(1), 63-68. https://doi.org/10.18421/TEM101-08.

[43] H. Zhang, "Online Education Big Data Management and Mining Based on Intelligent Technology," *Journal of Electrical Systems*, vol. 20, no. 6s, 2024, pp. 292-300.

[44] A. Razaque, S. Hariri, and J. Yoo, "AI-Driven User Interface Design: Enhancing Digital Learning and Skill Development." Available: http://dx.doi.org/10.2139/ssrn.5114814.

[45] A. Karimov, M. Saarela, and T. Kärkkäinen, "AI-Powered Education Equality: Evidence from Five Countries," in *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, C. Bonk and G. Marks, Eds., Singapore: Association for the Advancement of Computing in Education (AACE), 2024, pp. 500-505. Available: https://www.learntechlib.org/primary/p225038/.

[46] D.C. Lungu, A. Grigorescu, and Z. Yousaf, "The Ethical Concerns of AI Technologies," in *Europe in the New World Economy: Opportunities and Challenges*, 2024, p. 253.

[47] A.P. Srivastava and S. Agarwal, Eds., *Utilizing AI Tools in Academic Research Writing*. IGI Global, 2024.

[48] A.M. Hanafi, M.M. Al-mansi, and O.A. Al-Sharif, "Generative AI in Academia: A Comprehensive Review of Applications and Implications for the Research Process," *International Journal of Engineering and Applied Sciences-October 6 University*, vol. 2,

no. 1, 2025, pp. 91-110. Available: https://dx.doi.org/10.21608/ijeasou.2025.349520.1041.

[49] J. Borg and C.M. Scott-Young, "Decision-Making, Critical Thinking and Confidence: A Systematic Literature Review of How Organizations Can Develop These Skills in Early-Career Project Managers," in *Project Management for European, Asian and African Practitioners—Theory and Technique Examples in Selected Professions*, N.R. Vajjhala and K.D. Strang, Eds., *Information Systems Engineering and Management*, vol. 30, Springer, Cham, 2025. Available: https://doi.org/10.1007/978-3-031-77806-3_3.

[50] Z. Yi and S. Ayangbah, "The Impact of AI Innovation Management on Organizational Productivity and Economic Growth: An Analytical Study," International Journal of Business, Management and Economic Review, vol. 7, no. 1, 2024, pp. 1-15. Available: http://doi.org/10.35409/IJBMER.2024.3580.