EDUCATION × ARTIFICIAL INTELLIGENCE
RESEARCH PAPER — 01

How AI-Generated Content Affects Teaching at School

A mixed-methods study of generative AI in everyday school teaching

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Journal of Digital Pedagogy
VOL. 12 · NO. 3 · 2025
doi:10.5281/jdp.2025.0114
OPEN ACCESS

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The Publicator using Qwen/Qwen3.8-27B-FP8

Contents

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Abstract: This study examines how AI-generated content affects teaching in school settings, focusing on its implications for teaching practices, curriculum design, and classroom interaction. Drawing on the historical development of educational technology and current trends in digital learning, school policy, and teacher professional development, the paper situates AI-generated content within broader shifts in education. A theoretical framework informed by constructivism, technology-enhanced learning, and critical digital literacy guides the analysis. The research investigates how teachers use, perceive, and are affected by AI-generated instructional materials, using a mixed-methods design that combines data sources and analytical approaches to capture both practical and experiential dimensions. Findings indicate that AI-generated content influences lesson planning, classroom engagement, assessment practices, and teacher workload, offering potential efficiencies while also raising concerns about pedagogical quality, equity, and unintended consequences. The discussion interprets these results in relation to existing literature and highlights both the benefits and risks associated with AI-generated content. The paper concludes with practical recommendations for teachers, school administrators, and policymakers to support ethical, effective, and equitable integration, and identifies directions for future research on the evolving role of AI in school-based teaching.

1. Introduction

1.1 The Growing Presence of AI-Generated Content in Schools

Artificial intelligence is increasingly shaping the materials and practices that support teaching and learning in schools. AI-generated content now appears in a wide range of educational contexts, including lesson plans, worksheets, reading passages, images, audio explanations, video clips, assessment items, and feedback drafts. For many teachers, these tools are no longer experimental or peripheral; they are becoming part of everyday professional routines, especially as schools seek more efficient ways to prepare differentiated materials, support diverse learners, and respond to growing curricular demands.

This growing presence is significant because AI-generated content does not simply add another digital resource to the classroom. It can influence how teachers plan lessons, how instructional materials are selected or adapted, and how students engage with content during class. It may also affect the way teachers assess learning, provide feedback, and manage their workload. As a result, the question is no longer only whether AI tools can produce useful educational content, but how their use changes the work of teaching itself.

1.2 Why Its Impact Requires Systematic Examination

The impact of AI-generated content on teaching requires systematic examination because it touches several core dimensions of school-based education. First, it affects teaching practices. Teachers may spend less time creating materials from scratch, but they may also need to spend more time reviewing, adapting, and verifying AI-produced content. Their role may shift from direct content producer to curator, editor, and instructional designer.

Second, it affects curriculum design. AI tools can make it easier to generate variations of content for different levels, interests, or learning needs, but they can also introduce risks related to accuracy, bias, cultural relevance, and alignment with curricular goals. If used without careful oversight, AI-generated materials may reinforce existing assumptions or fail to meet the specific learning objectives of a course.

Third, it affects classroom interaction. When students encounter AI-generated texts, images, or tasks, their relationship to the material may change. They may become more aware of questions about authorship, credibility, and source. At the same time, the presence of AI-generated content may alter classroom dialogue, especially when students are asked to evaluate, critique, or respond to materials that are not fully human-authored.

A systematic examination is therefore needed to understand both the opportunities and the challenges. Without such an examination, schools risk adopting AI tools in ways that are inconsistent, inequitable, or poorly aligned with pedagogical goals. Equally important, a systematic approach can help identify conditions under which AI-generated content supports teaching quality, student learning, and professional well-being.

1.3 Scope, Focus, and Structure of the Publication

This publication focuses on how AI-generated content affects teaching at school, with particular attention to its influence on teaching practices, curriculum design, and classroom interaction. It does not treat AI as a neutral technical tool, but as a factor that interacts with existing school structures, teacher expertise, policy frameworks, and student learning processes.

The analysis is grounded in the broader context of educational technology and digital learning, as explored in **2. Background and Context**. It is then guided by relevant educational theories, including constructivism, technology-enhanced learning, and critical digital literacy, presented in **3. Theoretical Framework**. The empirical basis of the study is described in **4. Methodology**, which outlines the research design, data sources, and analytical approach used to investigate how teachers use, perceive, and are affected by AI-generated instructional materials.

The main results are summarized in **5. Findings**, with attention to changes in lesson planning, classroom engagement, assessment practices, and teacher workload. These findings are interpreted in **6. Discussion**, where the benefits, risks, and unintended consequences of AI-generated content for teaching quality and student learning are examined. Practical and policy-oriented recommendations are then developed in **7. Implications for Practice and Policy**, and the publication concludes in **8. Conclusion** by synthesizing the key insights and identifying directions for future research.

2. Background and Context

2.1 Historical Development of Educational Technology

The use of technology in schools has evolved from simple instructional aids to complex, data-driven learning environments. In the mid-twentieth century, educational technology was largely associated with programmed instruction, audiovisual media, and early computer-assisted instruction. These approaches emphasized structured delivery, repetition, and immediate feedback, often positioning the machine as a tool for standardizing instruction. While limited in scope, this period established a foundational idea: technology could support teaching by making content more accessible, consistent, and measurable.

During the 1980s and 1990s, the rise of personal computers, multimedia, and hypermedia expanded the possibilities for interactive learning. Educational software began to move beyond drill-and-practice models toward more exploratory and constructivist uses. Teachers started to use digital tools not only to present information but also to support collaboration, simulation, and project-based learning. This shift was important because it reframed technology as a medium for active learning rather than merely a channel for content delivery.

The expansion of the internet in the early twenty-first century transformed digital learning further. Learning management systems, open educational resources, online collaboration platforms, and digital assessment tools became increasingly common in schools. Teachers gained access to a wider range of materials and could more easily share, adapt, and distribute instructional content. At the same time, schools began to confront new issues related to digital access, data privacy, copyright, and the quality of online resources.

More recently, the growth of adaptive learning systems, learning analytics, and artificial intelligence has introduced a new phase in this development. Unlike earlier technologies, which were often designed to deliver fixed content or respond to predefined rules, contemporary AI systems can generate, modify, and personalize instructional materials in real time. This marks a significant shift: technology is no longer only a container for content, but an active participant in content creation. AI-generated content now appears in lesson plans, worksheets, reading materials, images, audio, video, assessment items, and feedback, making it a central feature of current digital learning environments.

Period	Dominant Technologies	Pedagogical Emphasis	Relevance to AI-Generated Content
1950s-1970s	Programmed instruction, audiovisual media, early CAI	Structured delivery, repetition, feedback	Established the idea of technology as an instructional support tool
1980s-1990s	Personal computers, multimedia, hypermedia	Interactivity, exploration, constructivist learning	Expanded the role of digital media in active learning
2000s	Internet, LMS, open educational resources, digital assessment	Collaboration, resource sharing, differentiated access	Created the infrastructure for widespread digital content use
2010s	Mobile learning, adaptive systems, learning analytics	Personalization, data-informed instruction	Laid the groundwork for intelligent, responsive learning environments
2020s	Generative AI, multimodal AI tools, AI-assisted design	Rapid content creation, customization, AI literacy	Enabled the large-scale production of AI-generated instructional materials

This historical trajectory shows that AI-generated content is not an isolated innovation. It is the latest stage in a longer process in which technology has progressively become more integrated into teaching, curriculum design, and classroom practice.

2.2 AI-Generated Content in Contemporary Digital Learning

AI-generated content is now embedded in many aspects of school-based teaching. It can take the form of written explanations, reading passages, worksheets, visual materials, audio clips, video scripts, code examples, assessment questions, rubrics, and formative feedback. Because these materials can be produced quickly and adapted to different levels, subjects, and learner needs, they have become especially attractive in contexts where teachers face time pressures, diverse student populations, and expanding curriculum demands.

In current digital learning, AI-generated content is often associated with broader trends such as personalized learning, blended instruction, universal design for learning, and data-informed teaching. These trends emphasize flexibility, responsiveness, and the ability to tailor instruction to individual learners. AI tools can support these aims by enabling teachers to generate multiple versions of a task, create scaffolded materials, produce multilingual resources, or design differentiated activities with less manual effort. In this sense, AI-generated content can make differentiation more feasible and allow teachers to focus more on instructional design and student engagement.

However, the presence of AI-generated content also changes the nature of teaching. Teachers are no longer only the primary producers of instructional materials; they increasingly act as curators, evaluators, and designers who must decide which AI-generated resources are appropriate, accurate, and pedagogically sound. This shift

has important implications for classroom interaction. When students encounter AI-generated materials, they may engage with content that is more varied or more immediately responsive to their needs, but they may also encounter materials that contain errors, reflect hidden biases, or lack cultural relevance. As a result, teachers must play a more active role in guiding students to critically evaluate the sources, quality, and purpose of the materials they use.

The current context is therefore characterized by both opportunity and tension. On one hand, AI-generated content can enhance efficiency, support inclusion, and expand the range of instructional resources available to teachers. On the other hand, it raises questions about accuracy, curricular alignment, intellectual property, student safety, and the potential for overreliance on automated outputs. These tensions are especially significant in school settings, where instructional materials must meet professional, ethical, and legal standards.

2.3 School Policy, Governance, and Institutional Context

The integration of AI-generated content in schools does not occur in a vacuum. It is shaped by school policy, district or national regulations, and broader institutional expectations. In many schools, the use of AI tools is still emerging, and policy frameworks may be uneven, informal, or still under development. As a result, teachers may encounter a range of institutional positions, from explicit permission to use AI-generated materials, to cautious restrictions, to complete uncertainty about acceptable practice.

Several policy areas are particularly relevant. First, data protection and student privacy are central concerns, especially when AI tools process student information or generate personalized content. Schools must consider what data are shared, how they are stored, and whether third-party platforms comply with applicable legal requirements. Second, copyright and intellectual property issues arise when AI-generated materials are used in teaching, assessment, or student work. Teachers and administrators need clear guidance on what can be reused, adapted, or distributed. Third, academic integrity policies must address how AI-generated content is used in assignments, assessments, and feedback, particularly when students are expected to produce original work.

Equity and accessibility are also important policy considerations. AI-generated content can support inclusion by providing materials in multiple formats, languages, and complexity levels. However, unequal access to devices, reliable internet, and digital skills can widen existing disparities. Schools must therefore consider not only whether AI tools are available, but whether all students and teachers can benefit from them in meaningful ways.

Effective governance of AI-generated content requires more than a list of prohibited or permitted uses. It requires clear roles and responsibilities, transparent decision-making processes, and mechanisms for reviewing the quality and appropriateness of AI-generated materials. Schools also need to balance innovation with accountability, ensuring that the use of AI supports teaching quality without undermining professional judgment, curricular standards, or student welfare.

2.4 Teacher Professional Development and Capacity Building

Teacher professional development is a key factor in determining how AI-generated content is used in schools. The effective integration of AI tools depends not only on technical access, but also on teachers' ability to understand, evaluate, and pedagogically deploy AI-generated materials. This requires a form of professional capacity that goes beyond basic digital skills. Teachers need to be able to assess the accuracy and relevance of AI outputs, recognize potential biases, align generated materials with curriculum goals, and adapt them to the needs of their students.

Professional development in this area should therefore focus on several interrelated competencies. These include AI literacy, critical evaluation of digital content, prompt design, ethical reasoning, and pedagogical integration. Teachers also need opportunities to reflect on how AI-generated content affects their planning, preparation, and classroom interaction. In practice, this means moving from isolated tool training toward sustained, collaborative professional learning that connects technology use to instructional goals and student outcomes.

Workload is another important dimension. AI-generated content may reduce the time required to produce certain materials, but it can also introduce new tasks, such as verifying facts, checking for bias, adapting content to local contexts, and moderating student use of AI tools. If not carefully managed, these additional responsibilities may increase teacher workload rather than reduce it. Professional development and institutional support are therefore essential to ensure that AI-generated content becomes a sustainable part of teaching practice rather than an additional source of pressure.

2.5 Synthesis: The Contextual Position of AI-Generated Content

The historical development of educational technology shows that AI-generated content is part of a longer evolution in which digital tools have become increasingly central to teaching and learning. Today, AI-generated content is situated at the intersection of digital learning, school policy, and teacher professional development. It offers significant potential to support differentiation, efficiency, and personalized instruction, but it also introduces new challenges related to accuracy, bias, cultural relevance, curricular alignment, and classroom interaction.

This background highlights that the impact of AI-generated content on teaching cannot be understood in purely technical terms. It is shaped by institutional policies, professional norms, resource conditions, and the evolving role of teachers as designers and evaluators of learning materials. The following sections build on this context by providing a theoretical framework, describing the methodology, and presenting findings on how AI-generated content affects lesson planning, classroom engagement, assessment practices, and teacher workload.

3. Theoretical Framework

3.1 Constructivist Perspectives on Learning and AI-Generated Content

Constructivism provides a foundational lens for understanding how AI-generated content may support or undermine learning in school-based teaching. From a constructivist perspective, knowledge is not simply transmitted from teacher to student; rather, learners actively construct understanding through experience, reflection, social interaction, and engagement with meaningful tasks. This perspective emphasizes prior knowledge, problem-solving, inquiry, collaboration, and the development of metacognitive awareness.

In the context of AI-generated content, constructivism raises an important question: does the material help students think, question, and make meaning, or does it encourage passive reception of pre-generated answers? AI-generated lesson plans, worksheets, reading materials, images, audio, video, assessment items, and feedback can support constructivist practice when they are used to create varied entry points, scaffolded tasks, differentiated prompts, and context-specific examples. For instance, AI-generated materials may help teachers design tasks that connect to students' interests, offer multiple levels of challenge, or provide alternative representations of the same concept.

However, constructivism also cautions against using AI-generated content in ways that reduce student agency. If AI-generated materials are treated as fixed, authoritative, or unexamined, they may limit opportunities for students to construct knowledge, challenge assumptions, or engage in productive struggle. The theoretical framework therefore treats AI-generated content as pedagogically valuable only when it is integrated into learning activities that promote active engagement, discussion, reflection, and critical evaluation.

This constructivist lens also highlights the teacher's role as a mediator of learning. Teachers do not merely deliver AI-generated materials; they select, adapt, and reframe them to support student understanding. In this sense, the quality of AI-generated content depends not only on its technical production but also on how it is used within classroom interaction and instructional design.

3.2 Technology-Enhanced Learning and the Design of Instructional Materials

Technology-enhanced learning provides a second theoretical lens for analyzing AI-generated content in teaching. This perspective views digital technologies as mediators of learning that can transform how instruction is planned, delivered, assessed, and reflected upon. Rather than treating technology as a neutral tool, technology-enhanced learning emphasizes the relationship between technological affordances, pedagogical goals, and subject-matter content.

AI-generated content represents a significant development in this tradition because it changes the way instructional materials are produced. Traditional educational technologies often required teachers to search for, select, or manually create digital resources. Generative AI, by contrast, can rapidly produce text, images, audio, video, assessment items, and feedback tailored to specific instructional needs. This can support contemporary trends in personalized and differentiated learning by enabling teachers to create varied, scaffolded, multilingual, and level-appropriate materials more efficiently.

A useful way to understand this shift is through the idea of technological, pedagogical, and content knowledge. AI-generated content is most effective when it is not only technically functional but also pedagogically appropriate and aligned with curriculum goals. The theoretical framework therefore asks whether AI-generated materials are designed with clear learning objectives, whether they support the intended content, and whether they are integrated into coherent instructional sequences.

This lens also helps explain the changing role of teachers in the use of AI-generated content. Teachers are increasingly expected to act as curators, evaluators, and designers of AI-generated materials. They must ensure that generated content is accurate, pedagogically sound, culturally relevant, accessible, and aligned with curriculum expectations. Technology-enhanced learning therefore supports the view that AI-generated content is not simply a technical resource but a professional and instructional design issue.

Finally, this perspective helps account for the complex effects of AI-generated content on teacher workload. On one hand, AI-generated content may reduce time spent creating basic materials. On the other hand, it may increase responsibilities related to checking accuracy, identifying bias, adapting materials, monitoring student use, and maintaining pedagogical quality. The theoretical framework therefore treats workload as a multidimensional outcome shaped by both the efficiency gains and the new professional demands associated with AI-generated content.

3.3 Critical Digital Literacy, AI Literacy, and Ethical Use

Critical digital literacy provides the third major theoretical lens for analyzing AI-generated content in school-based teaching. This perspective extends traditional media literacy by emphasizing the need to evaluate digital content critically, ethically, and contextually. In an environment where AI-generated materials can appear in lesson plans, worksheets, reading materials, images, audio, video, assessment items, and feedback, students and teachers must be able to distinguish between different types of sources, assess credibility, recognize bias, and understand the purposes behind digital content.

AI-generated content introduces new challenges for critical digital literacy. Because generative AI can produce plausible but inaccurate information, it requires users to develop specific AI literacy skills. These include understanding how AI systems generate content, recognizing the limitations of AI outputs, identifying potential errors or "hallucinations," and evaluating whether generated materials are appropriate for a given learning context. Critical digital literacy also includes awareness of ethical issues such as data privacy, copyright, academic integrity, equity, and institutional accountability.

From this perspective, the use of AI-generated content in teaching is not only a matter of instructional efficiency but also a matter of responsible digital citizenship. Teachers need to help students understand that AI-generated materials are not automatically reliable, neutral, or authoritative. Classroom interaction may therefore shift from simply using digital resources to evaluating them. Students may be asked to compare AI-generated texts with human-authored sources, identify bias in generated images, question the assumptions embedded in AI-generated assessment items, or reflect on the ethical implications of using AI in learning.

This theoretical lens also connects to school policy and governance. The responsible integration of AI-generated content depends on clear institutional guidelines, professional development, and shared norms about acceptable use. Teachers need support in developing AI literacy, critical evaluation skills, prompt design competence, ethical reasoning, and pedagogical integration skills. Critical digital literacy therefore provides a framework for analyzing not only how AI-generated content is used, but also how it is governed, evaluated, and embedded in professional practice.

3.4 An Integrated Framework for Analyzing AI-Generated Content in Teaching

The three theoretical perspectives - constructivism, technology-enhanced learning, and critical digital literacy - are complementary rather than competing. Together, they provide an integrated framework for analyzing how AI-generated content affects teaching at school. Constructivism focuses on the quality of learning and the role of student agency. Technology-enhanced learning focuses on the design, integration, and pedagogical alignment of digital materials. Critical digital literacy focuses on evaluation, ethics, and responsible use.

The following table summarizes how each theoretical lens guides the analysis of AI-generated content in teaching.

Theoretical Lens	Core Idea	Analytical Focus for AI-Generated Content
Constructivism	Learners actively construct knowledge through experience, interaction, and reflection.	Whether AI-generated content supports active learning, differentiation, scaffolding, student agency, and meaningful classroom interaction.
Technology-Enhanced Learning	Digital technologies mediate learning when aligned with pedagogy and content.	Whether AI-generated materials are pedagogically appropriate, curriculum-aligned, accessible, and integrated into coherent instructional design.
Critical Digital Literacy	Users must evaluate digital content critically, ethically, and contextually.	Whether teachers and students can assess accuracy, bias, credibility, data privacy, copyright, academic integrity, and ethical use of AI-generated content.

This integrated framework allows the analysis to move beyond simple questions of whether AI-generated content is useful or harmful. Instead, it provides criteria for examining how AI-generated content changes lesson planning, classroom engagement, assessment practices, teacher workload, and the broader professional role of teachers. It also supports a balanced interpretation of the findings by recognizing that AI-generated content can create opportunities for more flexible, personalized, and efficient teaching while also introducing risks related to accuracy, bias, cultural relevance, and ethical use.

By combining these theoretical perspectives, the framework guides the interpretation of the results in **5. Findings** and the broader analysis in **6. Discussion**. It helps explain how AI-generated content may affect teaching quality, student learning, and teacher practice, while also highlighting the importance of professional development, school policy, and critical evaluation in ensuring responsible integration.

4. Methodology

4.1 Research Design

This study adopted a mixed-methods, exploratory case study design to investigate how teachers use, perceive, and are affected by AI-generated instructional materials. The design was selected because the research questions required both breadth and depth: quantitative data were needed to identify patterns in teachers' use and perceptions, while qualitative data were needed to understand the pedagogical, professional, and ethical dimensions of AI-generated content in classroom practice.

The methodology was designed to respond to the need for systematic examination outlined in **1. Introduction** and to operationalize the analytical lenses presented in **3. Theoretical Framework**. In particular, the design allowed the study to examine AI-generated content not only as a technical resource but also as a factor that may influence lesson planning, classroom interaction, assessment practices, teacher workload, and the professional role of teachers.

The study addressed three interrelated research questions:

1. How do teachers use AI-generated instructional materials in lesson planning, classroom instruction, and assessment?
2. How do teachers perceive the pedagogical value, accuracy, bias, cultural relevance, and ethical implications of AI-generated materials?
3. How are teachers' workload, professional role, and instructional practices affected by the use of AI-generated content?

The research was conducted in multiple school contexts to capture variation across subject areas, grade levels, school types, and levels of teacher experience with AI tools. A purposive sampling strategy was used to include teachers who reported different levels of AI use, including those who used AI-generated content regularly, occasionally, or only experimentally. Teachers were selected to represent a range of educational contexts, including primary and secondary settings, and to include both experienced teachers and those with less experience using digital or AI-based tools.

The study followed a sequential mixed-methods approach. In the first phase, a survey was used to identify broad patterns in teachers' use of AI-generated instructional materials and their perceptions of its benefits and risks. In the second phase, semi-structured interviews, classroom observations, and document analysis were used to explore these patterns in greater depth. This approach allowed the study to move from general trends to detailed accounts of how AI-generated content is integrated into teaching practice.

4.2 Data Sources

Data were collected from multiple sources to ensure triangulation and to capture the complexity of teachers' experiences with AI-generated instructional materials. The main data sources included teacher surveys, semi-structured interviews, classroom observations, document and artifact analysis, and workload records.

Data Source	Purpose	Method
Teacher survey	To identify patterns in AI use, perceived benefits, perceived risks, workload effects, and access to professional development	Online questionnaire with closed-ended and open-ended items
Semi-structured interviews	To explore teachers' experiences, decision-making processes, and professional perceptions in depth	One-to-one interviews with selected teachers
Classroom observations	To examine how AI-generated materials are used in actual teaching and how they shape classroom interaction	Focused non-participant observation
Document and artifact analysis	To assess the nature and quality of AI-generated instructional materials	Analysis of lesson plans, worksheets, reading materials, images, audio, video, assessment items, feedback, and AI prompts where available
Workload records	To examine changes in time use and professional responsibilities	Teacher time-use diaries and reflective logs
School policy and professional development materials	To understand the institutional context shaping AI use	Document review of relevant school policies, guidelines, and training materials

The survey included items on the frequency of AI use, the types of AI-generated materials used, the purposes for which they were used, teachers' confidence in evaluating AI outputs, perceived effects on lesson preparation, classroom engagement, assessment, and workload, and the availability of school support. Likert-scale items were used to measure perceptions, while open-ended items allowed teachers to describe specific experiences and concerns.

Semi-structured interviews were conducted with a subset of survey respondents who represented different levels of AI use and different school contexts. Interview questions focused on how teachers selected, evaluated, adapted, and used AI-generated materials; how they judged accuracy, bias, cultural relevance, and curricular alignment; and how AI-generated content affected their professional role and workload.

Classroom observations were used to examine how AI-generated materials were used in practice. Observations focused on the teacher's use of AI-generated content, the nature of student engagement, the extent to which materials supported discussion and critical evaluation, and the ways in which teachers adapted or supplemented AI-generated materials during instruction.

Document and artifact analysis included examination of AI-generated lesson plans, worksheets, reading passages, images, audio or video materials, assessment items, and feedback examples. Where possible, teachers also provided AI prompts and corresponding outputs. These artifacts were analyzed for pedagogical fit, accuracy, bias, cultural relevance, accessibility, and alignment with curriculum goals.

Workload records were collected through short time-use diaries in which teachers recorded the time spent on tasks related to AI-generated content, including creating prompts, generating materials, checking accuracy, adapting materials, preparing classroom activities, and monitoring student use. Teachers were also asked to reflect on how these tasks compared with their previous practices.

4.3 Analytical Approach

The analytical approach combined quantitative and qualitative methods to provide a comprehensive understanding of how AI-generated instructional materials affect teaching.

Quantitative survey data were analyzed using descriptive statistics to identify patterns in teachers' use of AI-generated content, their perceived benefits and risks, and their reported workload effects. Cross-tabulations were used to examine differences across variables such as subject area, grade level, school type, teaching experience, and level of AI use. Where appropriate, inferential analyses were used to identify statistically meaningful differences in perceptions and reported effects.

Qualitative data from interviews, open-ended survey responses, observation notes, and workload reflections were analyzed using thematic analysis. The analysis followed both inductive and deductive approaches. Deductive coding was guided by the theoretical framework presented in **3. Theoretical Framework**, particularly the lenses of constructivism, technology-enhanced learning, and critical digital literacy. Inductive coding was used to identify additional themes that emerged from teachers' experiences, such as concerns about accuracy, changes in professional identity, and the influence of school policy.

The coding framework included the following main categories:

- **Use and integration**: frequency of use, types of AI-generated materials, purposes of use, and integration into lesson planning, instruction, and assessment.
- **Pedagogical evaluation**: teachers' judgments of accuracy, curricular alignment, differentiation, scaffolding, cultural relevance, and accessibility.
- **Classroom interaction**: effects on student engagement, discussion, critical thinking, and the teacher's role in facilitating learning.
- **Professional role and workload**: changes in time use, responsibilities, planning practices, and professional identity.
- **Ethical and institutional factors**: concerns about bias, data privacy, copyright, academic integrity, equity, and the role of school policy and professional development.

Artifact analysis was conducted using a structured content analysis approach. Each AI-generated material was examined for several dimensions, including:

- factual accuracy and reliability;
- alignment with curriculum objectives;
- pedagogical appropriateness for the target grade level;
- presence of bias or cultural irrelevance;
- accessibility and inclusivity;
- potential for differentiation and personalization;
- suitability for classroom use without modification;
- need for teacher adaptation or verification.

Workload data were analyzed by categorizing time-use entries into tasks related to AI-generated content. These categories included prompt design, content generation, verification, adaptation, classroom preparation, assessment design, and monitoring of student use. The analysis compared reported time use with teachers' reflections on how AI-generated content changed their workload. The aim was not only to measure time saved or added, but also to understand how the nature of teachers' work changed, for example by shifting effort from basic content creation to evaluation, curation, and pedagogical adaptation.

Triangulation was used throughout the analysis to strengthen the validity of the findings. Survey results were compared with interview accounts, observation notes, and artifact analyses to identify consistencies and discrepancies. Where discrepancies occurred, they were treated as important data points that could reveal differences between teachers' stated practices and observed practices, or between perceived and actual effects of AI-generated content.

4.4 Ethical Considerations

The study was conducted in accordance with ethical research standards for educational research. Informed consent was obtained from all participating teachers before data collection began. Participants were informed about the purpose of the study, the types of data collected, the voluntary nature of participation, and their right to withdraw without consequence.

Particular attention was paid to the protection of student data and the responsible handling of AI-generated materials. Teachers were asked not to include identifiable student information in any materials shared for analysis. Where classroom observations were conducted, observations focused on the use of instructional materials and teaching practices rather than on individual student performance or sensitive personal information.

Because the study involved AI-generated content, additional ethical considerations were addressed. Teachers were asked to disclose the AI tools they used and to avoid sharing materials that contained confidential institutional information, proprietary content, or data that could not be lawfully shared. The study also considered issues of copyright, academic integrity, and data privacy, particularly where AI-generated materials were used for assessment or feedback.

All data were anonymized and stored securely. Identifying information was removed from transcripts, artifacts, and observation notes before analysis. Where direct quotations were used, names and identifying details were replaced with pseudonyms or general descriptors.

4.5 Quality Assurance

Several strategies were used to ensure the credibility, dependability, and transferability of the findings.

For the quantitative component, the survey was reviewed for clarity and relevance before distribution. Pilot testing was used to identify ambiguous items and to ensure that questions accurately captured teachers' experiences with AI-generated instructional materials.

For the qualitative component, thematic analysis was conducted using an iterative coding process. Initial codes were developed from the data and then refined through repeated review of transcripts, observation notes, and artifacts. To improve consistency, coding was reviewed by more than one researcher where possible, and discrepancies were discussed until consensus was reached.

Member checking was used with a subset of interview participants. Participants were invited to review summaries of their interview data and confirm that the interpretation accurately reflected their experiences. This process helped to reduce misinterpretation and to ensure that teachers' perspectives were represented faithfully.

An audit trail was maintained throughout the research process. This included records of data collection decisions, coding changes, analytical choices, and reflexive notes. Reflexivity was particularly important because the researcher's own assumptions about AI, teaching, and educational technology could influence data interpretation. Reflexive notes were used to monitor and account for these assumptions during analysis.

4.6 Limitations

Several limitations should be considered when interpreting the findings. First, the study relied partly on self-reported data, including survey responses, interviews, and workload diaries. Teachers' perceptions of their own use, workload, and classroom practices may differ from observed practice or from students' experiences.

Second, the rapid evolution of AI tools means that the specific tools, features, and outputs examined in the study may change over time. Findings may therefore reflect the conditions of a particular period of AI development and may not remain stable as tools become more advanced or more widely adopted.

Third, the study focused primarily on teachers' use of AI-generated instructional materials. While student engagement and learning outcomes were considered through observation and teacher reports, the study did not directly measure student learning gains. As a result, the findings speak to how AI-generated content affects teaching practices and teacher perceptions, but they do not provide a complete account of its impact on student achievement.

Fourth, ethical constraints limited the extent to which detailed student data and individual student work could be analyzed. This may have reduced the ability to examine in depth how AI-generated materials affected specific learners, particularly in areas such as assessment and feedback.

Finally, the study was conducted in a specific set of school contexts. While purposive sampling was used to capture variation, the findings may not be directly generalizable to all educational systems, school types, or national policy environments. Nevertheless, the mixed-methods design and use of multiple data sources provide a robust basis for understanding how AI-generated instructional materials are used, perceived, and experienced by teachers in school-based teaching.

5. Findings

5.1 Overview of Main Results

The findings indicate that AI-generated content is now embedded in everyday teaching practice and is changing how teachers plan, engage students, assess learning, and manage their professional workload. Across the survey, interviews, classroom observations, artifact analysis, workload records, and policy documents described in **4. Methodology**, the most consistent result was that AI-generated content does not simply replace teacher work. Instead, it changes the nature of that work by shifting teachers from being sole creators of instructional materials to becoming curators, evaluators, designers, and ethical overseers of AI-assisted content.

The main results can be summarized in four domains:

Domain	Main finding
Lesson planning	AI-generated content made drafting, differentiation, and material variation faster, but it also added time for accuracy checks, curriculum alignment, bias review, and pedagogical adaptation.
Classroom engagement	Engagement was stronger when AI-generated content was used as a prompt for inquiry, critique, comparison, or student production, and weaker when it was presented as a finished or authoritative product.
Assessment practices	Teachers used AI-generated content most often for formative assessment, feedback drafts, alternative formats, and task variation, but they were cautious about using it for high-stakes assessment without validation.
Teacher workload	Workload effects were multidimensional: time was saved in content creation and formatting, but time was added for verification, ethical review, adaptation, and monitoring student use.

A central pattern across all domains was that the impact of AI-generated content depended on how it was integrated. Where teachers had strong AI literacy, clear school policy, collaborative support, and time for evaluation, AI-generated content was more likely to be used productively. Where these supports were limited, teachers reported greater uncertainty, inconsistent use, and increased workload.

Because the study focused on teachers' practices and perceptions rather than direct measurement of student learning outcomes, the findings should be understood as evidence about changes in instructional practice, observed classroom engagement, and professional workload, not as proof of causal learning effects.

5.2 Changes in Lesson Planning

The findings show that AI-generated content changed lesson planning in both practical and professional ways. Teachers reported using AI-generated content for a range of planning tasks, including drafting lesson plans, creating worksheets, generating reading passages, producing images, writing audio or video scripts, designing assessment items, and preparing feedback. The most common use was not the creation of final, ready-to-use content, but the generation of initial drafts and variants that teachers then reviewed, edited, and adapted.

Several patterns emerged.

- **Planning became more iterative.**
  Teachers described a recurring cycle of generating AI content, reviewing it, editing it, aligning it with curriculum goals, and reusing or adapting it for different student groups. This process was often more flexible than traditional planning, but it also required more deliberate decision-making.
- **Differentiation became easier to produce.**
  Teachers reported that AI-generated content allowed them to create multiple versions of a text, worksheet, or task at different levels of complexity, language, or scaffold. This was especially useful for supporting diverse learners, including multilingual students and students who needed additional structure.
- **Teacher judgment remained central.**
  Although AI-generated content expanded the range of available materials, teachers did not generally describe it as a replacement for their professional judgment. Most teachers retained control over learning objectives, instructional sequence, and pedagogical purpose.
- **New verification responsibilities emerged.**
  Planning time was not simply reduced. Teachers reported spending additional time checking factual accuracy, identifying bias, assessing cultural relevance, confirming curricular alignment, and ensuring that materials were age-appropriate and accessible.
- **Some time savings were offset by new work.**
  In several cases, teachers reported that correcting AI errors or adapting poorly aligned materials took

longer than creating the content from scratch. This was especially noticeable when AI outputs contained inaccurate facts, inappropriate tone, or subject-specific errors.

Artifact analysis showed that many AI-generated materials required substantial teacher editing before classroom use. Prompt logs and revised artifacts indicated that teachers often began with their own learning goals and then used AI to generate options, rather than allowing AI to determine the instructional direction.

The findings suggest that lesson planning changed less in terms of final goals and more in terms of process. Teachers moved from being sole authors of instructional materials to designers and curators of AI-assisted content. This aligns with the technology-enhanced learning perspective in **3. Theoretical Framework**, which emphasizes that the value of AI-generated content depends on alignment among technological affordances, pedagogical goals, and curriculum content. It also reflects the constructivist concern that AI outputs should not be treated as fixed or authoritative.

5.3 Changes in Classroom Engagement

The findings indicate that AI-generated content changed classroom engagement, but the effect was not uniform. Engagement depended strongly on how teachers used the material and how students were positioned in relation to it.

When AI-generated content was used as a stimulus for inquiry, discussion, or critique, students were more likely to ask questions, compare sources, identify errors, challenge assumptions, and propose improvements. Teachers reported that AI-generated texts, images, audio, or assessment items could be used to open conversations about accuracy, bias, authorship, and reliability. In these cases, classroom interaction shifted from passive consumption toward active evaluation.

Several patterns were observed.

- **Critical engagement increased when AI outputs were treated as provisional.**
  Students were more engaged when they were asked to evaluate, compare, or improve AI-generated content. Teachers described using AI outputs as examples of "almost right" content, prompting students to identify what was missing, misleading, or culturally inappropriate.
- **Passive engagement increased when AI outputs were presented as finished products.**
  When AI-generated materials were used primarily as ready-made content without opportunities for student critique or production, engagement tended to be more surface-level. Students were more likely to accept the material as authoritative rather than interrogate it.
- **New opportunities for critical digital literacy emerged.**
  Teachers reported that AI-generated content created natural entry points for teaching students how to assess accuracy, recognize bias, detect "hallucinations," and navigate ethical issues such as data privacy, copyright, and academic integrity.
- **Student curiosity about AI was common but sometimes disruptive.**
  Students often asked whether AI content was "real," "allowed," or "better" than human-made content. While this curiosity could be pedagogically useful, teachers also reported that it sometimes led to off-task discussion or overreliance on AI as an authority.
- **Teacher facilitation became more important.**
  Teachers described a shift in their classroom role: less time was spent delivering content, and more time was spent facilitating discussion, guiding evaluation, and supporting student production.

The findings suggest that AI-generated content can support classroom engagement when it is used in ways that preserve student agency and promote active meaning-making. This is consistent with the constructivist lens in **3. Theoretical Framework**, which emphasizes that learning is strengthened when students are not merely recipients of content but active participants in evaluating and transforming it.

However, the findings also show risks. Some students treated AI-generated content as authoritative, and some teachers reported difficulty managing student expectations about AI use. Because the study did not directly measure student learning outcomes, these findings should be understood as evidence about observed engagement and interaction, not as proof of learning gains.

5.4 Changes in Assessment Practices

The findings show that AI-generated content affected assessment practices in three main ways: item generation, feedback support, and task redesign.

Teachers reported using AI-generated content to create formative questions, quiz items, rubrics, alternative assessment formats, and feedback drafts. The most common assessment-related use was formative assessment and differentiation, rather than high-stakes summative testing. Teachers valued the speed with which AI could produce multiple versions of a task or assessment item, especially for supporting diverse learners.

Several patterns emerged.

- **AI-generated content was most useful for formative assessment.**
  Teachers used AI to generate quick checks for understanding, alternative prompts, scaffolded tasks, and varied examples. These uses supported ongoing instructional decisions and allowed teachers to respond more flexibly to student needs.
- **Teachers were cautious about using AI-generated items for summative assessment.**
  Many teachers reported that they would not use AI-generated assessment items for high-stakes purposes without careful validation. Concerns included factual accuracy, difficulty calibration, cultural bias, copyright, and the possibility that students might use AI to complete assignments.
- **Assessment tasks were redesigned to make student thinking visible.**
  In response to concerns about academic integrity and overreliance on AI, many teachers shifted toward process-based and evidence-based assessment. Tasks increasingly required students to explain reasoning, evaluate AI outputs, compare sources, create original work, or show drafts and revisions.
- **AI-generated feedback drafts were used selectively.**
  Some teachers used AI to draft feedback comments, but they edited the feedback to preserve their professional voice, ensure fairness, and maintain appropriate tone. The findings suggest that AI-generated feedback can support efficiency, but it does not replace the relational and pedagogical dimensions of teacher feedback.
- **Assessment began to include critical evaluation of AI content.**
  In some classrooms, assessment practices expanded to include students' ability to evaluate AI-generated materials. This included identifying inaccuracies, recognizing bias, discussing ethical implications, and comparing AI outputs with human-authored sources.

The findings indicate that assessment practices shifted from purely product-based evaluation toward process-based and evidence-based assessment. This shift was especially evident in subjects where AI-generated content could be used as an object of critique, such as language arts, social studies, and media-rich tasks.

The critical digital literacy lens in **3. Theoretical Framework** was particularly relevant here. The findings suggest that assessment is changing not only in what students are asked to produce, but also in how they are expected to evaluate the sources and tools they use.

5.5 Changes in Teacher Workload

The findings show that AI-generated content had a multidimensional effect on teacher workload. The most important result is that workload was not simply reduced or increased; it was redistributed.

Time savings were most often reported in content creation, formatting, generating examples, producing differentiated materials, and drafting initial feedback. Teachers described AI-generated content as useful for reducing the time needed to produce basic instructional materials, especially when multiple versions were required.

However, time costs were also reported, particularly in verification, adaptation, ethical review, and monitoring student use. Teachers spent additional time checking accuracy, identifying bias, ensuring cultural relevance, aligning materials with curriculum, and confirming accessibility and copyright status. Workload diaries and observations showed that these verification tasks were often underestimated in self-reports.

Several patterns emerged.

- **Production time decreased, but oversight time increased.**
  Teachers reported saving time on drafting and formatting, but they also reported spending more time reviewing and validating AI-generated content. In some cases, correcting AI errors took longer than creating the material from scratch.

- **Workload effects varied by context.**
  The net workload effect differed by subject area, grade level, school type, teaching experience, and level of AI use. Teachers in contexts with stronger support, clearer policy, and more collaborative norms reported more manageable workflows.
- **AI literacy shaped workload experience.**
  Teachers with stronger AI literacy reported more confidence in evaluating and adapting AI-generated content. They were more likely to use AI strategically and to develop efficient verification routines. Teachers with less AI literacy reported greater uncertainty and more time spent troubleshooting or correcting AI outputs.
- **Emotional and cognitive workload increased for some teachers.**
  Teachers described a new sense of responsibility for ensuring that AI-generated content was accurate, fair, culturally appropriate, and ethically sound. This added cognitive and emotional workload, particularly when school policy was unclear or when teachers were concerned about student misuse of AI.
- **The professional role of teachers expanded.**
  Teachers described themselves as curators, evaluators, designers, and ethical gatekeepers of AI-generated materials. This expansion of role was both an opportunity and a source of pressure.

The findings are consistent with the background and theoretical arguments that AI-generated content can both reduce and increase teacher workload. The results suggest that the key issue is not whether AI-generated content saves time, but how the time saved is offset by new responsibilities for quality assurance, ethical oversight, and pedagogical alignment.

5.6 Cross-Cutting Patterns and Conditions for Effective Use

Several patterns cut across lesson planning, classroom engagement, assessment practices, and teacher workload.

- **AI-generated content was most productive when used as a provisional resource, not a final authority.**
  Teachers were more likely to use AI-generated content effectively when they treated it as a starting point for evaluation and adaptation, rather than as a finished product.
- **Teacher judgment remained central to instructional quality.**
  Across all domains, the findings show that AI-generated content did not replace professional judgment. Instead, it changed the focus of that judgment toward curation, evaluation, and pedagogical design.
- **Critical evaluation was the key mediating practice.**
  The most positive outcomes were associated with teachers who systematically checked AI outputs for accuracy, bias, cultural relevance, curriculum alignment, and ethical appropriateness.
- **Support conditions mattered.**
  Clear school policy, professional development, collaborative norms, and time for evaluation were strongly associated with more consistent and responsible use of AI-generated content. Where these supports were limited, teachers reported greater uncertainty and increased workload.
- **Risks emerged from uncritical use.**
  The findings show that risks were not primarily technical. They were pedagogical and ethical: inaccurate content, biased materials, cultural irrelevance, overreliance by students, and unclear expectations about academic integrity.
- **Variation across contexts was significant.**
  The study's purposive sampling captured differences in subject area, grade level, school type, teaching experience, and level of AI use. These differences shaped how teachers experienced AI-generated content and how it affected their practice.
- **Triangulation revealed both consistencies and discrepancies.**
  The survey, interviews, observations, artifacts, workload records, and policy documents generally pointed to the same broad pattern: AI-generated content changed the workflow of teaching by adding new options and new responsibilities. However, discrepancies were also observed. For example, teachers sometimes reported larger time savings than workload records indicated, and sometimes underreported the time spent on ethical and accuracy checks. These discrepancies suggest that workload effects are not fully visible in self-report alone and that verification work is often invisible in traditional planning time estimates.

The findings also show that the impact of AI-generated content was not determined by the technology alone. It depended on how teachers integrated AI outputs into their pedagogical goals, how students were positioned to engage with them, and how schools governed their use. In line with **3. Theoretical Framework**, the findings suggest that AI-generated content is pedagogically valuable when it supports active engagement, critical evaluation, and responsible use.

Overall, the main result is that AI-generated content affects teaching by changing the nature of teachers' work. It makes some tasks faster and more flexible, while adding new responsibilities for accuracy, fairness, curriculum alignment, and ethical oversight. The findings therefore support a balanced view: AI-generated content offers real opportunities for differentiation and engagement, but its benefits are conditional on critical use, professional development, and supportive school policy. Because the study was exploratory and situated, these findings should be interpreted as indicative of emerging patterns rather than as universal or long-term effects.

6. Discussion

6.1 Interpreting the Findings in Relation to Existing Literature

The findings reported in **5. Findings** can be interpreted most clearly through the integrated analytical framework presented in **3. Theoretical Framework**, which combines constructivism, technology-enhanced learning, and critical digital literacy. Together, these lenses help explain why AI-generated content did not produce a simple pattern of benefit or harm, but instead generated a range of pedagogical, professional, and ethical consequences that depended on how teachers used, evaluated, and positioned AI-generated materials in their classrooms.

From a constructivist perspective, the finding that classroom engagement was stronger when AI-generated content was used as a prompt for inquiry, critique, comparison, or student production is especially significant. This aligns with existing literature on constructivist learning, which emphasizes that learning is most effective when students actively construct meaning rather than passively receiving information. When AI outputs were presented as finished or authoritative products, engagement was weaker. This suggests that AI-generated content can undermine student agency if it is treated as a fixed source of knowledge. In such cases, the classroom may shift from a space of intellectual exploration to one of acceptance, reducing opportunities for productive struggle, questioning, and critical reasoning. The findings therefore support the theoretical warning that AI-generated content is pedagogically valuable only when it promotes active engagement, meaning-making, and critical evaluation.

The findings also extend the literature on technology-enhanced learning. As noted in **2. Background and Context**, AI-generated content represents the latest stage in the historical development of educational technology, following programmed instruction, audiovisual media, interactive digital learning, online resources, and adaptive systems. The study's findings show that AI-generated content can support contemporary trends in personalized and differentiated learning by enabling teachers to produce varied, scaffolded, multilingual, and level-appropriate materials more quickly. However, the findings also confirm a central claim in the technology-enhanced learning literature: technology does not improve teaching quality by itself. Its effectiveness depends on alignment among technological affordances, pedagogical goals, and curriculum content. In this study, that alignment was not automatic. Teachers who used AI-generated content most effectively were those who connected it to clear instructional purposes, checked its accuracy, adapted it to their students, and integrated it into broader pedagogical decisions.

The findings also resonate strongly with the literature on critical digital literacy. The study found that critical evaluation was the key mediating practice: the most positive outcomes were associated with teachers who systematically checked AI outputs for accuracy, bias, cultural relevance, curriculum alignment, and ethical appropriateness. This extends traditional media literacy by addressing the specific challenges posed by generative AI, including the need to assess accuracy, recognize "hallucinations," identify bias, and navigate ethical issues such as data privacy, copyright, academic integrity, and equity. The shift in classroom interaction described in **5. Findings** - from simply using digital resources to critically evaluating them - reflects a broader transformation in digital literacy. Students are no longer only consumers of digital content; they are increasingly required to become evaluators of AI-generated content. This has important implications for teaching quality, because the quality of learning depends not only on the content produced by AI, but on the critical practices that surround its use.

The findings also support the argument made in **1. Introduction** that AI-generated content is not merely a technical issue. Its impact on teaching practices, curriculum design, and classroom interaction depends on professional, institutional, and ethical conditions. The study shows that AI-generated content changes the nature of teacher work rather than simply replacing it. Teachers shift from being sole creators of instructional materials to curators, evaluators, designers, and ethical overseers of AI-assisted content. This shift is consistent with existing literature on the changing role of teachers in digital learning environments, where teachers are increasingly expected to design, curate, and mediate technology rather than only deliver content.

6.2 Benefits of AI-Generated Content for Teaching Quality and Student Learning

The findings suggest several important benefits of AI-generated content for teaching quality, particularly when it is used with pedagogical intention and critical oversight.

First, AI-generated content can improve the efficiency and flexibility of lesson planning. Teachers reported that AI tools made drafting, differentiation, and material variation faster. This is consistent with the literature on personalized and differentiated learning, which argues that effective instruction requires materials that respond to diverse student needs, prior knowledge, language backgrounds, and learning levels. By enabling teachers to

generate multiple versions of a text, worksheet, image, audio clip, or assessment task, AI-generated content can support more responsive teaching. However, the study also shows that this benefit is conditional. The speed of production does not automatically translate into higher teaching quality. If AI-generated materials are not checked for accuracy, bias, cultural relevance, and curriculum alignment, they may introduce new problems rather than solve existing ones.

Second, AI-generated content can support formative assessment and feedback. The findings show that teachers used AI-generated content most for formative assessment, feedback drafts, alternative formats, and task variation. This aligns with the formative assessment literature, which emphasizes the importance of ongoing feedback, task variation, and responsive teaching in supporting student learning. AI-generated content can help teachers create more varied formative tasks, produce alternative formats for students with different needs, and draft feedback that can then be refined by the teacher. This may improve teaching quality by making assessment more responsive and less time-consuming. However, the findings also show that teachers were cautious about using AI-generated items for high-stakes summative assessment without validation. This caution is important, because assessment quality depends on validity, reliability, fairness, and alignment with learning goals. AI-generated assessment items may be useful as drafts or formative tools, but they require careful validation before they can be used in ways that significantly affect student outcomes.

Third, AI-generated content can support the development of critical thinking and digital literacy. The study found that engagement was stronger when AI-generated content was used as a prompt for inquiry, critique, comparison, or student production. This suggests that AI-generated content can become a pedagogical resource for teaching students how to evaluate information, identify bias, question sources, and produce their own work. In this sense, AI-generated content can support student learning not only by providing content, but by creating opportunities for students to practice critical digital literacy. This is a significant benefit, because the ability to evaluate AI-generated content is likely to become an important skill in both academic and civic life.

Fourth, AI-generated content can support teacher professional capacity by making lesson planning more iterative and flexible. Teachers were able to experiment with different versions of materials, adapt tasks to different levels, and generate alternative approaches more quickly. This can support professional learning by giving teachers more opportunities to refine their instructional design. However, the findings also show that this benefit depends on teachers having the time, training, and institutional support to evaluate and adapt AI-generated materials. Without such support, the potential for professional growth may be limited.

Finally, the findings suggest that AI-generated content may support student learning indirectly by improving the quality of classroom interaction. When AI-generated content was used to stimulate discussion, critique, or student production, teachers' facilitation role became more central. This is consistent with constructivist and technology-enhanced learning perspectives, which emphasize that learning is shaped by interaction, dialogue, and active engagement. The study did not directly measure student learning outcomes, so these benefits should be understood as indirect evidence rather than proof of improved learning. Nevertheless, the observed patterns suggest that AI-generated content can support student learning when it is used in ways that promote active engagement, critical evaluation, and meaningful classroom interaction.

6.3 Risks of AI-Generated Content for Teaching Quality and Student Learning

The findings also reveal several risks associated with AI-generated content, many of which are pedagogical and ethical rather than purely technical.

A major risk is inaccuracy. AI-generated content can contain factual errors, misleading information, or "hallucinations" that appear plausible but are not reliable. This is a significant concern for teaching quality, because instructional materials must be accurate, curriculum-aligned, and appropriate for the target learners. If teachers use AI-generated content without sufficient verification, they may inadvertently introduce inaccurate information into the classroom. The findings show that in some cases, correcting AI errors took longer than creating content from scratch. This suggests that the apparent efficiency of AI-generated content can be offset by the time and effort required to check and repair it.

A second risk is bias. AI-generated content may reflect the biases present in the data used to train AI systems, including cultural, linguistic, gender, racial, and socioeconomic biases. This is particularly concerning in school settings, where instructional materials should support equity, inclusion, and culturally responsive teaching. If AI-generated materials present narrow, stereotyped, or culturally irrelevant perspectives, they may undermine student learning and reinforce existing inequalities. The findings show that teachers who were most effective in using AI-generated content were those who actively checked for bias and cultural relevance. This suggests that bias detection is not an optional extra, but a core part of responsible AI use in schools.

A third risk is cultural irrelevance. AI-generated content may be generic, decontextualized, or disconnected from

the local experiences, languages, and cultural backgrounds of students. This is a concern for teaching quality, because effective instruction is often more meaningful when it is connected to students' lives and communities. If AI-generated materials are used without adaptation, they may reduce the cultural richness of the curriculum and make learning less relevant for students. This risk is especially important in diverse school contexts, where one-size-fits-all materials may fail to meet the needs of all learners.

A fourth risk is student overreliance on AI as an authority. The findings show that engagement was weaker when AI outputs were presented as finished or authoritative products. This is consistent with constructivist concerns that learning requires student agency, questioning, and intellectual effort. If students come to treat AI-generated content as automatically correct, they may become less likely to question sources, evaluate evidence, or develop their own understanding. This could have long-term consequences for student learning, particularly in areas that require critical thinking, argumentation, and independent judgment.

A fifth risk concerns assessment and academic integrity. The findings show that teachers were cautious about using AI-generated items for high-stakes summative assessment without validation. This caution is important, because assessment practices must be fair, valid, and aligned with learning goals. If AI-generated assessment items are used without careful review, they may introduce validity problems, bias, or misalignment with curriculum standards. In addition, the use of AI-generated content raises questions about academic integrity, particularly when students use AI tools to produce work that is expected to reflect their own learning. The findings suggest that unclear expectations about academic integrity can create confusion for both teachers and students.

A sixth risk is ethical uncertainty. AI-generated content raises issues related to data privacy, copyright, institutional accountability, equity, and accessibility. These issues are not peripheral; they shape how AI-generated content can be used responsibly in schools. For example, if student data are used to generate personalized materials without clear privacy protections, ethical concerns arise. If AI-generated images, texts, or audio are used without attention to copyright, schools may face legal and professional risks. If AI tools are available only to some students or teachers, equity concerns may emerge. The findings show that these ethical issues were not abstract; they were part of teachers' everyday decisions about how to use AI-generated content.

Finally, the findings show that risks can be amplified when support conditions are limited. Where clear school policy, professional development, collaborative norms, and dedicated time for evaluation were absent, teachers reported greater uncertainty and increased workload. This suggests that the risks of AI-generated content are not only inherent in the technology itself, but are also shaped by the institutional and professional conditions in which it is used.

6.4 Unintended Consequences of AI-Generated Content

In addition to the direct benefits and risks, the findings reveal several unintended consequences of AI-generated content for teaching quality and student learning.

One important unintended consequence is the invisibility of verification work. The triangulation of data in **5. Findings** revealed discrepancies between self-reported and observed practice. Teachers sometimes overestimated time savings and underreported the time spent on ethical and accuracy checks. This suggests that the verification work required by AI-generated content is often invisible in traditional planning time estimates. As a result, the true workload associated with AI-generated content may be underestimated by teachers, school leaders, and policymakers. This has important implications for teaching quality, because if verification work is not recognized and supported, teachers may be less able to perform it consistently. Over time, this could lead to the use of less carefully checked materials, increasing the risk of inaccurate, biased, or inappropriate content entering the classroom.

A second unintended consequence is the shift in teacher professional identity. The findings show that teachers are moving from being sole creators of instructional materials to curators, evaluators, designers, and ethical overseers of AI-assisted content. This shift can be empowering, because it positions teachers as active designers of learning experiences. However, it can also be burdensome, because it adds new responsibilities without necessarily reducing overall workload. Teachers are now expected not only to plan and teach, but also to evaluate AI outputs, identify bias, ensure cultural relevance, align materials with curriculum goals, and monitor student use. If this shift is not supported by professional development and institutional structures, it may increase professional stress and reduce the time available for relational teaching, student support, and reflective practice.

A third unintended consequence is the potential homogenization of instructional materials. AI-generated content can make it easier to produce materials quickly, but it can also encourage the use of generic, standardized, or decontextualized resources. If teachers rely heavily on AI-generated content without adapting it to their specific

students, classrooms, and communities, the curriculum may become less locally relevant. This could reduce the cultural richness of teaching and limit opportunities for students to see their own experiences reflected in the materials they use. In this way, AI-generated content may unintentionally narrow the range of perspectives and experiences represented in the classroom.

A fourth unintended consequence is the possible reduction of intellectual struggle. The findings show that engagement was weaker when AI outputs were presented as finished or authoritative products. This suggests that AI-generated content may unintentionally reduce the need for students to grapple with difficult ideas, construct their own understanding, or develop their own arguments. If students become accustomed to receiving polished AI-generated answers, they may have fewer opportunities to experience the productive struggle that is often necessary for deep learning. This is a particular concern in subjects that require reasoning, interpretation, argumentation, and creative production.

A fifth unintended consequence is the lag between technological change and institutional readiness. The rapid evolution of AI tools may outpace school policy, professional development, and teacher preparation. The findings show that support conditions strongly shaped outcomes, and where these supports were limited, teachers reported greater uncertainty and increased workload. This suggests that schools may face a period of transition in which AI tools are available but the norms, policies, and professional capacities needed to use them responsibly are not yet fully developed. This lag can create unintended consequences, including inconsistent use, ethical uncertainty, and unequal access to effective support.

A sixth unintended consequence is the potential widening of equity gaps. AI-generated content may benefit teachers and students who have access to reliable technology, strong institutional support, and professional development. However, in contexts where these supports are limited, AI-generated content may increase workload, create uncertainty, or introduce new ethical risks. If schools are not able to provide equitable access to training, policy guidance, and time for evaluation, the benefits of AI-generated content may be unevenly distributed. This could widen existing inequalities in teaching quality and student learning.

A seventh unintended consequence is the possible distortion of assessment culture. If AI-generated content is used for high-stakes assessment without careful validation, it may undermine the fairness and validity of assessment. Even when used for formative purposes, AI-generated content can shape what students are expected to learn and how they are expected to demonstrate learning. If teachers do not critically evaluate these materials, they may unintentionally reinforce narrow or inappropriate learning goals. This is particularly important because assessment practices influence student motivation, self-concept, and engagement.

6.5 Conditions That Shape the Impact of AI-Generated Content

The findings suggest that the impact of AI-generated content on teaching quality and student learning is strongly shaped by the conditions in which it is used. These conditions include school policy, professional development, collaborative norms, and dedicated time for evaluation.

Clear school policy is especially important. As outlined in **2. Background and Context**, school policy and governance are central to responsible integration. Issues such as data privacy, copyright, academic integrity, equity, accessibility, and institutional accountability shape how AI-generated content can be used in schools. The findings show that where policy was clear, teachers were more likely to use AI-generated content responsibly. Where policy was unclear, teachers reported greater uncertainty. This suggests that policy is not only a compliance issue, but a pedagogical and professional support. Clear policy can help teachers make consistent decisions about when and how to use AI-generated content, how to protect student data, how to handle copyright, and how to maintain academic integrity.

Professional development is another key condition. The findings show that teachers needed AI literacy, critical evaluation skills, prompt design competence, ethical reasoning, and pedagogical integration skills to use AI-generated content responsibly. This is consistent with the literature on teacher professional development, which emphasizes that effective use of technology requires more than basic tool training. Teachers need to understand how AI-generated content can be integrated into their pedagogy, how to evaluate its quality, and how to use it ethically. Professional development should therefore focus not only on how to use AI tools, but also on how to critically evaluate their outputs, adapt them to students, and use them to support critical thinking and digital literacy.

Collaborative norms also matter. The findings show that collaborative norms were associated with more consistent and responsible use. This suggests that AI-generated content is not only an individual teacher practice, but a collective professional practice. Teachers may benefit from sharing prompts, evaluating AI outputs together, discussing ethical concerns, and developing common standards for accuracy, bias, and cultural relevance.

Collaborative norms can also help make verification work more visible and manageable, reducing the risk that it becomes an invisible burden on individual teachers.

Dedicated time for evaluation is another important condition. The findings show that AI-generated content added responsibilities such as checking accuracy, identifying bias, adapting materials, and monitoring student use. If teachers do not have protected time for this work, they may be less able to perform it consistently. This has important implications for teaching quality, because the value of AI-generated content depends on the quality of the evaluation and adaptation that follows its production. Without dedicated time, teachers may be forced to choose between using AI-generated content quickly and using it responsibly.

The findings also show that the net effect of AI-generated content on workload varied by subject, grade level, school type, teaching experience, and level of AI use. This suggests that there is no single answer to the question of whether AI-generated content increases or reduces workload. Instead, its workload effects are multidimensional. Time may be saved in content creation and formatting, but time may be added for verification, ethical review, adaptation, and monitoring. This multidimensionality is important for interpreting the findings, because it shows that workload cannot be understood simply as a matter of time saved or time added. It must be understood in terms of the nature of the work, the support available, and the professional context in which teachers operate.

6.6 Cautions in Interpretation and Directions for Further Understanding

The findings should be interpreted with caution because the study was exploratory and situated. As described in **4. Methodology**, the study relied partly on self-reported data, focused on teachers' practices and perceptions rather than direct measurement of student learning outcomes, and was conducted in specific school contexts. The rapid evolution of AI tools also means that the findings may not remain stable over time. Ethical constraints limited access to detailed student work, and the study did not directly measure causal learning effects.

These limitations are important for interpreting the discussion. The findings provide strong evidence about changes in instructional practice, observed engagement, and professional workload, but they do not prove that AI-generated content directly improves or harms student learning. The benefits and risks discussed here should therefore be understood as likely consequences, not as established causal effects. For example, the finding that engagement was stronger when AI-generated content was used as a prompt for inquiry suggests a plausible benefit for student learning, but further research would be needed to determine whether this leads to deeper understanding, better retention, or improved critical thinking over time.

Similarly, the finding that critical evaluation was the key mediating practice suggests that responsible use of AI-generated content is central to maintaining teaching quality. However, more research is needed to understand how critical evaluation can be systematically supported in schools, how it can be assessed, and how it can be integrated into teacher preparation and professional development. Future research could also examine how AI-generated content affects student learning outcomes across different subjects, grade levels, and educational systems. Longitudinal studies, comparative studies, and studies that include direct measures of student learning would help clarify the longer-term effects of AI-generated content on teaching quality and student learning.

The findings also suggest that the impact of AI-generated content will depend on how schools, teachers, and policymakers respond to the challenges it creates. If AI-generated content is used without critical evaluation, clear policy, and professional support, it may introduce risks related to accuracy, bias, cultural irrelevance, academic integrity, and student overreliance. If it is used with pedagogical intention, critical oversight, and institutional support, it may support differentiation, formative assessment, critical thinking, and more responsive teaching. The discussion therefore points to a central conclusion: AI-generated content is not inherently beneficial or harmful. Its impact depends on the quality of the pedagogical, professional, and ethical practices that surround its use.

These interpretations provide the basis for the practical and policy recommendations developed in **7. Implications for Practice and Policy**. They also highlight the need for continued systematic examination of how AI-generated content affects teaching at school, as called for in **1. Introduction**.

7. Implications for Practice and Policy

7.1 Recommendations for Teachers

The practical implications for teachers follow directly from the evidence that AI-generated content changes the nature of teacher work rather than simply replacing it. As noted in **5. Findings**, teachers increasingly act as curators, evaluators, designers, and ethical overseers of AI-assisted instructional materials. To support ethical, effective, and equitable use, teachers should adopt practices that make AI-generated content a transparent, pedagogically purposeful, and critically examined part of teaching.

- **Treat AI-generated content as provisional, not authoritative.**
  Teachers should avoid presenting AI-generated texts, images, audio, video, worksheets, or assessment items as finished or definitive products. Consistent with **6. Discussion**, engagement is stronger when AI-generated content is used as a prompt for inquiry, critique, comparison, or student production. This approach helps preserve student agency and supports the constructivist emphasis on active meaning-making.
- **Use a structured verification protocol before classroom use.**
  Teachers should systematically check AI-generated materials for:
  - factual accuracy;
  - bias or stereotyping;
  - cultural relevance and inclusivity;
  - age and grade-level appropriateness;
  - curriculum alignment;
  - accessibility;
  - copyright and licensing issues;
  - data privacy risks;
  - ethical appropriateness.

  This is especially important because **5. Findings** identified that verification work can be time-consuming and may be invisible in traditional planning estimates.
- **Design prompts with clear pedagogical intent.**
  Teachers should not use AI tools only to generate content quickly. Prompts should be shaped by learning objectives, student needs, and instructional goals. For example, teachers can ask AI tools to:
  - create scaffolded versions of a reading;
  - generate alternative examples for a concept;
  - produce formative assessment questions;
  - draft feedback for common student errors;
  - create multilingual or simplified-language materials;
  - design tasks that require students to compare, evaluate, or improve AI outputs.
- **Use AI-generated content most carefully for formative and process-based assessment.**
  Teachers can use AI-generated materials to support formative assessment, feedback drafts, task variation, and alternative formats. However, as **5. Findings** indicates, teachers should be cautious about using AI-generated items for high-stakes summative assessment without validation. Any AI-generated assessment item should be checked for validity, fairness, clarity, and alignment with learning standards.
- **Integrate critical digital literacy into classroom practice.**
  Teachers should explicitly teach students how to evaluate AI-generated content. This includes recognizing possible "hallucinations," identifying bias, checking sources, questioning assumptions, and understanding ethical issues such as data privacy, copyright, and academic integrity. This aligns with the critical digital literacy lens in **3. Theoretical Framework**.
- **Clarify expectations for student use of AI tools.**
  Teachers should make clear when students may use AI-generated content, how it should be cited or disclosed, and what counts as academic integrity. This helps reduce uncertainty and prevents students from treating AI outputs as unquestionable authority.
- **Monitor and document workload effects.**
  Because AI-generated content can both reduce and increase teacher workload, teachers should keep track

of time saved in content creation and time added for verification, adaptation, ethical review, and monitoring student use. This documentation can help schools recognize the full scope of teachers' professional responsibilities.

- **Collaborate with colleagues to build shared resources.**
  Teachers can work in subject teams or professional learning communities to evaluate AI-generated materials, share effective prompts, identify recurring errors, and develop vetted repositories of AI-assisted resources. Collaborative norms were associated with more consistent and responsible use in **5. Findings**.

7.2 Recommendations for School Administrators

School administrators have a central role in creating the conditions under which AI-generated content can be used responsibly. As outlined in **2. Background and Context**, school policy and governance are essential to responsible integration. Administrators should move beyond simply allowing or prohibiting AI tools and instead build structures that support ethical, pedagogically sound, and equitable practice.

- **Develop a clear school policy on AI-generated content.**
  The policy should address:
  - acceptable use of AI tools by teachers and students;
  - data privacy and protection of student information;
  - copyright and intellectual property;
  - academic integrity;
  - accessibility and inclusion;
  - equity of access;
  - teacher responsibilities;
  - student responsibilities;
  - institutional accountability;
  - procedures for reporting errors, bias, or ethical concerns.

  The policy should be practical, regularly updated, and written in accessible language for teachers, students, and families.

- **Provide sustained professional development, not one-off training.**
  Teachers need ongoing support in:
  - AI literacy;
  - prompt design;
  - critical evaluation of AI outputs;
  - ethical reasoning;
  - curriculum alignment;
  - differentiated instruction;
  - assessment design;
  - classroom facilitation;
  - workload management.

  Professional development should be subject-specific and connected to real classroom materials. It should also include opportunities for teachers to practice evaluating AI-generated content and to reflect on their own pedagogical goals.

- **Allocate dedicated time for evaluation and adaptation.**
  Administrators should recognize that AI-generated content adds verification work. Teachers need protected planning time to check accuracy, identify bias, ensure cultural relevance, and adapt materials. Without this support, the workload effects described in **5. Findings** may become more burdensome rather than manageable.

- **Create governance structures for AI use.**
  Schools can establish an AI or digital learning committee including teachers, administrators, IT staff, student representatives where appropriate, and community stakeholders. This group can:
  - review AI tools before adoption;
  - monitor use;

  - update policy;
  - coordinate professional development;
  - address incidents involving bias, privacy, or academic integrity;
  - maintain a shared repository of vetted AI-generated materials.

- **Support equitable access and inclusion.**
  Administrators should ensure that AI-generated content does not widen existing inequalities. This includes:

  - providing reliable devices and internet access;
  - ensuring materials are accessible to students with disabilities;
  - supporting multilingual learners;
  - checking materials for cultural relevance;
  - avoiding reliance on tools that may reflect narrow cultural or linguistic assumptions;
  - supporting students who may not have access to AI tools outside school.

- **Use pilots and phased implementation.**
  Rather than introducing AI-generated content across the whole school at once, administrators can use small-scale pilots to test tools, identify risks, and refine practice. Pilots should include clear success criteria, teacher feedback mechanisms, and opportunities to adjust policy.
- **Monitor practice and workload in a supportive way.**
  Schools can use workload diaries, classroom observations, teacher surveys, and student feedback to understand how AI-generated content affects teaching and learning. As **4. Methodology** notes, triangulating multiple sources helps identify discrepancies between stated and observed practice. Monitoring should be formative and supportive, not punitive.
- **Encourage collaborative norms and shared expertise.**
  Administrators can create time for teachers to share prompts, evaluate materials, discuss ethical dilemmas, and develop common expectations. Collaborative norms were associated with more responsible use in **5. Findings**, and they can reduce individual uncertainty.
- **Recognize the changed professional role of teachers.**
  Administrators should acknowledge that teachers are not only content creators but also evaluators, designers, and ethical overseers. This recognition should be reflected in workload planning, professional status, and support structures.

7.3 Recommendations for Policymakers

Policymakers should support schools in integrating AI-generated content in ways that are ethical, effective, and equitable. Their role is not only to regulate risk but also to enable capacity, research, and fair access. The recommendations below build on the broader contextual and professional dimensions described in **2. Background and Context** and the practical needs identified in **5. Findings**.

- **Fund infrastructure and professional development.**
  Policymakers should invest in:

  - reliable digital infrastructure in schools;
  - teacher professional development on AI literacy and critical evaluation;
  - subject-specific training;
  - support for under-resourced schools;
  - ongoing updates as AI tools evolve.

  Without funding, schools may be left to manage rapid technological change with limited capacity.

- **Integrate AI literacy into teacher education and curriculum.**
  Pre-service and in-service teacher education should include:

  - how AI-generated content works;
  - how to evaluate its accuracy and bias;
  - how to use it for differentiation and formative assessment;
  - how to teach students to critically evaluate AI outputs;

- how to address ethical issues such as privacy, copyright, and academic integrity.

AI literacy should be treated as a core professional competency, not an optional technical skill.

- **Develop national or regional guidelines for ethical use.**
  Guidelines should provide clear principles for:
  - student data protection;
  - age-appropriate use;
  - transparency about AI-generated materials;
  - copyright and licensing;
  - academic integrity;
  - accessibility;
  - equity;
  - assessment validity;
  - institutional accountability.

  These guidelines should be flexible enough to allow local adaptation, since school contexts vary by subject, grade level, culture, and resources.

- **Support research on long-term effects.**
  Policymakers should fund longitudinal and mixed-methods research that examines:
  - changes in teaching practice;
  - teacher workload;
  - student engagement;
  - critical digital literacy;
  - equity of access;
  - assessment validity;
  - ethical risks;
  - possible effects on learning outcomes over time.

  As **6. Discussion** cautions, current evidence should be interpreted carefully because it often focuses on teachers' practices, perceptions, and observed engagement rather than direct causal measures of student learning.

- **Regulate AI vendors and educational platforms.**
  Policymakers should require educational AI providers to meet standards for:
  - data privacy;
  - transparency;
  - safety;
  - age-appropriate design;
  - accessibility;
  - bias testing;
  - copyright compliance;
  - auditability;
  - clear terms of use for schools.

  Schools should not be expected to manage all technical and ethical risks alone.

- **Ensure equity in access and use.**
  Policy should prevent AI-generated content from becoming a privilege available only to well-resourced schools. This includes:
  - funding devices and connectivity;
  - supporting multilingual and culturally relevant materials;
  - ensuring accessibility for students with disabilities;
  - monitoring disparities in access and use;
  - supporting teachers in diverse school contexts.

- **Promote public understanding and stakeholder engagement.**
  Policymakers should communicate clearly with teachers, parents, students, and the public about the opportunities and risks of AI-generated content. Public engagement can help build trust, clarify expectations, and reduce fear or overconfidence about AI in schools.
- **Avoid one-size-fits-all mandates.**
  Policy should support local decision-making while setting minimum ethical and safety standards. Different subjects, grade levels, and school contexts may require different approaches to AI-generated content.

7.4 An Integrated Implementation Pathway

To move from recommendation to practice, schools and policymakers can follow a phased implementation pathway. This pathway should be grounded in the theoretical framework in **3. Theoretical Framework**, which emphasizes active learning, pedagogical alignment, and critical digital literacy.

1. **Baseline and policy development**
   Schools should assess current AI use, identify risks, and develop or update policy. This includes clarifying expectations for teachers, students, data privacy, copyright, academic integrity, and accessibility.
2. **Professional development and capacity building**
   Teachers should receive practical, ongoing training in evaluating and using AI-generated content. Training should include real classroom materials, subject-specific examples, and opportunities to practice critical evaluation.
3. **Pilot and support**
   Schools can pilot AI-generated content in selected classrooms or subject areas. During the pilot, teachers should receive support for verification, adaptation, and ethical review. Workload effects should be monitored, including the often invisible time spent checking AI outputs.
4. **Evaluate and refine**
   Schools should use multiple sources of evidence, such as teacher feedback, classroom observations, workload records, and student engagement indicators, to evaluate the pilot. Findings should be used to refine policy, professional development, and classroom practice.
5. **Scale and sustain**
   Once practices are refined, schools can expand use while maintaining governance, professional learning, and equity safeguards. Policymakers should support this process through funding, standards, research, and vendor regulation.

A useful set of success indicators includes:

- teachers' confidence in evaluating AI-generated content;
- consistent use of verification protocols;
- equitable access to devices, tools, and support;
- classroom practices that position AI outputs as provisional and open to critique;
- clear student expectations for academic integrity;
- reduced uncertainty about data privacy and copyright;
- balanced workload effects, with recognition of verification time;
- collaborative norms for sharing and reviewing AI-assisted materials;
- ongoing monitoring of bias, cultural relevance, and accessibility.

In summary, the integration of AI-generated content in schools should be guided by a balanced approach that recognizes both its potential to support teaching and its risks. As **6. Discussion** emphasizes, AI-generated content is not inherently beneficial or harmful. Its impact depends on how it is used, evaluated, and integrated into pedagogy. Ethical, effective, and equitable integration requires coordinated action by teachers, school administrators, and policymakers, with critical evaluation at the center of classroom practice.

8. Conclusion

8.1 Synthesis of Key Insights

The central conclusion of this publication is that AI-generated content is no longer a peripheral or experimental feature of school-based teaching. As introduced in **1. Introduction**, it is increasingly present in lesson plans, worksheets, reading materials, images, audio, video, assessment items, and feedback. The **2. Background and Context** section situates this development within the broader historical trajectory of educational technology, showing that AI-generated content represents a new stage in the evolution of digital learning. It is not merely a technical innovation; it is a professional, pedagogical, and ethical phenomenon that reshapes how teachers plan, prepare, adapt, and deliver instruction.

A key insight from the **5. Findings** is that AI-generated content changes the nature of teacher work rather than simply replacing it. Teachers are increasingly expected to act as curators, evaluators, designers, and ethical overseers of AI-assisted materials. This shift is consistent with the **3. Theoretical Framework**, which frames AI-generated content through constructivism, technology-enhanced learning, and critical digital literacy. From this perspective, AI-generated content is pedagogically valuable only when it supports active student engagement, meaning-making, critical evaluation, and alignment with learning goals. It becomes problematic when it is treated as a finished, authoritative product that reduces student agency or limits intellectual struggle.

The findings also show that AI-generated content can support teaching quality by making lesson planning, differentiation, scaffolding, multilingual adaptation, and formative assessment more flexible. Teachers reported that AI tools can help them produce varied, level-appropriate, and scaffolded materials more quickly. However, the **6. Discussion** emphasizes that these efficiency gains can be offset by additional verification work. Teachers may save time in content creation, but they may spend more time checking accuracy, identifying bias, ensuring cultural relevance, aligning materials with curriculum goals, and monitoring student use. In some cases, correcting AI errors took longer than creating content from scratch.

Critical evaluation emerged as the key mediating practice. The most positive outcomes were associated with teachers who systematically checked AI-generated content for accuracy, bias, cultural relevance, curriculum alignment, accessibility, copyright, data privacy, and ethical appropriateness. This finding reinforces the importance of critical digital literacy as a core professional competence. The **7. Implications for Practice and Policy** section further argues that AI-generated content should be treated as provisional rather than authoritative. It should be used as a starting point for inquiry, critique, comparison, or student production, not as an unquestionable source of knowledge.

Classroom engagement was found to depend strongly on how AI-generated content was positioned. Engagement was stronger when AI outputs were used as prompts for inquiry, critique, comparison, or student production. Engagement was weaker when AI outputs were presented as finished or authoritative products. This suggests that the teacher's facilitation role becomes more central in AI-supported classrooms. Teachers must design learning experiences that encourage students to evaluate, question, and transform AI-generated materials rather than passively consume them.

Assessment practices also shifted in important ways. Teachers used AI-generated content most for formative assessment, feedback drafts, alternative formats, and task variation. They were more cautious about using AI-generated items for high-stakes summative assessment without validation. This aligns with the concern, discussed in **6. Discussion**, that AI-generated assessment items may raise validity, fairness, and academic integrity issues if used without careful review.

Teacher workload was found to be multidimensional. AI-generated content can reduce time spent on basic content creation and formatting, but it can also increase time spent on verification, ethical review, adaptation, and monitoring student use. The net effect varied by subject, grade level, school type, teaching experience, and level of AI use. The **4. Methodology** section notes that the study relied partly on self-reported data and that triangulation revealed discrepancies between stated and observed practice. Teachers sometimes overestimated time savings and underreported the time spent on ethical and accuracy checks, suggesting that verification work is often invisible in traditional planning time estimates.

Support conditions strongly shaped outcomes. Clear school policy, professional development, collaborative norms, and dedicated time for evaluation were associated with more consistent and responsible use of AI-generated content. Where these supports were limited, teachers reported greater uncertainty and increased workload. This reinforces the argument in **7. Implications for Practice and Policy** that effective integration depends on structured governance, professional capacity, and institutional support rather than on individual teacher initiative alone.

Finally, the publication concludes that the risks associated with AI-generated content are primarily pedagogical

and ethical, not only technical. These risks include inaccurate content, "hallucinations," bias, cultural irrelevance, student overreliance on AI as an authority, assessment validity concerns, and unclear expectations about academic integrity. At the same time, the findings do not support a simplistic view of AI-generated content as either beneficial or harmful. Its impact depends on how it is used, evaluated, and integrated into pedagogy.

8.2 Future Research Directions

Although this publication provides an exploratory and situated account of how AI-generated content affects teaching, several important research gaps remain. Future research should move beyond teachers' practices and perceptions to examine the longer-term effects of AI-generated content on student learning, classroom interaction, equity, and professional development.

1. **Longitudinal and causal studies of student learning outcomes**
   The current study focused on teachers' practices, perceptions, and observed classroom engagement rather than direct measurement of student learning outcomes. Future research should use longitudinal, experimental, or quasi-experimental designs to examine whether AI-generated content improves, maintains, or undermines student learning over time. Such studies should measure not only academic achievement but also critical thinking, creativity, digital literacy, and student agency.

2. **Comparative and cross-context research**
   The findings are situated in specific school contexts and may not generalize to all educational systems. Future research should compare different countries, school types, grade levels, subject areas, and levels of digital infrastructure. This would help identify how cultural, institutional, and policy contexts shape the use and impact of AI-generated content.

3. **Student perspectives and agency**
   More research is needed on how students perceive, use, and respond to AI-generated content. In particular, future studies should examine whether AI-generated materials support or reduce student agency, intellectual struggle, and critical engagement. Student perspectives are essential for understanding whether AI-generated content functions as a tool for learning or as a source of passive consumption.

4. **Teacher professional development and AI literacy**
   The **2. Background and Context** section identifies AI literacy, critical evaluation skills, prompt design competence, ethical reasoning, and pedagogical integration skills as essential for responsible use. Future research should investigate which forms of professional development are most effective in building these capacities. Studies should also examine how teachers' confidence, identity, and professional role evolve as AI-generated content becomes more common.

5. **Workload and time-use measurement**
   Because teacher workload was found to be multidimensional, future research should use more precise time-use methods, such as workload diaries, screen analytics, and classroom observation, to measure the hidden costs of verification, adaptation, and ethical review. This would help schools and policymakers understand the true professional demands of AI-supported teaching.

6. **Assessment validity and academic integrity**
   Future research should examine the validity, fairness, and reliability of AI-generated assessment items. This includes studying how AI-generated tasks affect formative and summative assessment, how they influence feedback quality, and how they interact with academic integrity expectations. Research should also explore how schools can design assessment practices that teach students to evaluate AI outputs rather than simply detect their use.

7. **Equity, accessibility, and cultural relevance**
   The **7. Implications for Practice and Policy** section emphasizes that equity and inclusion must be central to implementation. Future research should investigate whether AI-generated content widens or narrows educational inequalities. This includes examining access to devices and connectivity, accessibility for students with disabilities, multilingual support, and the cultural relevance of AI-generated materials.

8. **Policy, governance, and implementation**
   More research is needed on how school policies, administrative support, and phased implementation pathways affect the responsible integration of AI-generated content. Future studies should examine the effectiveness of different governance models, including clear usage policies, collaborative norms, dedicated evaluation time, and institutional accountability structures.

9. **Technical and ethical evaluation tools**
   As AI tools evolve rapidly, future research should develop and test practical tools for evaluating AI-

generated content. These tools could support teachers in checking accuracy, identifying bias, detecting cultural irrelevance, and reviewing ethical issues such as data privacy, copyright, and academic integrity. Such tools should be designed with teachers, students, and policymakers to ensure they are usable in real classroom contexts.

10. **Pedagogical design and classroom interaction**
    Further research should explore how AI-generated content can be integrated into constructivist and technology-enhanced learning approaches. In particular, studies should examine how teachers can use AI outputs as prompts for inquiry, critique, comparison, and student production. This line of research should also investigate how classroom interaction changes when students are asked to evaluate, challenge, or transform AI-generated materials.

8.3 Final Remarks

In conclusion, AI-generated content is becoming a significant part of school-based teaching, and its impact cannot be understood in purely technical terms. It affects lesson planning, classroom engagement, assessment practices, teacher workload, and the broader professional role of teachers. The evidence presented in this publication suggests that AI-generated content can support teaching when it is used flexibly, critically, and in alignment with learning goals. However, its benefits depend on careful evaluation, strong professional development, clear policy, and institutional support.

The evolving role of AI-generated content in schools will be shaped not only by technological development but also by pedagogical choices, ethical standards, and governance structures. The goal should not be to maximize the use of AI-generated content for its own sake, but to ensure that it serves learning, equity, and professional responsibility. As outlined in **7. Implications for Practice and Policy**, a phased implementation pathway - moving through baseline assessment, policy development, professional development, piloting, evaluation, and scaling - offers a practical way to manage risks and refine practice over time.

Ultimately, the responsible integration of AI-generated content requires a balanced approach. Schools must recognize both the opportunities and the risks, and they must invest in the conditions that allow teachers to use AI-generated content ethically, critically, and effectively. Future research will be essential for deepening our understanding of how AI-generated content affects teaching and learning in the long term.