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From Experimentation to Integration: How Professional Learning Groups Supported Independent School Teachers' Use of Generative AI

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Abstract

This article investigates how secondary teachers in two Australian independent schools engaged with generative AI (GenAI) tools to support teaching and learning. Using a qualitative case study methodology and the Technology Acceptance Model (TAM) as a sensitising framework, the study examines teachers' perceptions of usefulness, ease of use, and the challenges they encountered. Over three months, teachers participated in professional learning groups supported by university-led workshops and peer collaboration. The findings show that teachers' adoption of GenAI was not simply determined by tool availability or perceived efficiency. Rather, teachers' perceptions of usefulness and ease of use developed through cycles of experimentation, prompt refinement, peer sharing, and ethical reflection. The study contributes a contextually grounded interpretation of TAM by showing how collaborative professional learning shaped teachers' movement from initial experimentation towards more purposeful pedagogical integration. The findings suggest the value of considering how perceptions of usefulness and ease of use may develop over time through sustained engagement with GenAI.

Keywords: generative AI; technology acceptance model; teacher professional learning; educational innovation

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Academic Editors: Sergio Miranda, Randall S. Davies, Niels Erik Ruan Lyngdorf, Nicolaj Riise Clausen and Thomas Ryberg

Received: 26 May 2026
Revised: 12 August 2026
Accepted: 13 August 2026
Published: 14 August 2026

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1. Introduction

The increasing presence of generative AI (GenAI) in education is impacting traditional teaching practices, offering new ways to enhance efficiency, creativity, and student engagement. As GenAI-powered tools become more accessible, teachers are experimenting with their use to support lesson planning, assessment, and instructional design (Zawacki-Richter et al., 2019). One of the advantages of GenAI in education is its versatility. Teachers can use GenAI to support their use of administrative tasks, the creation of learning materials, and to support students with diverse needs. GenAI-generated content enables more efficient lesson preparation while fostering interactive and engaging learning experiences (Luckin

et al., 2018). Additionally, GenAI's capacity for feedback can support both students and teachers in refining written work, analysing texts, and enhancing student understanding (Escalante et al., 2023). While these capabilities present important opportunities, they also introduce challenges related to quality control, ensuring the need for GenAI outputs to align with curriculum objectives and pedagogical goals (Selwyn, 2022).

The effectiveness of GenAI-assisted teaching often depends on teachers' ability to effectively use these tools. Developing strong prompting techniques and critically evaluating GenAI-generated content have become essential skills in maximising the benefits of this technology (Williamson & Eynon, 2020). As GenAI applications continue to develop, teachers must navigate the balance between leveraging automation for efficiency and maintaining the depth of human-driven teaching. The process of refining GenAI-generated materials requires thoughtful and critical engagement with AI, reinforcing the need for digital literacy and professional development in this space (Shibani et al., 2024). Furthermore, concerns surrounding data privacy and intellectual property highlight the need for responsible use (Williamson & Eynon, 2020). Ethical considerations, such as the potential for GenAI to reinforce biases or produce misleading output, require ongoing consideration. Additionally, access to premium GenAI tools raises questions about equity in education (Selwyn, 2022). As teachers and institutions grapple with these issues, the future of GenAI in education will depend on thoughtful integration strategies that prioritise pedagogical integrity and innovation.

Teachers' readiness is a critical factor for successfully integrating AI in teaching practices. To understand teacher's practices around the use of GenAI, an exploratory qualitative research project was undertaken with teachers in two New South Wales (NSW) independent schools. The purpose of the project was to introduce a range of GenAI tools to the teachers and support their use of these tools. The teachers participated in professional learning sessions and were guided by university staff in these sessions as part of the research project. The sessions provided opportunities for teachers to showcase their practices and share ideas and resources with each other as well as be supported with input from university lecturers and their peers.

The overarching question guiding the project was: How do independent schoolteachers use GenAI to enhance their practice? Two sub-questions were: How do teachers perceive the usefulness and ease of use of GenAI tools in their professional practice? What factors enable or constrain teachers' sustained use of GenAI in classroom and planning contexts?

While existing research has largely relied on survey-based measures of teacher perceptions and intentions to use AI, this study offers a novel contribution by capturing the situated, iterative, and practice-based nature of how teachers learn to integrate GenAI into their work. Specifically, it advances the field in three key ways. First, it provides fine-grained qualitative evidence of how secondary teachers' GenAI practices developed over time within authentic, school-based professional learning groups. Second, it identifies prompt refinement as an emerging professional practice, demonstrating how teachers iteratively improved the usefulness, relevance, and pedagogical alignment of GenAI outputs. Third, it shows that teachers' acceptance of GenAI extends beyond perceived usefulness and ease of use to include collaborative learning processes, ethical judgement, subject-specific experimentation, and institutional support. Together, these contributions move beyond descriptive accounts of GenAI adoption to offer new insight into the social and professional conditions that make GenAI usable, valuable, and pedagogically meaningful in practice.

2. Theoretical Framework

The Technology Acceptance Model (TAM), developed by Davis (1989), offers a useful theoretical framework to examine technology adoption in educational settings. Grounded in the Theory of Reasoned Action (Fishbein & Ajzen, 1975), TAM has been widely used in information systems research and provides a structured way to investigate the cognitive and behavioural determinants of technology use. In the context of GenAI in schools, TAM can help researchers analyse the factors that influence how teachers and learners embrace GenAI-powered tools. In this study, TAM is not applied as a predictive model or survey instrument. Instead, it is used qualitatively as a sensitising framework. This means that its key constructs, particularly perceived usefulness and perceived ease of use, informed the interpretation of teachers' accounts without determining the coding structure in advance.

There are three iterations of TAM. The iteration used here identifies two central beliefs that drive technology adoption: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). These beliefs underpin teachers' attitudes toward technology, which then influences their Behavioral Intention to Use, which then leads to Actual System Use (Davis, 1989). The iteration used in this article provides a validated and structured framework to understand how teachers form beliefs about the usefulness and ease of use of GenAI tools and how these beliefs shape their attitudes and classroom use.

Perceived Usefulness is defined as the degree to which a person believes that using a particular system will enhance their performance (Davis, 1989). In a school context, this may involve a teacher's belief that a GenAI system improves lesson planning, supports personalised learning, or provides more effective assessment feedback. If a GenAI-powered writing assistant, for example, helps students construct better arguments or receive faster feedback, both students and teachers may see it as valuable. Perceived Ease of Use refers to the degree to which a person believes that using the system will be free of effort (Davis, 1989). When GenAI tools are intuitive and integrate smoothly into existing classroom practices, teachers are more likely to view them positively. For instance, a GenAI chatbot that answers student questions with minimal teacher input would likely be accepted more readily if it has a user-friendly interface and requires little training.

Both PU and PEOU have been shown to directly influence users' attitudes toward the technology. Positive attitudes then shape behavioural intentions, which are the strongest predictors of actual use. In school environments, this pathway from beliefs to intention to behaviour can be used to design interventions that increase the uptake of GenAI tools. For example, professional development initiatives that demonstrate the usefulness and simplicity of GenAI platforms could enhance teachers' willingness to use them.

The value of TAM lies in its empirical validation. Numerous studies across various sectors, including education, have confirmed the model's predictive usefulness (Teo, 2011). TAM can capture the drivers of technology adoption, allowing researchers to identify key leverage points of acceptance. In the context of GenAI in schools, the model offers a systematic approach to understanding why some teachers readily adopt new technologies while others are resistant. A recent study has extended TAM with GenAI as an additional construct to examine teachers' perceptions and acceptance of GenAI (Yang & Appleget, 2024). Significantly, TAM supports qualitative research design, allowing for the exploration of perspectives from diverse perceptions of teachers.

Alternative frameworks could also have informed this study. For example, the Unified Theory of Acceptance and Use of Technology (UTAUT) places greater emphasis on social influence, facilitating conditions, and behavioural intention, while the Technological Pedagogical Content Knowledge (TPACK) framework focuses on the relationship between technological, pedagogical, and content knowledge in teachers' practice. Activity Theory offers a broader socio-cultural perspective by examining how technology use is

shaped by interactions between individuals, tools, rules, and institutional contexts. Each of these frameworks provides valuable insights into teachers' engagement with educational technologies. However, TAM was selected because the study was specifically concerned with how teachers developed perceptions of usefulness and ease of use during sustained engagement with GenAI tools. These constructs provided an appropriate lens through which to examine teachers' evolving experiences while allowing the study to explore how such perceptions were shaped through professional learning, experimentation, and collaborative reflection.

3. Literature Review

3.1. GenAI Use by Teachers

There are multiple benefits associated with teachers' use of GenAI tools in the classroom, as reported across studies involving language teachers (X. Huang et al., 2023) as well as primary, secondary, and tertiary teachers (Kiryakova & Angelova, 2023). However, the evidence also suggests that these benefits are not translating into uniform or consistent adoption. Adoption levels vary, with some studies reporting that just over 50 percent of teachers are using GenAI in some capacity (Pettersson et al., 2024). This indicates that GenAI use among teachers is emerging as a significant but uneven practice, shaped not only by access to tools but also by teachers' confidence, institutional conditions, and perceptions of professional value.

Among the GenAI tools, ChatGPT is reported as the most widely used, with 87% of teachers indicating its use (Collie & Martin, 2025). Studies have shown that teachers perceive significant benefits in using GenAI for classroom preparation tasks (Pettersson et al., 2024), in the creation of customised learning content (Nyaaba et al., 2024), supporting student interactions with GenAI, providing feedback, and handling administrative work. These findings suggest that teachers are primarily engaging with GenAI as a tool for reducing workload and supporting the design of teaching materials, rather than necessarily transforming pedagogy. As such, current use may alter teachers' cognitive engagement by shifting time away from routine tasks toward higher-order planning and professional judgement, although the extent to which teachers critically interrogate GenAI outputs remains underexplored.

GenAI has also been used in the detection of GenAI-generated student work (Pettersson et al., 2024), although these tools have their limitations (Roman & Clark, 2025) and can produce false positive or false negative results. This points to an important tension in teacher use: while GenAI may be valued as a support for teaching and administration, its use in areas such as detection and academic integrity remains problematic and may reinforce uncertainty about how teachers should use these tools responsibly.

In a survey by Collie and Martin (2025), teachers were asked to rank tasks based on the frequency of GenAI use. The most common applications were content creation tasks, with 40% of teachers reporting they used GenAI to develop teaching resources, such as worksheets, and 34% using it for lesson planning. Communication tasks followed, with 25% using GenAI to prepare written communication for parents and carers, and 22% using it for report writing. A smaller proportion, 6%, reported "other" uses, such as creating artwork examples, simplifying complex explanations, conducting subject research, writing scripts for curriculum development, and contributing to whole-school evaluations (Collie & Martin, 2025). Taken together, these findings suggest that current teacher use is concentrated in practical, task-oriented applications that support existing work practices. Studies indicate that GenAI is most often used as a supplementary device to support existing teaching practices, rather than to fundamentally transform pedagogy or instructional design (X. Wang et al., 2025). Although existing studies describe general adoption rates and perceived

benefits of GenAI among teachers, there is limited qualitative research capturing the specific ways teachers are applying GenAI tools in their daily practice (Xue et al., 2025). This lack of research limits understanding of how teachers make decisions about GenAI use, how they adapt these tools to teaching contexts, and how such use becomes embedded, or not, in everyday professional practice.

3.2. To Use or Not to Use

Barnes and Tour (2025) describe teachers' use of GenAI tools as a "dirty little secret." This framing highlights that teacher adoption of GenAI is not only a technical or pedagogical issue, but also a professional and ethical one. The decision is not about using GenAI, but whether its use is appropriate and should be disclosed to colleagues, students, and institutions, largely due to fears of teacher devaluation (Uygun, 2024). In this sense, teachers' engagement with GenAI is shaped by questions of professional legitimacy: whether using GenAI is seen as innovative, efficient, inappropriate, or as diminishing teachers' expertise.

Additional concerns include the potential misuse of student data (L. Huang, 2023), the storage and sharing of that data (Yu et al., 2023), and the risk of biased teaching materials, as algorithmic processes have been shown to unintentionally reinforce social inequalities (O'Neil, 2016). These factors contribute to hesitation around GenAI adoption. They also suggest that teachers' caution may be grounded in legitimate concerns about privacy, fairness, and responsibility rather than simple resistance to innovation. Compared to students, teachers and researchers demonstrate greater awareness of ethical considerations, personal accountability, and the potential risks associated with GenAI use (Đerić et al., 2025). However, teachers may be hesitant to disclose their own use of GenAI, as to not encourage student use, as concerns around student use often focus on academic integrity, plagiarism, and diminished critical thinking (Michel-Villarreal et al., 2023). This creates a contradiction: teachers may recognise the practical value of GenAI for their own work while simultaneously feeling uncertain about whether open use might legitimise student practices they view as risky.

Research focuses on ways GenAI is used, and on the limitations that may affect teachers' motivations and engagement with implementing GenAI. One perspective is on teacher agency and their attitudes towards GenAI engagement (Toncelli & Kostka, 2024; Wu et al., 2025). Zhai (2024) outlines four stages of teacher engagement with GenAI, which are awareness, exploration, collaboration and innovation, reflecting varying levels of integration across educational contexts. This staged view is useful because it suggests that adoption should not be understood as a simple binary between use and non-use. Rather, teachers may move through different levels of engagement depending on their confidence, perceived usefulness, institutional support, and sense of professional agency.

3.3. Greater Influences on Teachers' Use of GenAI

Among Collie and Martin's (2024) survey of 339 Australian teachers, greater valuing of GenAI stemmed from encouraged choice and flexibility from leadership, described as autonomy-supportive leadership, teachers' personal motivation to keep developing their skills, described as professional growth striving, and the pressures teachers experienced from broader educational changes, described as change-related stress. These findings suggest that teachers' perceptions of GenAI are shaped by both enabling and pressuring conditions. On the one hand, autonomy-supportive leadership and professional growth striving may create conditions in which teachers feel able to experiment with GenAI. On the other hand, change-related stress may also push teachers towards GenAI as a response to workload, reform pressures, or uncertainty in the profession.

Another survey by K. Wang et al. (2024) revealed anxieties such as unfamiliarity, concerns about privacy, and ethical issues that were key deterrents in using GenAI to support their teaching. It is recommended that teacher educator programs should include training on both the technical use of GenAI tools and their integration into teaching practices to reduce Gen AI anxieties (K. Wang et al., 2024; Zhai, 2024) and improve teacher confidence (Nyaaba & Zhai, 2024). This suggests that professional learning needs to move beyond tool demonstration and address the pedagogical, ethical, and contextual dimensions of GenAI use. Studies have pointed out the direct relationship between formal support in the form of training and guidelines to inform teacher's adoption and use of GenAI. Formal support should focus on the "confidence, knowledge and skills to navigate the complexities of the entanglements of GenAI, pedagogy and shared agency ethically and responsibly" (Barnes & Tour, 2025, p. 13). This emphasis on entanglement is important because it positions GenAI use not as an isolated teacher decision, but as a practice shaped by pedagogy, professional judgement, institutional expectations, and technological affordances.

Variations in teachers' digital literacy, access to technology, and confidence in using digital tools can result in different levels of technology integration in classrooms (McIntosh et al., 2023). These variations are significant because they indicate that GenAI adoption may reproduce existing inequalities in digital capability and access unless formal support is sustained, practical, and sensitive to teachers' contexts. Despite growing evidence identifying factors that influence teachers' perceptions of GenAI, there is still a lack of empirical research examining how formal support, including professional development, technical training, and leadership guidance, translates into actual classroom use. Limited studies examine how these types of support influence teachers' day-to-day practices or how variations in teacher adoption may affect students' learning experiences. This gap is central because understanding teachers' perceptions of GenAI is not sufficient on its own; it is also necessary to examine how teachers incorporate GenAI into their work, what forms of support enable meaningful use, and how these practices shape classroom learning.

Taken together, the literature suggests that teachers increasingly recognise the potential value of GenAI for lesson planning, resource creation, differentiation, and administrative efficiency. Across studies, perceived usefulness consistently emerges as an important influence on adoption, while concerns relating to ethics, privacy, reliability, and professional identity continue to shape teacher engagement with these tools. At the same time, the literature reveals several tensions. Although teachers often report positive attitudes towards GenAI, actual use remains uneven and highly dependent on contextual factors such as professional learning, leadership support, confidence, and access to resources. Furthermore, much of the existing literature relies on surveys and cross-sectional measures of perception and intention. Consequently, there is limited understanding of how teachers' perceptions of usefulness and ease of use develop through repeated engagement with GenAI in authentic educational contexts. This study addresses that gap by examining how teachers' experiences evolved over time within collaborative professional learning groups.

4. Materials and Methods

Qualitative methodology was employed to examine secondary school teachers' experiences using GenAI in authentic educational settings. A case study approach was adopted to enable an in-depth, contextually grounded examination of how teachers in two independent schools engaged with GenAI tools and how professional, social, and institutional factors influenced their adoption and use. Case study research is particularly suited to investigating complex educational phenomena within real-world contexts, where the boundaries between a phenomenon and its setting are not clearly defined (Yin, 2018).

The study involved sustained engagement with teachers over a period of three to four months. Multiple sources of data were used, including teacher diary entries, observations of professional learning group sessions, and thematic analysis. This multi-source design supported a rich, contextualised understanding of how teachers' perceptions and practices evolved over time. The case study approach enabled an interpretive examination of GenAI integration that foregrounded everyday practice and organisational context, aligning with educational technology research that emphasises the importance of studying technology use as it occurs within specific school settings (Selwyn, 2022).

4.1. Participants

The participants were 37 secondary school teachers from two independent schools in NSW, Australia: Trinity Grammar School and Ravenswood School. Twenty-six teachers were from Trinity and 11 were from Ravenswood. Participants represented a range of secondary teaching areas, including humanities, creative arts, languages, and STEM-related subjects. The study did not formally assess baseline digital literacy before participation; however, teachers' diary entries and PLG discussions indicated varied levels of confidence and prior experience with GenAI, ranging from tentative first use to more confident experimentation with subject-specific tools. The schools were adopting AI for teacher use and wanted guidance on how to effectively incorporate it. All teachers were invited to be part of a professional learning group (PLG), and these teachers were nominated to join the group where the focus was on the use of GenAI to support teaching and learning. Both schools ran the PLG over the space of one or two terms using a common structure (Table 1).

Table 1. Structure of PLGs.

Phase	Focus	Role of University Staff	Role of Teachers
Introductory sessions	Introduction to GenAI tools, ethical considerations, possible teaching uses	Modelled tools, introduced examples, discussed risks and possibilities	Explored initial questions and identified possible uses
Experimentation phase	Classroom and planning experimentation	Provided guidance and troubleshooting	Trialled tools, recorded reflections in diaries
Sharing phase	Peer exchange and refinement	Facilitated discussion and synthesis	Shared prompts, examples, outputs, challenges and adaptations
Consolidation phase	Reflection on practice change	Supported interpretation of emerging practices	Reflected on usefulness, ease of use, constraints and future use

Both schools stated they were happy to have their names published. The project was approved through the ethics committee at the university at which the authors worked. All teachers were provided with a participant information and consent forms and agreed to be a part of the project.

4.2. Data Collection

Following introductory sessions on GenAI use and tools, teachers were encouraged to experiment with AI tools that could support their teaching practices, and document their usage and reflections in an online learning diary set up by the research team. Data were collected primarily through use of learning diaries the teachers were asked to submit after each interaction with a GenAI tool. There were 12 prompting questions provided and a final question allowing teachers to add any other comments.

The diary instrument was designed to capture teachers' experiences of using GenAI tools over time, including their intended purposes, perceptions of usefulness and ease of use, challenges encountered, and reflections on practice. The prompts were structured to encourage participants to describe specific interactions with GenAI rather than provide general opinions. Questions addressed participants' initial expectations, tasks undertaken using GenAI, observations about tool performance, challenges and frustrations, perceived benefits, and impacts on teaching practice. Example prompts included: "What specific tasks did you use the AI for today?"; "How did the AI assist in this task?"; "Did the AI perform as you expected?"; "What benefits have you noticed from using AI in your teaching?"; and "What challenges or frustrations did you encounter?" Participants were also invited to provide copies of AI interaction logs and any additional reflections. The full set of diary prompts is provided in Appendix A.

A total of 37 teachers completed the diaries, (26 from Trinity and 11 from Ravenswood) with some teachers completing two or more entries which meant there were a total of 77 entries (45 and 32).

Observational data were collected during each professional learning group session by the university facilitators. Field notes recorded teacher discussions, demonstrations of GenAI use, examples of prompts and outputs shared during meetings, questions raised by participants, and recurring areas of enthusiasm, uncertainty, or concern. Rather than focusing on individual teachers, the observations captured collective practices, peer interactions, and the ways participants discussed and refined their use of GenAI tools across the project. Observational notes were written immediately following each session and retained as part of the study dataset.

4.3. Analytic Approach

Thematic analysis was used to analyse the data. It is a widely used qualitative research method that involves identifying, analysing, and reporting patterns (themes) within data (Braun & Clarke, 2006). The data were reflexively analysed through aspects of Technology Acceptance Model, which examines the perceived usefulness, perceived ease of use, perceived cost, subjective norms, behavioural attitudes, and perceived behavioural control on teachers' use of GenAI technologies (Lu et al., 2024).

Analysis proceeded in four stages. First, all diary entries and observational notes were read repeatedly to develop familiarity with the data and to identify recurring accounts of GenAI use, hesitation, experimentation, and adaptation. Observational data served two purposes in the analysis. They provided contextual information about how teachers collectively discussed, demonstrated, and evaluated GenAI practices during professional learning group sessions. Also, they were used to corroborate and extend patterns identified in diary entries. For example, themes relating to prompt refinement, peer sharing, and ethical concerns appeared both in individual diary reflections and in observational records of group discussion. In this way, observational data contributed to the triangulation of findings and strengthened the credibility of interpretations.

Second, the research team generated initial inductive codes that remained close to teachers' descriptions of GenAI use, including codes such as time saving, prompt refinement, differentiation, ethical uncertainty, technical constraint, and peer sharing. Third, these codes were reviewed and grouped into broader themes that captured recurring patterns across participants and across the two school sites. For example, diary entries describing the creation of scaffolds, summaries, and differentiated resources were grouped under lesson planning and differentiation, while entries describing changes to prompts, feedback to GenAI tools, and repeated testing of outputs informed the theme of changes in practice. Fourth, the themes were interpreted through TAM constructs, particularly per-

ceived usefulness, perceived ease of use, and external variables, to examine how teachers' acceptance and use of GenAI developed through professional learning and experimentation. Coding reliability was supported through a systematic and transparent analytic process. All diary entries and observational notes were coded iteratively using thematic analysis following Braun and Clarke's (2006) six-phase framework. Initial coding was conducted inductively to remain close to participants' language and experiences, before being examined through the sensitising concepts of the Technology Acceptance Model. Codes were reviewed and refined across multiple analytic cycles to ensure internal consistency and conceptual coherence.

To enhance trustworthiness, emerging themes were discussed among the research team across multiple analytic meetings. These discussions focused on testing whether themes were supported across multiple diary entries and observational notes, clarifying theme boundaries, and identifying negative or complicating cases. The evolution of some example codes to themes is shown in Table 2.

Table 2. Example progression from codes to themes.

Example Codes	Category	Theme
Time saving; resource generation; worksheet creation; scaffold development	Lesson planning and differentiation	Benefits and challenges of GenAI use
Idea generation; visualisation; creative inspiration	Creativity and idea generation	Benefits and challenges of GenAI use
Ethical concerns; privacy concerns; inaccurate outputs; technical barriers	Challenges and constraints	Benefits and challenges of GenAI use
Peer sharing; modelling; troubleshooting; collaborative discussion	PLG support	Changes in practice over time
Prompt refinement; prompt experimentation; iterative improvement	Prompt refinement	Changes in practice over time
Confidence growth; increased experimentation; more targeted use	Temporal development of practice	Changes in practice over time

Because the study used reflexive thematic analysis, we did not calculate inter-rater reliability; instead, rigour was supported through collaborative interpretation, transparent coding decisions, and alignment between themes, data excerpts, and the study's research questions. Consistent with Braun and Clarke's approach to reflexive thematic analysis, the purpose of analysis was not to achieve data saturation in a positivist sense. Rather than seeking exhaustive coverage of all possible experiences, the analysis focused on producing a coherent and conceptually rich interpretation of patterns across the dataset. Theme development concluded when the research team judged that the themes adequately addressed the research questions and were strongly supported by the available data. This approach aligns with the interpretive aims of reflexive thematic analysis and the exploratory nature of the study.

Researcher positionality was also considered in interpreting the data. University staff were not detached observers: they introduced tools, facilitated discussion, provided troubleshooting, and supported teachers' reflection on emerging practices. This embedded role created a possible risk that teachers might emphasise positive experiences or frame their diary entries in ways that aligned with perceived facilitator expectations. To mitigate this risk, teachers' diary entries were analysed alongside observational notes from PLG sessions, with attention given to both enabling and constraining experiences. The analysis also

included negative and complicating cases, such as technical barriers, ethical uncertainty, limited tool functionality, and concerns about student use. In this way, credibility was supported through triangulation across data sources, collaborative discussion within the research team, and an explicit effort to retain evidence of ambivalence rather than only reporting positive accounts of adoption.

5. Results and Discussion

This section first provides an overview of the GenAI tools used by teachers. It then analyses two themes that emerged from the data (Table 3): Benefits and challenges of using Gen AI, and changes in practice over time. The table below sets out key themes covered.

Table 3. Key themes.

Theme	Sub-Theme	Key Finding	TAM Interpretation
Benefits and challenges of GenAI use	Lesson planning and differentiation	Teachers used GenAI to develop scaffolds, summaries, differentiated activities and curriculum-aligned resources.	Demonstrated strong perceived usefulness through efficiency, instructional support and adaptation to student learning needs.
Benefits and challenges of GenAI use	Creativity and idea generation	Teachers used GenAI to support idea generation, visualisation, reflection, critique and creative discussion.	Expanded perceived usefulness beyond administrative efficiency by positioning GenAI as a creative pedagogical tool.
Benefits and challenges of GenAI use	Challenges and constraints	Teachers identified ethical concerns, technical barriers, access issues and output limitations.	Constraints moderated perceived usefulness and perceived ease of use, but also prompted adaptation, checking and further refinement.
Changes in practice over time	Professional learning group support	PLGs supported teachers' initial engagement by providing modelling, peer exchange, structured training and troubleshooting.	PLGs operated as external variables shaping attitudes, confidence, acceptance and continued use.
Changes in practice over time	Prompt refinement	Prompt refinement emerged as a recurring professional practice through which teachers improved output quality and pedagogical alignment.	Prompt refinement strengthened both perceived usefulness and perceived ease of use by giving teachers greater control over GenAI outputs.
Changes in practice over time	Temporal development of practice	Teachers moved from uncertainty and surface-level experimentation towards more confident, curriculum-aligned and purposeful integration.	Supports a temporal interpretation of TAM in which PU and PEOU are constructed through sustained practice rather than fixed before use.

The teacher used a variety of GenAI tools that were able to support successful outcomes. Their choice of tool use depended on the subject they were teaching, their needs and experiences. As illustrated in Table 4, 13 different GenAI tools were used.

Table 4. Teachers GenAI tool selection.

Tool	Number of Users
Chat-Based AI	27
Adobe Firefly	4
Copilot AI	3
Julius AI	3
Meshy AI	2
Anthem Score	1
Runway	1
Suno	1
Photoshop Generative AI	1
Diffit	1
2D image to 3D stl file converter	1
Notebook LM	1
Midjourney	1

5.1. Benefits and Challenges of Using Gen AI

A significant number of teachers (43%) reported using GenAI to support lesson planning and differentiated instruction across a range of subjects. As teachers became more confident with GenAI, these activities extended beyond practical efficiencies and became more closely connected to instructional quality, curriculum alignment, and inclusive practice. Teachers frequently described GenAI as enabling the rapid development of scaffolds, summaries, and instructional tools that would otherwise require significant planning time. Teacher 14 (Trinity) reflected: *"AI has helped me to create scaffolds more effectively for my EAL/D students, in this instance, a table of quotes, techniques and analysis."* This illustrates how GenAI was valued not only for efficiency but also for supporting cognitively demanding teaching tasks such as scaffolding disciplinary literacy for diverse learners.

Differentiated instruction represented another central mechanism through which usefulness was realised. For example, teacher 12 (Ravenswood) stated: *"Gamma assisted me in developing differentiated activities for my lessons."* Teachers also described using GenAI to generate curriculum-aligned, subject-specific resources, including syllabus-aligned questions, art history materials, and revision content at different reading levels. In these examples, usefulness and ease of use became intertwined: GenAI reduced planning time while also helping teachers adapt resources to students' learning needs.

Teachers' use of GenAI to enhance student creativity (38%) evolved from tentative experimentation to more deliberate pedagogical practice. Initially, teachers used GenAI to support idea generation and visualisation. For example, Teacher 11 (Trinity) described using GenAI to generate reference images based on students' superhero mind maps: *"I wanted Year 8 students to come up with a prompt based on their Superhero mind mapping to generate a reference image for art making."* This positioned GenAI as a mediating tool that translated abstract student ideas into tangible forms without replacing student agency.

As teachers became more confident, GenAI was used less for output generation and more as a catalyst for reflection, critique, and conceptual discussion. Teacher 21 (Trinity) described prompting GenAI with student concepts to explore compositional possibilities in English, noting that *"It opened up space for conversations about abstraction and intention that might not have happened otherwise."* Opportunities to share these practices through PLGs helped teachers observe effective uses of GenAI, recalibrate their expectations, and increasingly view it as a legitimate creative pedagogical tool.

While there were many benefits noted by teachers in using GenAI, they also encountered a range of challenges and constraints (68%), including ethical concerns, technical barriers, and content limitations. However, many of the teachers found ways to adapt and

refine their approach to make GenAI a more effective tool in their teaching practice. These experiences highlight how external factors and system limitations, as described in the TAM, can influence both PU and PEOU (Davis, 1989). These challenges are echoed in the recent literature that emphasises the uneven readiness and capacity among teachers to integrate GenAI effectively (Hsiao & Tang, 2024).

Some teachers wrestled with ethical concerns surrounding GenAI's role in student learning. Teacher 14 (Trinity) reflected on these dilemmas, stating: "*I asked my student for consent to copy and paste his response into GenAI. I suggested this might be a way to use GenAI to help him improve his writing when he's not in class but that he must check feedback and tips and paraphrase suggestions.*" Such ethical tensions can lower the perceived usefulness of GenAI when teachers are unsure whether it ultimately enhances student learning or undermines independence. This aligns with findings that ethical considerations significantly impact technology acceptance in educational contexts (Hsiao & Tang, 2024).

Other teachers faced technical barriers while using GenAI tools. Teacher 23 (Trinity) found the user interface confusing, stating: "*The menu navigation was a bit confusing, especially going from outline to complete answer.*" Teacher 5 (Trinity) encountered access issues. McGehee (2024) found that access, stability, and usability issues are key reasons some teachers resist GenAI adoption, so it is important that technical obstacles are minimised.

Other teachers encountered functional limitations in GenAI-generated outputs. Teacher 28 (Trinity) noted: "*It could not add pictures into the PowerPoint for me*" meaning she had to manually adjust the slides. Teacher 24 (Trinity) found discrepancies in GenAI's navigation capabilities and Teacher 22 (Trinity) found GenAI's descriptions of musical elements difficult to interpret. These functional limitations affected PU, as outputs that required substantial correction or lacked depth diminished GenAI's perceived value. This is consistent with studies highlighting that content limitations can negatively influence perceived usefulness in educational technologies. Additionally, Collie et al. (2024) found that teachers can value GenAI as it is able to ease time pressures. The aspect of GenAI supporting time was noted earlier, but it did also impact negatively on teachers' time when it did not perform as expected.

Despite these challenges, many teachers demonstrated adaptive practices and problem-solving approaches, such as refining prompts or double-checking outputs. According to TAM, when external barriers are managed through skill development or coping strategies, it can moderate their negative effects and help sustain positive attitudes toward ongoing technology use (Venkatesh & Davis, 2000). This is supported by recent studies showing that professional learning, experimentation, and reflective GenAI use positively shift both PU and PEOU over time (Ghimire & Edwards, 2024).

While presented here as distinct themes, these findings were highly interconnected in practice. Teachers' use of GenAI for lesson planning, creativity, and managing constraints was shaped by the same underlying processes of experimentation, prompt refinement, and collaborative exchange. For example, practices developed in lesson planning contexts often informed more sophisticated creative applications, while challenges related to reliability and ethics prompted further cycles of refinement and peer discussion. This suggests that teachers' engagement with GenAI was not modular, but iterative and cumulative, with each area of use reinforcing and extending others over time.

5.2. Changes in Practice over Time

One of the main reasons that teachers initially engaged with GenAI was the influence of PLGs, where university staff modelled its use. Exposure to the tools through structured training illustrates the impact of External Variables in TAM, where support, access, and training opportunities can shape user attitudes toward new technologies (Venkatesh &

Bala, 2008). This aligns with findings that emphasise the significance of contextual factors in technology adoption within educational settings (Granić & Marangunić, 2019). Similar observations were made by Tatar et al. (2024), who reported that professional learning significantly boosts teacher confidence in GenAI integration.

Observational notes from the PLG meetings reinforced the importance of collaborative learning processes. Across both schools, teachers frequently demonstrated prompts, shared successful outputs, and discussed strategies for refining GenAI responses. These interactions provided evidence that prompt refinement was often learned socially through peer exchange rather than solely through individual experimentation.

One aspect teachers were very interested in, and received support via the PLGs, was the use of prompts. Many teachers found that refining their prompts led to more precise and relevant GenAI-generated content. Teacher 5 (Ravenswood) explained: "*More focused instructions using the prompt to deliver the specific requirements.*" This example aligns with TAM, demonstrating how iterative prompt refinement can improve PU by ensuring GenAI outputs are better aligned with teaching goals (Teo, 2011). Similar iterative learning processes were noted by Holmes and Tuomi (2022), who found that repeated GenAI prompt adjustments improved teachers' satisfaction and learning outcomes.

For more subject-specific refinement, Teacher 22 (Trinity) discovered that modifying his prompts improved GenAI's ability to mimic professional styles, stating: "*More focused and detailed questions. Asking for specific technical outcomes and asking the GenAI to replicate the style of a famous musician.*" This quote reinforces how subject-specific adjustments enhanced PU across disciplines (King & He, 2006).

Across the data, prompt refinement emerged as more than a technical skill. It functioned as a form of pedagogical translation, through which teachers learned to convert curriculum goals, student needs, disciplinary conventions, and ethical boundaries into instructions that GenAI tools could act upon. In this sense, prompting was not simply a way to operate the technology; it became a professional practice through which teachers exercised judgement over the quality, appropriateness, and usefulness of AI-generated outputs. Teachers' sense that GenAI was "easy to use" developed through repeated experimentation, feedback, and peer exchange. Similarly, perceived usefulness increased when teachers became more capable of producing outputs that aligned with their pedagogical intentions.

Teachers realised that GenAI tools allowed for follow-up adjustments and interactive engagement. Teacher 1 (Ravenswood) explored different input variations, noting: "*Searching for prompts to change outputs. Trying variations of sentences, seeing if/when they have an impact.*" These experiences reflect TAM's idea that external factors like user familiarity and training shape both PU and PEOU over time (Venkatesh & Zhang, 2010).

Some teachers encountered difficulties in GenAI comprehension and found that restructuring their input improved the results. Teacher 25 (Trinity) tested GenAI's ability to process non-English text, sharing, "*I found out that Adobe Firefly did not have good comprehension on Chinese language. When I entered 20 words in Chinese of a particular poem, it did not generate an image reflecting the poem correctly. Actually, it made a lot of mistakes. Then I translated the poem into English and added it into the text, it came up with a much more accurate text.*"

Teachers also focused on refining their engagement with GenAI tools by revising their prompts and providing feedback. Teacher 27 (Trinity) emphasised how interactive prompting improved GenAI's responses, explaining: "*I have focused more on the prompt and giving specific instructions. I tried to embed the ROSE model and give more context in my prompts. I have given more feedback to the GenAI. For example, when I didn't like some of the results it gave me, I told it to swap those specific examples with something that was more focused on the topic I wanted.*" These experiences reinforce TAM's principle that as users develop strategies to

work around system limitations, their perceptions of usefulness and ease improve, leading to greater integration of the technology (Marangunić & Granić, 2015).

Across the data, teachers' development can be understood as a temporal progression shaped by ongoing participation in professional learning groups and repeated engagement with GenAI tools. Early interactions were characterised by uncertainty, surface-level experimentation, and limited confidence. Over time, teachers demonstrated increasingly sophisticated practices, including targeted prompt refinement, critical evaluation of outputs, and intentional alignment with curriculum goals. This temporal development was not linear but iterative, with teachers moving back and forth between experimentation and refinement as they encountered challenges and incorporated feedback from peers and facilitators. Participation in the professional learning groups was central to this process, providing a structured space for sharing practice, troubleshooting, and collectively developing strategies for effective use.

Through sustained engagement, teachers' perceptions of ease of use and usefulness became more grounded in practice, as they developed the skills required to produce reliable, relevant, and pedagogically meaningful outputs. This highlights the importance of time, repetition, and collaborative learning in understanding teacher adoption of GenAI, extending existing models that often treat these constructs as static perceptions.

6. TAM in the Context of GenAI

6.1. From Confirmation to Reinterpretation of TAM

The findings of this study initially appear to confirm the relevance of the TAM in understanding teachers' engagement with GenAI. Consistent with prior work, perceived usefulness, particularly in relation to support for differentiation, and enhanced creative possibilities, emerged as a key driver of teachers' adoption and sustained use of GenAI tools. Perceived ease of use also shaped engagement, particularly in early encounters with unfamiliar systems and interfaces.

However, while TAM provides a useful starting point, the findings suggest that its core constructs require reinterpretation in the context of GenAI. In particular, the data indicate that perceived usefulness and perceived ease of use do not operate as stable, pre-existing beliefs that determine technology adoption. Instead, they emerge through sustained interaction with the technology and are progressively constructed through practice.

6.2. From Static Perceptions to Temporal Conceptions

A key contribution of this study is to show that PU and PEOU are best understood as temporal and emergent constructs, rather than as fixed cognitive settings. Traditional applications of TAM tend to treat PU and PEOU as relatively stable perceptions that precede and predict technology use. In contrast, the findings presented here demonstrate that these constructs develop over time through iterative engagement with GenAI tools.

Teachers' early interactions with GenAI were characterised by uncertainty, limited confidence, and exploratory use. At this stage, perceptions of both usefulness and ease of use were tentative and often constrained by technical issues, unfamiliar interfaces, or ethical concerns. Over time, however, these perceptions shifted as teachers engaged in repeated cycles of experimentation, feedback, and reflection. As teachers became more familiar with the capabilities and limitations of GenAI, they were increasingly able to align its outputs with their pedagogical intentions, resulting in stronger and more stable perceptions of usefulness. Similarly, ease of use was not experienced as an inherent property of the technology but as an outcome of growing familiarity, skill development, and contextual understanding.

These findings challenge the implicit assumption within TAM that usefulness and ease of use are properties that can be readily perceived prior to, or independent of, sustained engagement. Instead, they suggest that in the case of GenAI, these constructs are constructed through time, shaped by ongoing interaction between users, technologies, and professional contexts.

6.3. The Importance of Iterative Practice and Refinement

The temporal development of PU and PEOU was driven by iterative cycles of practice, in which teachers experimented with GenAI tools, reflected on outputs, and refined their approach. Within these cycles, prompt refinement emerged as a central mechanism through which teachers improved both the relevance and quality of AI-generated outputs.

Importantly, prompt refinement functioned as more than a technical adjustment. It can be understood as a form of pedagogical mediation, through which teachers translated curriculum goals, disciplinary knowledge, and student needs into instructions that shaped GenAI outputs. Through repeated engagement, teachers developed increasingly sophisticated prompting strategies, enabling them to produce outputs that were more aligned with their instructional intentions.

This process had direct implications for both TAM constructs. As prompts became more effective, the outputs generated by GenAI were perceived as more relevant, accurate, and pedagogically useful, thereby strengthening perceived usefulness. At the same time, as teachers developed greater control over the interaction, their experience of effort decreased, contributing to stronger perceptions of ease of use. In this way, iterative practice acted as the mechanism through which both PU and PEOU were progressively realised.

6.4. Towards a Temporally Informed Interpretation of TAM

Building on these findings, this study suggests a temporally informed interpretation of TAM for understanding GenAI adoption in the context examined here. While the findings indicate the value of viewing perceived usefulness and perceived ease of use as emerging through practice, further research across a broader range of educational settings would be required before making broader theoretical claims. It does not propose a new version of TAM or replace its core constructs. Rather, it refines how TAM can be applied qualitatively to emerging technologies by treating perceived usefulness and perceived ease of use not as fixed perceptions formed before adoption, but as emergent properties of practice. In this interpretation, usefulness and ease of use develop through repeated use, professional learning, situated experimentation, prompt refinement, and critical evaluation of outputs. This is particularly relevant for GenAI, where teachers often need time to align tools with curriculum goals, ethical expectations, and classroom practice before the technology becomes genuinely useful or easy to use.

In this extended view, technology acceptance is not a one-off evaluative judgement, but a process of continual negotiation in which teachers develop the capacities required to make a technology usable and meaningful within their specific context. Professional learning environments, such as the PLGs examined in this study, play a critical role in this process by providing opportunities for experimentation, peer exchange, and collective sense-making. These social and contextual factors do not simply influence acceptance; they actively shape the development of PU and PEOU over time.

7. Implications for Practice, Policy, and Research

For practice, the results indicate that teachers' effective and sustained use of GenAI is strongly supported by collaborative, practice-based professional learning rather than tool-focused training alone. This aligns with research by Shibani et al. (2024), which

emphasises experimentation, peer dialogue, and situated support as central to developing AI-related teaching capability. At a policy level, the study highlights the need for clear strategies for GenAI integration that balance ethical guidance, access to reliable tools, and professional trust. Teachers' reported benefits coexisted with ethical uncertainty and technical constraints, supporting prior research suggesting that overly restrictive policies may drive hidden or uncritical use, whereas supportive frameworks encourage responsible and reflective engagement (Selwyn, 2022). For research, the findings point to the value of further longitudinal and qualitative studies examining subject-specific applications of GenAI and the relationship between teachers' use of these tools and students' learning experiences. They also highlight the need to refine technology adoption models to better account for skill development, ethical reasoning, and collaborative professional learning processes in GenAI contexts (Collie & Martin, 2024).

8. Limitations

The findings should be interpreted in light of the study's context. Both participating schools were high-fee independent schools in New South Wales with established digital infrastructure, institutional interest in AI, and access to professional learning support. These conditions may have shaped teachers' willingness to experiment with GenAI and their capacity to sustain use over time. As a result, the findings are not intended to be generalised to all school contexts, particularly public or under-resourced schools where access to devices, premium tools, time for professional learning, and institutional support may differ substantially. Instead, the study offers a contextually grounded account of how teacher engagement with GenAI developed within well-resourced professional learning environments. Future research should examine whether similar patterns of experimentation, prompt refinement, and pedagogical integration occur in more diverse school settings.

Participation in the PLGs was voluntary, which may have introduced a degree of self-selection bias. Teachers who chose to participate may have been more interested in educational technology, more willing to experiment with emerging tools, or more positively disposed towards GenAI than teachers who did not volunteer. Consequently, the experiences reported here may not reflect the views of teachers who are more skeptical of GenAI or less inclined to adopt new technologies. Although the study captured both positive and negative experiences, the findings should be interpreted with this possibility in mind.

A further limitation relates to the role of the researchers. University staff acted both as facilitators of the professional learning groups and as researchers responsible for analysing the data. While this embedded role enabled rich insight into participants' learning processes and evolving practices, it also created the possibility that teachers may have framed their experiences in ways that aligned with perceived facilitator expectations. To mitigate this risk, the study incorporated multiple sources of data, including learning diaries and observational notes, and paid attention to both enabling and constraining experiences. Nevertheless, it is important to acknowledge that the dual facilitator-analyst role may have influenced both participant engagement and the interpretation of the findings.

Finally, the study involved a relatively small number of participants from two schools and was designed to generate an in-depth understanding of teacher experiences rather than statistically generalisable findings. In line with qualitative research traditions, the value of the study lies in the richness of the account provided and its potential transferability to similar educational contexts. Readers should therefore consider the extent to which the conditions described in this study resemble their own settings when interpreting the findings. Future research involving a broader range of school sectors and socio-economic

contexts would help establish the extent to which the patterns identified here are evident across different educational environments.

9. Conclusions

This study set out to examine how secondary school teachers engaged with GenAI within the context of structured professional learning groups. The findings demonstrate that teachers used a wide range of GenAI tools to support lesson planning, differentiation, and creative pedagogical work, while also navigating ethical concerns, technical limitations, and questions about the role of AI in student learning. While these findings contribute to a growing body of research on teacher engagement with AI, the primary contribution of this study lies in how it reinterprets the process of technology acceptance.

Rather than viewing technology adoption as a decision shaped by stable perceptions of usefulness and ease of use, this study shows that teachers' engagement with GenAI unfolds as a temporal, iterative process. Teachers' early use was characterised by uncertainty and exploratory experimentation, with limited confidence in both the value and usability of the tools. Over time, however, sustained engagement, supported by opportunities for reflection, peer exchange, and guided practice, enabled teachers to develop more sophisticated and intentional uses of GenAI. In this process, perceptions of usefulness and ease of use were progressively strengthened, not as a result of initial evaluation, but through repeated interaction and refinement.

These findings suggest a potentially useful refinement to how TAM may be interpreted in this context, positioning PU and PEOU as emergent properties of practice rather than solely as fixed antecedents to technology use. Because the study is situated within two independent schools participating in structured professional learning groups, further research is needed to examine whether similar patterns occur across different educational contexts.

In the context of GenAI, these constructs are dynamically shaped through cycles of experimentation, feedback, and social learning. Teachers do not simply assess whether a tool is useful or easy to use; they develop the capacity to make it so through ongoing engagement. This challenges static interpretations of TAM and suggests the need for a temporally sensitive understanding of technology acceptance that better reflects the realities of educational practice.

The role of collaborative professional learning was central to this temporal development. Professional learning groups provided a structured space for experimentation, sharing, and collective sense-making, enabling teachers to learn from one another and to normalise the use of GenAI within their practice. This highlights the importance of social and contextual factors in shaping technology adoption, not merely as external influences but as integral to the development of teachers' perceptions and capabilities over time.

Taken together, these findings suggest that research on technology adoption in education must move beyond static, cross-sectional accounts of teacher beliefs and towards approaches that capture situated practice and change over time. For policymakers and school leaders, the study underscores the importance of sustained, collaborative professional learning in supporting meaningful and responsible integration of GenAI. Rather than focusing solely on access to tools or initial training, effective implementation requires ongoing opportunities for experimentation, reflection, and refinement.

Author Contributions: The all authors of this paper contributed equally to the data collection, analysis, and writing of the paper. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the University of Technology Sydney Human Research Ethics Committee (protocol code: ETH24-9194 and date of approval: 1 March 2024).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: There is no data available given that some of the data involved minors and ethics was not sought to make it available.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Teacher Reflection Diary Instrument

Instructions to participants

Each time you interact with an AI tool please copy the text and send this to us. Please include the AI platform used, the date of the interaction, your name, and the interaction log.

Section 1. Initial Thoughts and Expectations

1. What were your initial thoughts about using an AI platform for teaching?
2. What did you hope to achieve by using this AI tool?

Section 2. Interactions

1. What specific tasks did you use the AI for?
2. How did AI assist in this task?
3. How easy or difficult was it to use the AI for these tasks?

Section 3. Observations and Reflections

1. What surprised you most about your interaction with the AI today?
2. Did the AI perform as you expected? If not, what was different?

Section 4. Challenges and Frustrations

1. What challenges did you face while using the AI?
2. Were there any particular frustrations or limitations you encountered?

Section 5. Benefits and Advantages

1. What benefits have you noticed from using AI in your teaching?
2. How has the AI helped you with your teaching tasks?
3. Please identify any teaching tasks (e.g., lesson planning, differentiation, assessment preparation) and associated benefits.

Additional Comments

1. Please provide any additional reflections or observations.

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