

1 Generative Artificial Intelligence for Personal, Academic, and Lesson Planning Purposes:
2 Applications and Perceptions of Irish Pre-Service Primary Teachers

3 **Abstract**

4 As the initial stage of an international collaborative design-based research initiative, this study
5 explores the applications and perceptions of generative artificial intelligence (GenAI) among
6 Irish pre-service primary teachers. This study focuses on how personal and academic uses of
7 GenAI influence their perceptions of using GenAI for lesson planning. With a sample of 100
8 student teachers completing the questionnaire, and data analysed using descriptive analysis and
9 Pearson correlation, the findings highlight that while pre-service teachers use GenAI primarily
10 for personal and academic purposes preliminarily, its integration into lesson planning remains
11 limited. Crucially, the study reveals no significant correlation between personal use of GenAI
12 and perceptions of its application in lesson planning. In contrast, academic use of GenAI is
13 positively correlated with recognising its potential for lesson planning and the desire for
14 professional development, while negatively correlated with perceptions of challenges and ethical
15 concerns. The practical implications suggest that pre-service teachers who primarily use GenAI
16 for personal purposes may require foundational training similar to those without prior GenAI
17 experience. Student teachers with academic GenAI experience would benefit from advanced
18 training aligned with their academic GenAI use patterns. Professional development should also
19 address challenges and ethical concerns in integrating GenAI into education.

20 *Keywords:* Generative Artificial Intelligence, Lesson Plan, Perception, Pre-service
21 teacher, Primary Teacher Education.

23

Introduction

24 Since the release of ChatGPT, a myriad of opportunities and challenges have been highlighted at
25 the intersection of Generative Artificial Intelligence (GenAI) and education (Bonner et al., 2023;
26 Dwivedi et al., 2023). Lesson planning is crucial for determining teaching and learning quality
27 (Liu & Zou, 2014) as it provides a roadmap for a teacher to follow, ensuring that instructional
28 content is delivered in a logical and organised manner (van den Berg & du Plessis, 2023).

29 However, lesson planning is regarded as a time-consuming and challenging process (Alanazi,
30 2019; Colaco & Antao, 2023), leading to significant levels of anxiety for pre-service teachers
31 during teaching practicum (Gorman & Hall, 2023; Union of Students in Ireland, 2018;

32 Sammephet & Wanphet, 2013). Several studies have highlighted the efficacy of technology-
33 integrated approaches in assisting lesson planning (Colaco & Antao, 2023; Liu & Zou, 2014;
34 Susantini et al., 2022). With the advancement of GenAI technology such as ChatGPT, it is now
35 possible to apply this technology to lesson planning to produce lesson plans with a clear structure
36 and learning objectives (Kehoe, 2023). GenAI tools can also provide personalised constructive
37 feedback on lesson plans written by pre-service teachers (van den Berg & du Plessis, 2023).

38 While GenAI presents opportunities that pre-service teachers can leverage for lesson planning
39 (Karaman, 2024), studies regarding pre-service teachers' application and perception of GenAI in
40 lesson planning are in their emerging stages. Further investigation is also needed to determine
41 how pre-service teachers' application of GenAI for personal and academic purposes impacts
42 their perception of GenAI for lesson planning. Teachers' prior experiences with digital
43 technologies may influence their professional practices (Ottenbreit-Leftwich et al., 2012; Purcell
44 et al., 2013). Whether personal and academic GenAI engagement similarly impact pre-service
45 teachers' perceptions of GenAI's lesson planning applications remains underexplored. Moreover,

46 several studies have been conducted to investigate university students' perceptions of using
47 GenAI for personal and academic purposes in different areas, including Australia (Kelly et al.,
48 2023), Germany (von Garrel & Mayer, 2023), Hong Kong (Chan & Hu, 2023), Spain (Lozano &
49 Blanco Fontao, 2023), the United Kingdom (Johnston et al., 2024), the United States (Gatlin,
50 2023; Goldberg et al., 2024), and Sweden (Malmström, 2023). However, further research is
51 needed in Ireland, particularly since studies from Irish pre-service teachers' perspectives are
52 limited. There is a need for collaborative research on a global scale to mutually inform and
53 develop GenAI research agendas across institutions and countries. To address these gaps, the
54 primary objective of this internationally collaborative, preliminary study explores how pre-
55 service primary teachers, who will teach children aged 4 to 12, use and perceive GenAI for
56 personal, academic and lesson planning purposes in one major teacher education programme in
57 Ireland. Specifically, this study investigates how pre-service primary teachers' application of
58 GenAI for personal and academic purposes impacts their perception of GenAI for lesson
59 planning, if at all. Thus, this study explores the following research questions:

- 60 1) How do pre-service primary teachers use GenAI for personal, academic, and lesson
61 planning purposes?
- 62 2) What are pre-service teachers' perceptions of using GenAI in lesson planning?
- 63 3) How does the application of GenAI for personal and academic purposes impact pre-
64 service teachers' perceptions of using GenAI for lesson planning?

65 **International Collaborative Research Initiative**

66 This study marked the initial stage of a design-based research (DBR) activity as part of an
67 international collaborative research initiative between a teacher education institution in Dublin,
68 Ireland, and one in the state of Arizona in the United States. Based on a comprehensive higher

69 education partnership agreement signed in 2013, the two institutions have collaborated closely to
70 enhance technology-driven learning, research, and discovery. This DBR builds on this
71 foundation through exploring pathways to ensure the effective and ethical use of GenAI among
72 pre-service teachers for personal, academic, and professional purposes at both institutions. This
73 collaborative study originated from a research networking event held between the two
74 institutions in September 2023 to consolidate their long-established research partnership. During
75 the event, representatives from each institution recognised and agreed on the need to
76 collaboratively conduct the DBR to promote the effective and ethical use of GenAI among pre-
77 service teachers and to share findings that could inform best practices at both institutions. Since
78 October 2023, monthly meetings have been hosted through Zoom, complemented by frequent
79 email communications and collaborative work on Google Docs. This collaboration has facilitated
80 the formation of research questions, discussion of research methodologies, and composition of
81 research ethics applications for both institutions. Two Irish and four American teacher educators
82 were involved in this DBR activity. Based on the DBR framework of McKenney and Reeves
83 (2018), this study reports the findings from the initial phase of analysis and exploration
84 conducted in Ireland. The American partner institution will conduct the same investigation in
85 August 2024. The findings from the first phase contributed to the forthcoming design and
86 development of promotional practices for the effective and ethical use of GenAI by pre-service
87 teachers in both institutions. Empirical evidence indicates that integrating GenAI into teacher
88 education has a critical role in supporting pre-service teachers to effectively and ethically use
89 GenAI in their future teaching practice.

90 **Literature Review**

91 **Use of GenAI by Pre-Service Teachers: Personal, Academic, and Lesson Planning Purposes**

92 The engagement of pre-service teachers with GenAI tools across personal, academic, and lesson
93 planning contexts is increasingly evident (Chan & Lee, 2023; Kehoe, 2023; Zhang et al., 2023).
94 In their personal lives, these tools are widely used for various tasks, including entertainment,
95 creative hobbies, personal development, communication, social networking, daily organisation,
96 language translation, and health management (Schroeder, 2024). Academically, pre-service
97 teachers utilise GenAI for writing assistance, tutoring, project development, career preparation,
98 time management, presentation support, and team collaboration across different regions (Chan &
99 Hu, 2023; Gatlin, 2023; Goldberg et al., 2024; Johnston et al., 2024; Lozano & Blanco Fontao,
100 2023). In the context of lesson planning, GenAI enhances efficiency by assisting in
101 brainstorming teaching activities, developing and refining instructional materials, and supporting
102 assessment and feedback (İpek et al., 2023; Moorhouse & Kohnke, 2024). Additionally, by
103 generating customised content tailored to the needs of diverse learners (van den Berg & du
104 Plessis, 2023), GenAI saves time while improving the quality of lesson planning through
105 detailed, context-specific suggestions (The Open Innovation Team and Department for
106 Education, 2024). Overall, pre-service teachers engage with GenAI across personal, academic,
107 and professional contexts. This broad usage enhances their technological fluency and may
108 improve their ability to integrate GenAI into educational contexts, particularly lesson planning.
109 However, whether similar trends are observed among Irish pre-service teachers remains unclear.
110 This study aims to address that gap.

111 **Pre-Service Teachers' Perceptions of Using GenAI in Lesson Planning**

112 Pre-service teachers' perceptions significantly influence their adoption of technology in the
113 classroom (Farjon et al., 2019; Li et al., 2016; Ogebo et al., 2024). Several empirical studies
114 have explored these perceptions in relation to AI tools, examining how they affect pre-service
115 teachers' intentions to use such tools in educational settings. These studies were informed by

116 various theoretical frameworks, including the Technology Acceptance Model++ (Yang &
117 Appleget, 2024), the Technology Acceptance Model 3 (Zhang et al., 2023), and the Theory of
118 Planned Behaviour (Sanusi et al., 2024). For example, Yang & Appleget (2024) empirically
119 indicated that pre-service primary teachers' perceptions of using GenAI positively impacted their
120 intention to use the technology for teaching, learning and assessment. While research has
121 identified pre-service teachers' perceptions of using GenAI in educational contexts, several
122 studies have delved deeper into their perceptions of applying GenAI specifically in lesson
123 planning. These perceptions can be categorised into perceived opportunities, perceived
124 challenges, ethical concerns, and the need for professional development to ensure effective and
125 ethical GenAI integration.

126 *Perceived Opportunities*

127 Pre-service teachers increasingly recognise the potential of GenAI tools in lesson planning,
128 perceiving them as valuable resources for enhancing efficiency, creativity, and long-term
129 pedagogical practices (Moorhouse & Kohnke, 2024). One of the most significant perceived
130 benefits is increased efficiency (Chan & Zhou, 2023), as traditional lesson planning can be
131 daunting and time-consuming. In addition to efficiency, pre-service teachers see GenAI as a tool
132 for enhancing creativity and originality in lesson planning. AI can offer diverse ideas and
133 perspectives that teachers might not have considered (The Open Innovation Team and
134 Department for Education, 2024). Pre-service teachers express optimism about the long-term
135 adoption of GenAI tools in educational settings (Yang & Appleget, 2024) and recognise the
136 potential for these tools to improve lesson quality and adaptability to changing educational
137 demands and landscapes (Yang & Appleget, 2024).

138 *Perceived Challenges*

139 Pre-service teachers identify several significant challenges of using GenAI, including concerns
140 about the accuracy and reliability of AI-generated content, the potential decline in lesson
141 planning quality, over-reliance on AI, and a diminished role for teachers in the educational
142 process (Chan & Zhou, 2023; Dahri et al., 2024; İpek et al., 2023). Specifically, they express
143 concerns that AI may produce content with factual errors, outdated information, or biases, which
144 could undermine teaching quality and lead to student confusion and misinformation (Moorhouse
145 & Kohnke, 2024). Additionally, they are concerned that excessive reliance on AI may diminish
146 teachers' creativity, critical engagement, and autonomy in lesson planning, reducing them to a
147 more passive role (Moorhouse & Kohnke, 2024; Zhang et al., 2023). Lastly, pre-service teachers
148 fear that AI-generated lesson plans could negatively impact student learning outcomes (Yang &
149 Appleget, 2024).

150 *Perceived Ethical Concerns*

151 In addition to pre-service teachers recognising both the opportunities and challenges of using
152 GenAI in lesson planning, they also raise ethical concerns. These concerns include the risks of
153 educational inequity, data privacy breaches, threats to academic integrity, and the need for
154 transparency in AI usage (İpek et al., 2023; Zhang et al., 2023). A major key issue is that AI
155 could exacerbate already-existing educational inequity (Hoffmann et al., 2024) with high-quality
156 AI-generated lesson plans being limited to well-funded schools, leaving under-resourced schools
157 and disadvantaged students further marginalised (Sekli et al., 2024; van den Berg & du Plessis,
158 2023). Additionally, pre-service teachers worry that AI tools may collect and store sensitive
159 student data, such as personal information and academic performance, posing privacy risks
160 (Whalen & Mouza, 2023). Lastly, they stress the importance of transparency in using AI tools
161 during the student teaching period in a teacher education programme, as concealing AI

162 involvement in lesson planning could be viewed as deceptive by supervising teachers and
163 students (van den Berg & du Plessis, 2023).

164 ***Perceived Needs for Professional Development for effective and ethical use of GenAI***

165 As pre-service teachers explore GenAI in lesson planning, they identify key areas for
166 professional development to ensure effective and ethical integration into their practices (Gatlin,
167 2023; Zhang et al., 2023). They stress the need for training to help them critically assess the
168 capabilities and limitations of GenAI, enabling them to evaluate the accuracy, reliability, and
169 appropriateness of AI-generated content while maintaining their autonomy (Moorhouse &
170 Kohnke, 2024). Understanding these factors is crucial for informed decision-making on when
171 and how to use GenAI in lesson planning (Antonenko & Abramowitz, 2023). Additionally,
172 concerns about educational equity prompt pre-service teachers to advocate for training that
173 ensures equitable access to AI tools (Cotton et al., 2024; Mouta et al., 2024). Ethical
174 considerations, such as data privacy, intellectual property, transparency in AI use, and strategies
175 for upholding academic integrity, are also emphasised (Brandão et al., 2024). The integration of
176 GenAI in lesson planning presents pre-service teachers with opportunities, challenges, and
177 ethical concerns, highlighting the need for professional development to learn the effective and
178 ethical use of GenAI. While these insights provide a broad understanding of pre-service teachers'
179 perceptions, a gap exists in the context of Ireland. Conducting research with Irish pre-service
180 teachers is essential to enrich existing knowledge and provide a localised understanding of their
181 perceptions of GenAI in lesson planning, thereby contributing unique and valuable insights to the
182 international scholarly community.

183 **Impact of Pre-service Teachers' GenAI Use in Personal and Academic Contexts on**
184 **Perceptions of Lesson Planning**

185 While extensive research has explored pre-service teachers' perceptions of AI, studies examining
186 the factors shaping these perceptions are still in the early stages. Chan and Hu (2023) studied 399
187 undergraduate and postgraduate students in Hong Kong. They found that students who are more
188 knowledgeable about GenAI technologies and use them with greater frequency are more likely to
189 continue using GenAI technologies in the future. These findings conceptually align with Parissi
190 et al. (2023), indicating that students' use of digital tools to search for information is significantly
191 influenced by their familiarity with the subject matter. However, prior experience with digital
192 technology does not automatically translate into a positive perception of its integration in
193 classroom contexts. Lavidas et al. (2022) found that during the COVID-19 pandemic, preschool
194 teachers in Greece adapted their mathematics teaching to online and distance learning
195 environments. Nevertheless, once face-to-face classes returned, they reverted to traditional
196 methods, favouring hands-on activities and direct communication. Although these teachers
197 acknowledged the benefits of digital tools during remote learning, they preferred traditional
198 approaches when teaching maths in person. Given the diversified perspectives reviewed above,
199 further research is needed to explore how prior experience with GenAI influences perceptions of
200 its applications in educational contexts. Prior experience with GenAI can be personal and
201 academic (Johnston et al., 2024). Whether these two types of experiences similarly impact
202 perceptions of GenAI's educational applications remains unclear. Moreover, limited research
203 focuses explicitly on pre-service teachers despite their critical role in shaping future educational
204 practices. In response to these gaps, this study investigates the impact of pre-service teachers'
205 personal and academic experiences on their perceptions of using GenAI for lesson planning,
206 particularly concerning opportunities, challenges, ethical considerations, and professional
207 development needs. Addressing these gaps is essential for designing effective and practical

208 training and targeted support that cater to pre-service teachers' specific needs and concerns as
209 they integrate GenAI tools into their current and future teaching practices.

210 **Method**

211 This study used a quantitative research design through a questionnaire survey to investigate the
212 Irish institution's pre-service primary teachers' use of GenAI for personal and academic
213 purposes and their applications and perceptions of using GenAI for lesson planning.

214 **Participants**

215 The current study employed a convenience sampling method, including 1,308 pre-service
216 primary student teachers from the Bachelor of Education programme and 55 pre-service primary
217 student teachers from the Professional Master of Education programme at an Irish institution.

218 The first author sent out weekly email invitations over a three-week period from March to April
219 during the spring semester of 2024. The invitations included a brief introduction to the study,
220 emphasising participation's voluntary and anonymous nature. The email also contained a link to
221 Qualtrics, where participants could access a plain language statement introducing the study,
222 contact of the university's ethics committee, an anonymous online consent form, and the survey
223 itself. The programme-wide questionnaire survey was the only one approved by the relevant
224 programme boards for that semester, ensuring students were not overwhelmed by multiple
225 surveys. A total of 14 invalid responses were excluded due to careless responding or insufficient
226 effort (Huang & Wang, 2021). For example, responders who consistently selected the first or last
227 option provided for all items on the questionnaire or quit before finishing the entire survey. After
228 removing invalid surveys from the analysis, 100 valid responses were obtained.

229 **Instrumentation**

230 The questionnaire covered various dimensions, including participant demographics and the
231 GenAI tools they use. To answer the first research question, the survey included questions on the
232 application of GenAI for pre-service teachers' personal, academic, and lesson planning purposes.
233 To answer the second and third research questions, the questionnaire items then explored
234 participants' perceptions of the opportunities, challenges, ethical concerns, and professional
235 development needs related to the effective and ethical application of GenAI in lesson planning.
236 Items concerning GenAI applications and perceptions were based on a 5-point Likert scale,
237 ranging from 1 (strongly disagree) to 5 (strongly agree).

238 The development of the questionnaire began with a review of similar studies and a search for
239 existing questionnaires on teachers' and students' applications and perceptions of GenAI in
240 higher education. Draft items investigating the applications of GenAI for personal, academic,
241 and lesson planning purposes were developed by conceptually referring to existing articles that
242 reviewed and discussed these applications (Hsu, 2023; Imran & Almusharraf, 2023; Johnston et
243 al., 2024; Kehoe, 2023; Lo, 2023; van den Berg & du Plessis, 2023). Additionally, for the draft
244 perception items, the international research referenced the questionnaire items developed by
245 Chan and Hu (2023) as a foundation, which were highly regarded, as evidenced by their high
246 citation numbers on Google Scholar among studies with similar focuses. However, since the
247 questionnaire of Chan and Hu was primarily aimed at general undergraduate and
248 postgraduate students, the research team also referenced a survey by Lozano and Blanco Fontao
249 (2023) that explored pre-service primary teachers' AI perceptions, along with other studies that
250 examined AI's educational opportunities and challenges (Chan & Zhou, 2023; Zhang et al.,
251 2023), ethical concerns (Hoffmann et al., 2024; İpek et al., 2023; van den Berg & du Plessis,
252 2023; Whalen & Mouza, 2023), and strategies for preparing educators to effectively and

253 ethically use AI in educational settings (Cotton et al., 2024; Gatlin, 2023; Mouta et al., 2024).
254 The draft items were then reviewed by an expert with expertise in questionnaire design and
255 statistical analysis and an experienced in-service primary teacher with three years of
256 undergraduate teaching experience in a digital learning module and experience using GenAI. The
257 review feedback was subsequently discussed internally by the research team to finalise the
258 questionnaire. During the discussion, items with similar focus were removed to reduce survey
259 fatigue, while those with unclear or complex wording were revised for clarity.

260 **Data Analysis**

261 The study's descriptive and inferential analyses were conducted using the Statistical Package for
262 the Social Sciences Version (SPSS) 29.0.1.0. Descriptive analyses were performed to answer the
263 first research question related to pre-service primary teachers' application of GenAI for personal,
264 academic, and lesson planning purposes. The second question, concerning perceptions, was also
265 addressed using descriptive analysis. The correlational aspect of the final research question was
266 analysed using the Pearson correlation coefficient. An alpha level of .05 was used for the study.
267 The assumptions of linearity and homoscedasticity were checked by examining scatter plots. The
268 Kolmogorov-Smirnov test was performed to check the normality of each variable as the sample
269 size was larger than 50 (Mishra et al., 2019). Perfect multicollinearity was not identified. Thus,
270 the research data fulfilled the assumptions required for conducting the Pearson correlation
271 coefficient.

272 **Results**

273 This section was organised according to the sequence of the research questions to ensure that
274 each question was answered and supported with relevant statistical results.

275 **Pre-Service Primary Teachers' Use of GenAI for Personal, Academic, and Lesson Planning**

276 **Purposes**

277 The first research question concerns how pre-service primary teachers use GenAI for personal,
278 academic, and lesson planning purposes.

279 *GenAI Tools Used by the Student Teachers*

280 Out of 100 survey respondents, 32 indicated that they have never used any GenAI tools, while
281 the remaining 68 reported their experience with the tool. Among those who reported their
282 experience, 60 participants used ChatGPT the most. Grammarly GO and Phrase AI were the
283 second most commonly used tools by the primary student teachers, with 16 participants reporting
284 their experience with each tool. Some respondents used more than one tool, which explains the
285 overlapping numbers.

286 *Experience of Using GenAI for Personal, Academic and Lesson Planning Purposes*

287 The participants had varying degrees of experience using GenAI for personal, academic, and
288 lesson planning purposes (Table 1).

289 Table 1

290 Pre-Service Teachers' Experience of GenAI for Personal, Academic and Lesson Planning

291 Purposes

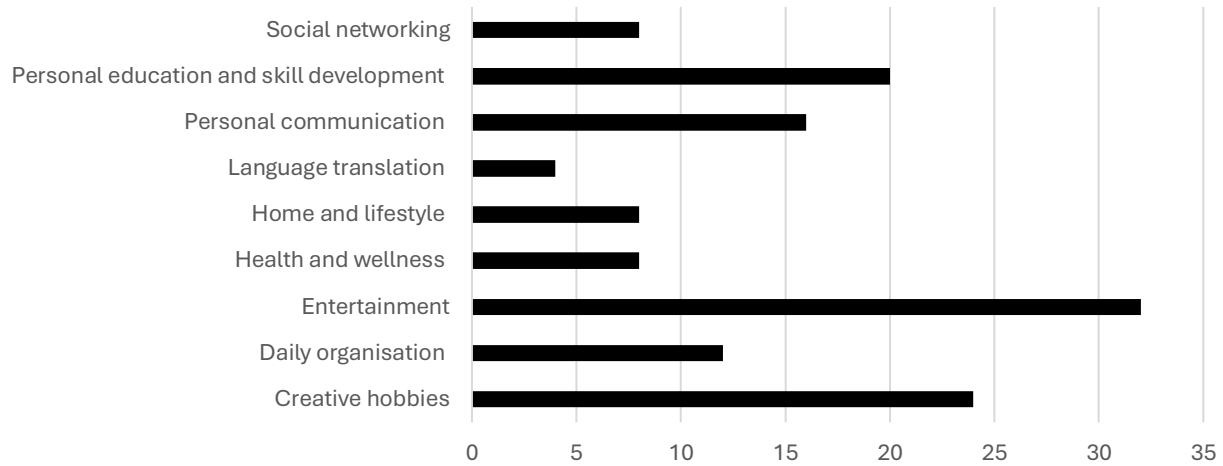
| | N | Mean | SD |
|--|-----|------|------|
| I am experienced in using GenAI for personal purposes | 100 | 2.48 | 1.37 |
| I am experienced in using GenAI for academic purposes | 100 | 2.24 | 1.37 |
| I am experienced in using GenAI for lesson planning purposes | 100 | 1.96 | 1.38 |

292 The average experience level for personal use is the highest, recorded at 2.48 with a standard
293 deviation of 1.37, indicating a nearly moderate experience level with some variability among
294 responses. This contrasts with the use in academic settings, where the average experience level

295 slightly drops to 2.24, accompanied by a standard deviation of 1.37, reflecting a similar spread in
296 individual experiences. Finally, the lowest average experience is observed in the context of
297 lesson planning, where it further decreases to 1.96, with the variability of responses remaining
298 consistent, as indicated by a standard deviation of 1.38. These statistics suggest that while 68%
299 of the research participants claimed their access to GenAI tools, their experience levels decreased
300 when transitioning from personal to lesson planning settings. Furthermore, the self-reported
301 experience levels for these purposes all fall below three on a five-point Likert scale, suggesting
302 that the majority of respondents tend to disagree that they are experienced in using GenAI for
303 personal, academic, and lesson planning purposes.

304 According to Figure 1, the use of GenAI for personal purposes by the pre-service teachers shows
305 that entertainment (32 cases) and creative hobbies (24 cases) are the top applications, followed
306 by personal education (20 cases). Personal communication also sees moderate use (16 cases).
307 Applications like daily organisation and social networking are less frequent (12 and eight cases,
308 respectively), and the least engaged categories include health and wellness (eight cases), home
309 and lifestyle (eight cases), and language translation (four cases). These statistics reveal a trend
310 where pre-service teachers favour GenAI for leisure and learning over other personal uses. Some
311 respondents used GenAI for multiple personal purposes, which explains the overlapping
312 numbers.

GenAI for Personal Purposes



313

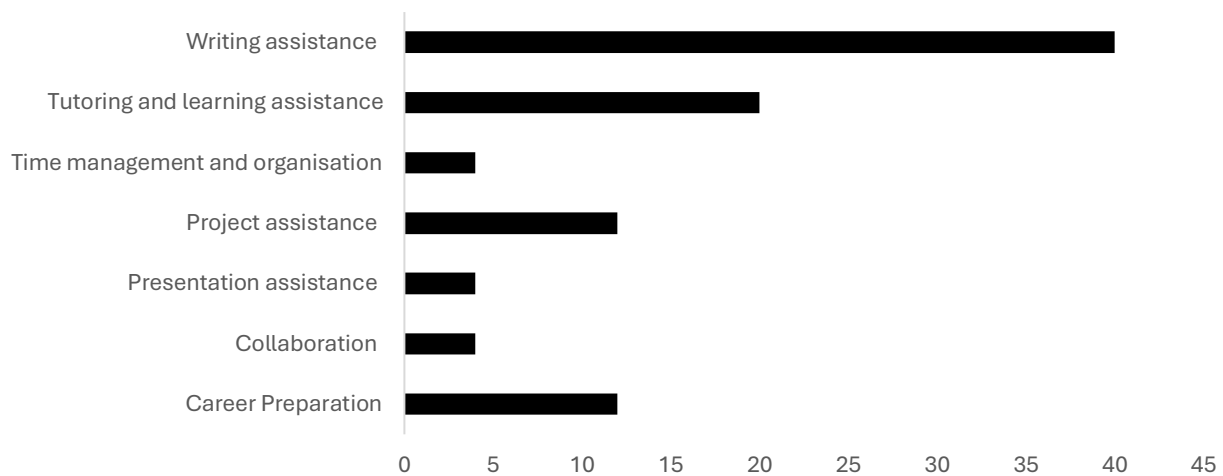
314 Figure 1

315 Pre-Service Teachers' Use of GenAI for Personal Purposes

316 In academic settings (see Figure 2), the pre-service teachers mainly use GenAI for writing

317 assistance, with 40 cases reported indicating a heavy reliance on AI for writing tasks.

GenAI for Academic Purposes



318

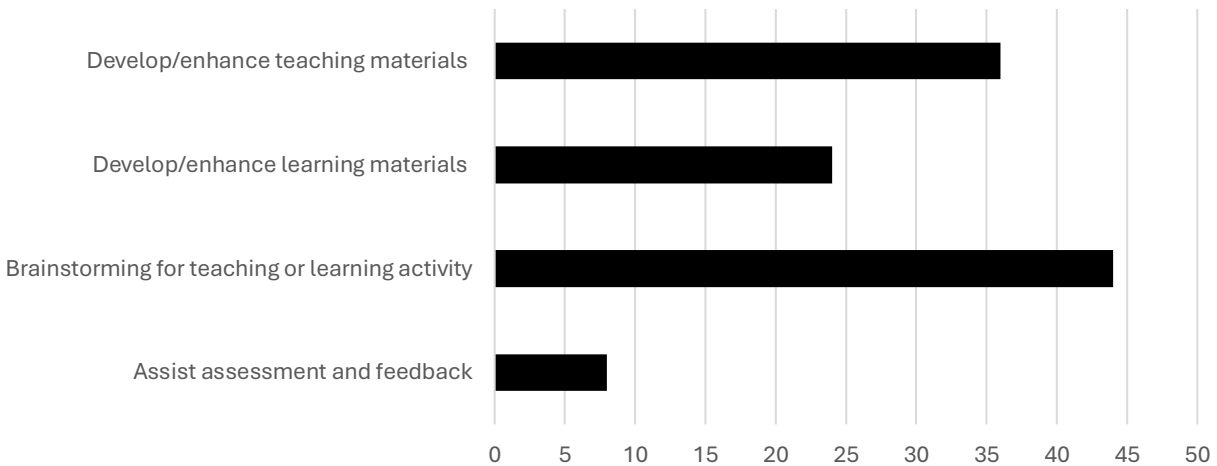
319 Figure 2

320 Pre-Service Teachers' Use of GenAI for Academic Purposes

321 Tutoring and learning support follows, with 20 cases. Career preparation and project work each
 322 account for 12 cases, showing moderate use. In contrast, presentation aid, time management, and
 323 collaboration see minimal application, with just 4 cases reported for each, suggesting lesser
 324 engagement with GenAI for these functions. The data presents a clear preference for GenAI to
 325 aid individual tasks over collaborative or organisational activities within academic settings.
 326 Again, the overlapping numbers were explained by some respondents who used GenAI for
 327 multiple academic purposes.

328 As shown by Figure 3, the pre-service teachers most frequently use GenAI for brainstorming
 329 activities (44 cases) and developing teaching materials (36 cases). GenAI is also employed to
 330 enhance learning materials (24 cases). Meanwhile, its use in assisting with assessment and
 331 feedback is less common (8 cases), suggesting that this application is in its earlier stages
 332 compared to the teaching and learning aspects of lesson planning.

GenAI for Lesson Planning Purposes



333

334 Figure 3

335 Pre-Service Teachers’ Use of GenAI for Lesson Planning Purposes

336 **Pre-Service Teachers’ Perceptions of Using GenAI in Lesson Planning**

337 The second research question concerns pre-service teachers' perceptions of using GenAI in
 338 lesson planning. The related findings are presented in Table 2.
 339 Table 2
 340 Pre-Service Teachers' Perceptions of GenAI for Lesson Planning: Opportunities, Challenges,
 341 Ethical Considerations, and Needs for Professional Development

| | N | Mean | SD |
|--|-----|------|------|
| Opportunity | | | |
| I believe the use of GenAI can save me time in planning lessons | 100 | 4.12 | 1.11 |
| I believe using GenAI like ChatGPT to write lesson plans can lead to originality and creativity in my lesson plans | 100 | 2.88 | 1.18 |
| I am confident in the accuracy and reliability of lesson plans generated by GenAI | 100 | 2.44 | 1.10 |
| I believe the use of GenAI can help me produce a better lesson plan | 100 | 3.28 | 1.16 |
| I foresee a long-term adoption of GenAI tools in the primary education sector for lesson planning | 100 | 3.84 | 0.93 |
| Overall (Cronbach's alpha = .82) | 100 | 3.31 | 0.84 |
| Challenge | | | |
| GenAI tools undermine the quality of lesson planning | 100 | 3.12 | 1.08 |
| Teachers may become overly reliant on GenAI for lesson planning | 100 | 4.12 | 1.08 |
| GenAI tools diminish the role of teachers in the future in terms of lesson planning. | 100 | 2.96 | 1.22 |
| I am concerned that using GenAI tools for lesson planning could have a negative impact on children's learning outcomes | 100 | 3.60 | 1.24 |
| Overall (Cronbach's alpha = .86) | 100 | 3.45 | 0.97 |
| Ethical Concerns | | | |
| I am concerned that the application of GenAI in lesson planning may cause the issue of educational inequity | 100 | 3.12 | 1.11 |
| I am concerned that the use of GenAI may pose a risk to user data privacy | 100 | 3.00 | 1.27 |
| Pre-service teachers need to proactively disclose their use of GenAI in lesson planning in professional placement | 100 | 3.44 | 1.31 |

| | | | |
|--|-----|------|------|
| Unauthorised use of GenAI tools to complete lesson planning in professional placement is cheating | 100 | 2.88 | 1.22 |
| Overall (Cronbach's alpha = .70) | 100 | 3.11 | 0.89 |
| Need for Professional Development for Effective Use | | | |
| I feel the need for professional development programmes to effectively integrate AI into lesson planning | 100 | 3.60 | 1.06 |
| Need for Professional Development for Ethical Use | | | |
| Pre-service teachers must learn how to use GenAI tools ethically in their professional practices | 100 | 4.16 | 1.01 |

342 ***Perceived Opportunities***

343 Pre-service teachers view using GenAI for lesson planning as time-saving, with a high mean
 344 rating of 4.12 (SD = 1.11). However, they are less confident about the originality and reliability
 345 of GenAI-generated plans, with mean scores of 2.88 (SD = 1.18) and 2.44 (SD = 1.10),
 346 respectively. In contrast, participants moderately agreed (mean = 3.28, SD = 1.16) that GenAI
 347 can help produce better lesson plans, although there are some reservations. A positive response
 348 (mean = 3.84, SD = 0.93) was noted on the potential long-term adoption of GenAI tools in the
 349 primary education sector for lesson planning. The overall internal consistency of the
 350 questionnaire is good (Cronbach's alpha = 0.82), suggesting reliable measurements across the
 351 items with a collective mean of 3.31 and a standard deviation of 0.84.

352 The findings highlight a gap between pre-service teachers' recognition of GenAI's practical
 353 benefits in terms of efficiency and their lack of confidence in the originality, creativity, and
 354 reliability of AI-generated content. This gap underscores the critical need for targeted
 355 professional development that enhances pre-service teachers' abilities to use GenAI effectively
 356 and to address these concerns. Furthermore, the positive outlook on long-term adoption suggests
 357 that GenAI could be widely integrated into lesson planning, where efficiency is highly valued if
 358 these concerns are resolved.

359 ***Perceived Challenges***

360 The mean challenge score is slightly higher at 3.45 (SD = 0.97), with Cronbach's alpha at .86,
361 showing good internal consistency. The findings show a moderate agreement (mean = 3.12, SD
362 = 1.08) that GenAI may undermine the quality of lesson planning. An obvious concern is the
363 potential for teachers to become overly reliant on GenAI, with a high mean score of 4.12 (SD =
364 1.08). Conversely, participants were nearly neutral (mean = 2.96, SD = 1.22) on the potential
365 diminishment of teachers' roles in the future due to GenAI, indicating mixed feelings about the
366 long-term impact of these tools. Concerns were also raised about the potential negative effects on
367 children's learning outcomes (mean = 3.60, SD = 1.24), reflecting worries about the practical
368 implications of GenAI in education.

369 The findings suggest that while pre-service teachers recognise the efficiency of using GenAI in
370 lesson planning, several challenges are perceived, particularly the risk of over-reliance and
371 adverse effects on student learning outcomes. These challenges reveal a critical tension in
372 integrating GenAI into lesson planning: balancing the efficiency gains with preserving the
373 integrity of teaching and learning. These findings again highlight the critical need for teacher
374 education programmes to focus on strategies promoting GenAI as a supportive tool for lesson
375 planning rather than replacing the entire process.

376 ***Perceived Ethical Concerns***

377 The overall mean for ethical concerns is 3.11 (SD = 0.89), the lowest among the categories, with
378 a Cronbach's alpha of .70 to indicate acceptable internal consistency. The concerns include
379 potential educational inequity (Mean = 3.12, SD = 1.11) and data privacy risks (Mean = 3.00, SD
380 = 1.27). Additionally, the necessity for transparency in the use of GenAI was affirmed, as
381 respondents felt that pre-service teachers should proactively disclose their use of GenAI during
382 professional placements (mean = 3.44, SD = 1.31). Conversely, there was a slightly lower level

383 of agreement (mean = 2.88, SD = 1.22) with the statement that the unauthorised use of GenAI
384 tools constitutes cheating, pointing to diverse views on this issue.
385 While concerns about educational inequity and data privacy are found, the emphasis on
386 transparency underscores a critical need for clear guidelines and ethical standards in the teacher
387 education programme. The mixed views on whether the unauthorised use of GenAI constitutes
388 cheating suggest that the current ethical framework may be insufficient or unclear in addressing
389 the complexities introduced by GenAI. To better prepare future educators, teacher education
390 must incorporate discussions on the ethical use of AI, focusing on transparency, fairness, and
391 equity. This would mitigate risks and foster responsible AI practice.

392 *Perceived Need for Professional Development*

393 Recognising the need for professional development to use GenAI effectively and ethically is
394 high, with means of 3.60 (SD = 1.06) and 4.16 (SD = 1.01), respectively. Overall, the pre-service
395 teachers perceived the potential benefits, risks, and ethical concerns associated with GenAI in
396 lesson planning, underscoring their recognition of the need for professional development to
397 maximise effective and ethical usage.

398 **The Impact of GenAI Use for Personal and Academic Purposes on Perceptions of Lesson** 399 **Planning**

400 The third research question addresses how pre-service teachers' application of GenAI for
401 personal and academic purposes impacts their perceptions of using GenAI for lesson planning.
402 No significant correlations were found between the experience of using GenAI for personal
403 purposes and all other variables (see Table 3). For instance, the correlation between the
404 experience in using GenAI for personal purposes and the experience in using GenAI for
405 academic purposes was not significant, $r(98) = -.019, p = .851$. Another example is the
406 correlation between the experience in using GenAI for personal purposes and perceiving the

407 opportunity brought by GenAI for lesson planning was not significant, $r(98) = .073, p = .472$.

408 These findings suggest that personal use of GenAI has a limited impact on how pre-service

409 teachers perceive its role in lesson planning.

410 Table 3

411 Correlations Between GenAI Applications for Personal and Academic Purposes and Perceptions

412 of Opportunities, Challenges, Ethical Concerns, and the Need for Professional Development

| | | GAIPP | GAIAP | OPPTY | CHALL | ETHCN | PDEF | PEET |
|-------|---------------------|-------|-------|---------|---------|----------|--------|-------|
| GAIPP | Pearson Correlation | 1 | -.019 | .073 | .102 | -.069 | .050 | -.027 |
| | Sig. (2-tailed) | | .851 | .472 | .312 | .496 | .621 | .791 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| GAIAP | Pearson Correlation | -.019 | 1 | .526*** | -.302** | -.462*** | .260** | .205* |
| | Sig. (2-tailed) | .851 | | <.001 | <.01 | <.001 | <.01 | <.05 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Note. The following acronyms are used in this table: GAIPP = Use of Generative Artificial Intelligence for Personal Purposes; GAIAP = Use of Generative Artificial Intelligence for Academic Purposes; OPPTY = Opportunity; CHALL = Challenge; ETHCN = Ethical Concerns; PDEF = Professional Development of Effective Use of Generative AI; PDET = Professional Development for Ethical Use of Generative AI.

*** Correlation is significant at the 0.001 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

413 As Table 3 indicates, a positive correlation with a large effect size was observed between the

414 experience of using GenAI for academic purposes and perceiving the opportunity brought by

415 GenAI for lesson planning, $r(98) = .526, p < .001$. Conversely, A negative correlation with a

416 medium effect size was found between the use of GenAI for academic purposes and perceiving

417 challenges brought by GenAI for lesson planning, $r(98) = -.302, p < .01$. Similarly, a negative
418 correlation with a medium effect size was noted between the experience of using GenAI for
419 academic purposes and having ethical concerns about using GenAI for lesson planning, $r(98) =$
420 $-.462, p < .001$. In contrast, a positive correlation with a small effect size was observed between
421 the experience of using GenAI for academic purposes and perceiving the need for professional
422 development to learn how to use GenAI effectively for lesson planning, $r(98) = .260, p < .01$.
423 Additionally, a positive correlation with a small effect size was found between the experience of
424 using GenAI for academic purposes and perceiving the need for professional development to
425 learn how to use GenAI ethically for lesson planning, $r(98) = .205, p < .05$.

426 The findings suggest that pre-service teachers' engagement with GenAI in academic settings
427 enhances their perception of its opportunities in lesson planning. However, their academic use of
428 GenAI also diminishes concerns about associated challenges and ethical issues. These results
429 indicate that familiarity with GenAI in academic contexts can help pre-service teachers perceive
430 the benefits of applying GenAI to lesson planning. However, it may also create blind spots
431 regarding its limitations and ethical implications. The positive correlation with the perceived
432 need for professional development shows that, despite their familiarity, these users still recognise
433 the importance of guidance in using GenAI effectively and ethically. The Pearson correlation
434 analysis highlights the need for structured training that builds on existing academic experience
435 while addressing overlooked practical challenges and ethical issues. Teacher education should
436 prioritise balanced development to ensure that greater familiarity with GenAI does not lead to
437 underestimating its risks and challenges.

438 **Discussion**

439 This study explored the emerging applications and perceptions of GenAI among pre-service
440 primary teachers within a major primary teacher education programme in Ireland. The findings
441 suggest early engagement with GenAI technologies in personal, academic, and lesson planning
442 settings. The findings also indicate no correlation between the personal application of GenAI and
443 perceived opportunities, challenges, ethical concerns, and the need for professional development.
444 By comparison, academic use of GenAI was significantly positively correlated with perceptions
445 of opportunities and the need for learning how to effectively and ethically use GenAI for lesson
446 planning while being negatively correlated with perceptions of challenges and ethical concerns.

447 **Utilisation of GenAI**

448 The results indicate that while 68 out of 100 respondents reported their access to GenAI tools,
449 mainly via ChatGPT, for personal and academic purposes, their application in lesson planning is
450 less frequent. Moreover, the self-reported experience levels for these purposes are below three on
451 a five-point Likert scale, indicating that the general use of GenAI among pre-service primary
452 teachers at the Irish institution remains in its early stage. This aligns with findings from other
453 countries that also identified early-stage GenAI use among higher education students in Hong
454 Kong (Chan & Hu, 2023), Germany (von Garrel & Mayer, 2023), Australia (Kelly et al., 2023),
455 and Sweden (Malmström, 2023). In contrast, the study of Gatlin (2023) found that 61% of 105
456 education majors at a four-year university in Texas reported high familiarity with AI. These
457 variations may suggest regional differences in pre-service teachers' experience levels with
458 GenAI.

459 Furthermore, this study found that pre-service participants predominantly use ChatGPT. Other
460 studies have also highlighted the predominant role of ChatGPT in university students' daily use
461 of GenAI, primarily for academic purposes (Helm & Hesse, 2024; Malmström, 2023), which

462 may raise concerns about over-reliance on a single GenAI tool and the potential for any bias
463 within the system to be amplified through on lesson planning and children's learning outcomes.
464 The AI algorithms, such as those used by ChatGPT, often function as 'black boxes' with opaque
465 decision-making processes (Rai, 2020). This lack of transparency can be problematic in AI-
466 supported lesson planning settings since teachers may struggle to understand how responses are
467 generated and therefore determine whether biases or misunderstandings are present (Chounta et
468 al., 2022). Thus, teacher education programs need to foster a critical understanding of how AI
469 works and the potential biases in AI systems (European Commission: European Education and
470 Culture Executive Agency, 2023). Additionally, various GenAI tools utilise different training
471 data and algorithms, which can further complicate their predictability and reliability in
472 educational applications (Yu & Guo, 2023). Student teachers and educators should be
473 encouraged to compare outputs from various GenAI tools. This practice can help prevent bias
474 and misunderstandings in lesson plans that may arise from relying on a single GenAI source,
475 aligning with UNESCO's Guidance for Generative AI in Education and Research (Holmes &
476 Miao, 2023), which calls for educational and research institutions to critically validate GenAI
477 tools for their ethical and pedagogical appropriateness in education.

478 **Perceptions of Using GenAI for Lesson Planning**

479 Irish pre-service teachers appear to recognise the opportunities of GenAI in reducing the time
480 required for lesson planning and increasing efficiency, which is in line with the findings of Chan
481 and Zhou (2023). However, moderate scepticism persists regarding the creativity and originality
482 of AI-generated content. This aligns with previous studies indicating that while AI can offer
483 significant support in lesson planning, its role in creative tasks is still limited and requires careful
484 integration (Hsu, 2023; Imran & Almusharraf, 2023; Kehoe, 2023; van den Berg & du Plessis,

485 2023). However, interviews with teachers and educators at 23 educational institutions in the
486 United Kingdom (The Open Innovation Team and Department for Education, 2024) suggested
487 that the application of GenAI can promote creative and engaging teaching by generating ideas
488 that teachers and educators might not have considered independently. Experienced educators, in
489 particular, valued the fresh suggestions for new activities or experiments after years of using the
490 same methods. Therefore, it can be inferred that a gap might exist between pre-service and in-
491 service teachers regarding GenAI's potential to promote creativity and originality in lesson
492 planning.

493 Specific challenges associated with using GenAI for lesson planning were identified. The pre-
494 service teachers expressed concerns about overly relying on AI for lesson planning, which could
495 potentially diminish their skills development and reduce their engagement in the creative process
496 of lesson planning (van den Berg & du Plessis, 2023), negatively impacting children's learning
497 outcomes. Ethical concerns were significant among Irish pre-service teachers, particularly
498 regarding educational equity and data privacy. There is a fear that AI technologies might
499 exacerbate disparities in educational access and quality if they are not universally accessible
500 (Tiernan et al., 2023). Additionally, the potential misuse of student data and the transparency of
501 AI decision-making processes are critical issues that need addressing to ensure the ethical use of
502 AI in educational settings (Yu & Guo, 2023).

503 The perceived opportunities, challenges, and ethical concerns discussed above highlight Irish
504 pre-service teachers' recognition of the need for professional development programmes focused
505 on effectively and ethically integrating GenAI. These programmes should prioritise strategies
506 promoting GenAI as a supportive tool for lesson planning rather than replacing the entire
507 process. The findings of this study empirically highlight a gap in current teacher education

508 programmes, suggesting the need for updates to include comprehensive training on emerging
509 technologies like GenAI (Whalen & Mouza, 2023).

510 **Impact of Personal and Academic Use of GenAI on Lesson Planning Perceptions**

511 Teachers' access to digital tools outside of the classroom was found to have a critical impact on
512 their adoption of digital technologies in their teaching practices (Purcell et al., 2013). Similarly,
513 university students with greater access to technology resources were more likely to feel
514 comfortable with GenAI (Goldberg et al., 2024). However, the present study found a lack of
515 correlation between the personal application of GenAI and the perceived opportunities,
516 challenges, ethical concerns, and the desire for professional development in the GenAI-supported
517 lesson planning context, which empirically indicates that access to GenAI resources does not
518 necessarily translate into the perceptions of the opportunities GenAI offers for professional
519 settings and the desire for professional development in using GenAI effectively and ethically for
520 professional purposes.

521 This study makes a unique contribution to understanding the varied perspectives on how prior
522 experience with technology influences pre-service teachers' perceptions of technology
523 integration in educational settings, particularly in the context of using GenAI for lesson planning
524 (Chan & Hu, 2023; Parissi et al., 2023). The empirical findings highlight that different types of
525 prior exposure may lead to different perceptions. While personal use of GenAI has limited
526 impact, pre-service teachers' academic use of GenAI significantly shapes their perceived
527 opportunities for the use of GenAI in lesson planning, increases their desire for professional
528 development, and creates blind spots regarding GenAI's limitations and ethical implications. The
529 practical implications for the international research team's next DBR design and construction
530 phase (McKenney & Reeves, 2018) and other teacher education institutions are significant. It

531 suggests that pre-service teachers who have used GenAI primarily for personal purposes, such as
532 social networking or creative hobbies, could be equated to those without GenAI experience
533 during professional learning on using GenAI effectively and ethically for professional purposes.
534 Pre-service student teachers with experience using GenAI for academic purposes can and should
535 be offered advanced-level training sessions. These sessions could be based on the pre-service
536 teachers' existing academic use patterns of GenAI to support them in developing effective uses
537 of GenAI for professional purposes. For example, student teachers who have been using GenAI
538 to assist in generating ideas for college assignments could be engaged in a professional
539 development session aimed at teaching them how to use GenAI to generate creative ideas for
540 teaching topics that are challenging and abstract for children. In addition, the professional
541 development for pre-service teachers with experience in using GenAI for academic purposes
542 should emphasise the challenges and ethical concerns associated with applying GenAI in
543 education.

544 **Conclusion**

545 This study presents a novel case of Irish pre-service primary teachers' GenAI application for
546 personal, academic, and professional purposes. This study also demonstrates how the pre-service
547 teachers perceived the opportunities, challenges, ethical concerns, and professional development
548 needs in the context of using GenAI for lesson planning. Finally, this study expands the
549 understanding of how prior technology exposure impacts pre-service teachers' perceptions of
550 technology integration, highlighting that different types of exposure can lead to varying
551 perceptions. While personal use of GenAI has minimal impact, pre-service teachers' academic
552 engagement with GenAI significantly shapes their perceived opportunities for its use in lesson
553 planning and increases their interest in professional development. Academic engagement with

554 GenAI may also cause pre-service teachers to be blind to GenAI's limitations and ethical
555 implications.

556 There are three limitations to this study. First, the correlational findings were based on data
557 collected from student teachers at an Irish institution. Data from student teachers in other regions
558 could yield different correlational results. Second, it is important to note that the convenience
559 sampling technique used in the current study can introduce sampling bias and limit participant
560 diversity, making the sample less representative of the broader population. This restricts the
561 generalisability of the research findings, as the specific characteristics of the sampled group may
562 overly influence the results. Third, the adoption of GenAI at the Irish institution is in its early
563 stages, so it is possible that students' perception of using GenAI in lesson planning settings might
564 have been restricted due to limited exposure. As GenAI becomes more common in everyday life,
565 student teachers may gain more experience in using GenAI and become more eager to learn how
566 to use it effectively and ethically through professional development.

567 This study has addressed essential questions regarding student teachers' perceptions of GenAI
568 applications by sharing a novel perspective from a pre-service primary teacher programme in
569 Ireland.

570 Several directions for further research could be undertaken. First, expanding the scope to include
571 learners from different disciplines across multiple universities could provide additional insights
572 into the use and understanding of these technologies. Furthermore, extending this research to
573 include international universities could enhance the data's representation, thereby facilitating a
574 broader understanding of how GenAI use is adopted by pre-service teachers and teachers
575 globally. Moving forward, this instrument can be utilised to collect data from universities
576 worldwide, aiming to contribute to developing educational strategies and resources related to the

577 challenges and opportunities of integrating emerging technologies. Second, the differing
578 perspectives between pre-service and in-service teachers regarding GenAI's potential to promote
579 creativity and originality may need further research to explore the underlying factors. Third,
580 while our study primarily focused on quantitative methods to examine correlations, future
581 research could benefit from a mixed-methods approach. This could involve participant
582 interviews and qualitative analysis to explore emerging themes related to pre-service teachers'
583 prior exposure to and familiarity with GenAI, along with their perceived opportunities,
584 challenges, ethical concerns, and professional development needs. Additionally, future studies
585 could establish hypotheses and employ advanced statistical techniques, such as latent variable
586 analysis or structural equation modelling, to identify underlying constructs, including how the
587 interaction between personal and academic uses of GenAI influences perceived opportunities,
588 challenges, ethical concerns, and professional development needs in the context of applying
589 GenAI in lesson planning.

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