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Abstract: The integration of digital technologies into academic research has transformed the writing practices of PhD students, particularly in the areas of meta-discourse awareness and quality research writing and productivity. This study aimed to investigate the perceptions of PhD research students regarding the use of digital tools in academic research, their awareness of meta-discourse strategies, the impact of digital resources on research writing quality and productivity, and the challenges encountered during academic writing. A quantitative survey design was employed using a structured 20-item Likert scale questionnaire. The sample comprised 28 PhD students selected through convenience sampling. The majority of PhD research students demonstrated positive perceptions regarding the use of digital tools in academic research and writing. Most respondents selected “Agree” and “Strongly Agree” for items related to digital resources, meta-discourse awareness, and research productivity. Students acknowledged that digital tools improved writing clarity, organization, and efficiency. Similarly, participants showed moderate to high awareness of meta-discourse practices, indicating that they consciously use reader-friendly and organized writing strategies in academic work. Regarding challenges, responses were comparatively mixed. While many respondents agreed that digital tools are beneficial, a noticeable number also expressed concerns about overreliance on technology, difficulties in verifying AI-generated content, and the need for additional training and institutional support. These findings suggested that PhD research students perceive digital tools and meta-discourse strategies as valuable components of academic research writing, despite some existing technological and educational challenges.

Introduction

Meta-discourse, in simple terms, is the “writer’s commentary” on their own text. It is the language that writers use to guide readers and express their stance, rather than just presenting new information (Hyland and Tse 2004). It is based on the view that academic writing is a social act of engaging with the reader (Hyland 2010; Pearson and Abdollahzadeh 2023). According to interpersonal model of Hyland,

first released in 2005, the key framework predominantly divide the meta-discourse into two main categories i.e. the interactive meta-discourse and interactional Meta-discourse (Hyland 2018).

Interactive meta-discourse guides the reader through the text to help them understand the writer's intended structure and argument. For instance, Transitions (*however, therefore, in addition*), Frame Markers (*first, finally*), Endophoric Markers (*as shown in Figure X*), Evidentials (*according to X, 2020*), and Code Glosses (*e.g., i.e., in other words*) (Weisi and Zandi 2024; Wongsu et al. 2024). Correspondingly, interactional meta-discourse engages the reader and conveys the writer's attitude, confidence, and relationship to their claims. For instance, Hedges (*may, might, suggest*), Boosters (*clearly, definitely*), Attitude Markers (*surprisingly, important*), Self-mentions (*I, we*), Engagement Markers (*consider, note that*) (Weisi and Zandi 2024; Wongsu et al. 2024).

The use of academic digital tools like AI, in academic writing, specifically affects meta-discourse strategies. AI-generated revisions of student writing generally increase the use of interactional resources (like Attitude Markers and Boosters) while decreasing the use of text-organizing devices (like Transitions) (Sanosi 2026). It is suggested that AI might make writing sound more confident and engaging, but possibly at the expense of clear logical flow. Comparing essays written by AI ChatGPT with those written by students found that human-authored texts used meta-discourse almost twice as frequently (Jiang and Hyland 2025). This indicated that the default AI writing style may be less rhetorically rich than a skilled human writer and potentially lead to more formulaic text.

While AI tools can be powerful, still they are not a perfect substitute for the nuanced meta-discourse decisions made by a skilled writer. AI revisions should be complemented by human oversight to ensure the writing remains rhetorically effective and appropriate for its academic context (Sanosi 2026).

Rationale of the Study

The rapid growth of digital technologies in higher education consistently increased the use of AI and digital writing assistants. There is a limited evidence exist regarding PhD students' awareness of meta-discourse in the digital age. Besides, it is also needed to understand whether digital tools enhance research writing and productivity. The findings of this study may help universities to develop training programs and institutional support systems. This study contributes to academic research writing, supports evidence-based policy and training decisions, and helps improve doctoral research performance.

Research Objectives

- To examine the use of digital tools by PhD students in academic research writing
- To assess PhD students' awareness of meta-discourse strategies
- To explore the perceived impact of digital tools on research writing quality and productivity
- To identify challenges faced by PhD students when using digital technologies for research writing

Research Questions

- Are the PhD students using digital tools in academic research?
- What is the level of meta-discourse awareness among PhD research students?
- How do digital tools influence research writing quality and productivity?
- What challenges do PhD students face while using digital technologies and AI-assisted writing tools?

Literature Review

Meta-discourse Awareness in Doctoral Writing

Understanding the meta-discourse is a key skill for students of academic writing in both L1 and L2 contexts (Hyland 2018). L1 and L2 are the terms used in linguistics and education which refer to a person's first and second languages respectively. Meta-discourse awareness helps the research students or writers adjust the level of personality in their texts and represent themselves and their arguments effectively (Hyland 2018). The relationship between meta-discourse awareness and reading comprehension among doctoral students have been examined across disciplines (Wichka 2025), where it is investigated that how reflexive meta-discourse awareness correlates with reading strategies, subject knowledge, and language proficiency. Kuhi (2022) suggested that theoretical developments in meta-discourse research have not always been fully translated into pedagogical materials (Kuhi 2022).

Digital Tools in Academic Research and Writing

Nowadays, various types of digital tools are used in research writing. Reference managers such as Zotero, EndNote, and Mendeley help organize citations and generate bibliographies (Ivey and Crum 2018). AI-powered writing assistants like Grammarly and Quillbot support content generation and refinement (Tamilselvi et al. 2023). Literature discovery tools like Google Scholar, Elicit, and Scite.ai facilitate efficient literature searching (Silva and Wickramaarachchi 2025). Such digital tools help researchers manage and synthesize extensive information, avoiding repetition and saving time. These digital platforms support knowledge management and help structure information effectively as well as these digital tools are essential for increasing productivity and efficiency (Yazon et al. 2019; Petrescu et al. 2025; Sreekanthaswamy et al. 2025).

Meta-discourse and the Integration of Digital Tool

Digital technologies have primarily transformed the research writing of doctoral students (Bista and Bista 2025). In context to meta-discourse, recent research indicated that AI-assisted revisions tend to increase the use of interactional resources (such as attitude markers and boosters) while decreasing the use of text-organizing devices (Sanosi 2026). This suggests that AI tools may make writing appear more confident and engaging, but potentially at the expense of clear logical flow. Research studies, comparing AI-generated text with human-authored text, have found that human writers tend to use meta-discourse more frequently (Sadigzade 2026). Consequently, digital tools support meta-discourse awareness by helping students improve writing clarity, organization, and efficiency (Yoon and Na-Young 2022; Tahmasbi et al. 2024). However, AI-generated content potentially require human oversight to ensure rhetorical effectiveness and academic appropriateness.

Conceptual Framework



Methodology

Research Design

The research design of the present study was quantitative survey research.

Population and Sampling

PhD research students enrolled in universities of Peshawar were taken as a population. A convenience sampling technique was used for data collection. The inclusion criteria for sample comprised the currently enrolled students in a PhD program of social sciences subjects, as well as actively involved in research writing activities. This resulted in a sample size of 28 PhD students (N = 28).

Research Instrument and data Collection

A structured questionnaire was designed and used as an instrument for data collection in this study. The questionnaire had 5 sections and 23 items. The demographic information section was having 3 items regarding gender, university, and year of PhD study. While the other 4 sections were use of digital tools in academic research (5 items, DT1 to DT5), meta-discourse awareness among PhD students (5 items, MA1 to MA5), research writing quality & productivity (5 items, RP1 to RP5), and challenges faced by PhD research students (5 items, CH1 to CH5). These sections are presented in Table 1. The questionnaire used five-point Likert scale for data collection.

Table 1. Items of the 4 sections of questionnaire.

Questionnaire Sections	Code	Items
Use of Digital Tools in Academic Research	DT1	I frequently use digital tools (e.g., Google Scholar, AI tools, and reference managers) in my research.
	DT2	Digital resources help me locate relevant literature efficiently.
	DT3	Digital tools improve the organization of my research work.
	DT4	I use digital platforms to enhance academic writing quality.
	DT5	Digital technologies save time during research and writing.
Meta-discourse Awareness among PhD students	MA1	I am aware of meta-discourse strategies used in academic writing.
	MA2	I consciously use transition markers to improve coherence.
	MA3	I use engagement markers to guide readers through my writing.
	MA4	I understand the importance of reader-friendly academic writing.
	MA5	I apply meta-discourse features to strengthen arguments.
Research Writing Quality & Productivity	RP1	Digital tools improve the clarity of my research writing.
	RP2	Digital resources enhance the quality of my academic papers.
	RP3	My research writing productivity has increased due to digital tools.
	RP4	I complete research-writing tasks more efficiently using technology.
	RP5	Digital tools help me produce better-organized research outputs.
Challenges Faced by PhD Research Students	CH1	I am concerned about overreliance on digital technologies.
	CH2	I find it difficult to verify AI-generated content.
	CH3	I need additional training to effectively use digital tools.

CH4	My institution should provide more support for digital research tools.
CH5	Technical issues sometimes hinder my research-writing process.

Reliability Analysis

To check the reliability of the questionnaire, the questionnaire were undergone with pilot testing with 10 PhD students. These students were excluded from the actual sample. Cronbach's Alpha (α) results stated that all values exceeded the acceptable threshold ($\alpha > 0.70$). The instrument demonstrated excellent internal consistency and reliability (Table 2).

Table 2. Cronbach's Alpha (α) results.

Variable	α
Digital Tools	0.86
Meta-discourse Awareness	0.84
Research Writing Productivity	0.88
Challenges	0.79
Overall Instrument	0.91

Data Analysis

The collected data was analyzed using SPSS Version 20 software for descriptive statistics like frequencies and percentages. For weighted mean analysis, the responses from five-point Likert scale were coded as 1, 2, 3, 4, and 5 corresponding to strongly disagree, disagree, neutral, agree, and strongly agree respectively. The scale interval was calculated by subtracting the lowest value from the highest value (i.e. $5 - 1 = 4$) and then, dividing the result (4) by the number of response categories (i.e. $4 \div 5 = 0.80$). The calculated interval (0.80) was used to establish the scale interpretation of participants' overall responses for each questionnaire item. Then, the scale used for weighted mean interpretation was strongly disagree (weighted mean range: 1.00 to 1.79), disagree (weighted mean range: 1.80 to 2.53), neutral (weighted mean range: 2.60 to 3.39), agree (weighted mean range: 3.4 to 4.19), and strongly agree (weighted mean range: 4.2 to 5) (Tabassum et al. 2025, 2026b, 2026a). The formula for weighted mean used is given below;

$$\text{Weighted Mean} = \frac{\sum(f \times x)}{\sum f}$$

Where;

f = frequency (number of respondents to five-point Likert scale)

x = scale value as coded (e.g., 1, 2, 3, 4, 5)

$\sum (f \times x)$ = sum of weighted scores

$\sum f$ = total number of respondents

Ethical Consideration

The study was conducted in accordance with accepted ethical research principles. Prior to participation, all respondents were informed about the purpose and objectives of the study. Informed consent was obtained from each participant. Participation in the survey was entirely voluntary. The respondents

were free to withdraw from the study at any stage without any consequences. The privacy and privacy of participants were strictly maintained. No personal identifiers were collected, and respondents' identities were kept hidden during the research process. The collected data were used solely for academic and research purposes. The results of this study were reported in aggregate form to ensure that individual participants could not be identified.

Results

Demographic Profile of Participants

Table 3. Demographic information of the respondents (N = 28).

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	16	57.1
	Female	12	42.9
University	University of Peshawar	15	53.6
	Qurtaba University	8	28.6
	Sarhad University	5	17.8
Year of PhD Study	1st Year	6	21.4
	2nd Year	8	28.6
	3rd Year	9	32.1
	4th Year or Above	5	17.9

The demographic information of the PhD students were presented in Table 3. In this study a total of 28 PhD students from social sciences subjects participated. Among them, 16 (57.1%) were male students while 12 (42.9%) were female students. The 15 (53.6%) participants were from the University of Peshawar, Peshawar, KP-Pakistan, 8 (28.6%) participants were from Qurtaba University of Science & Information Technology, Peshawar, KP-Pakistan, and 5 (17.8%) were from Sarhad University of Science and Information Technology, Peshawar, KP-Pakistan. There were 6 (21.4%) participants were in the first year of their PhD program, 8 (28.6%) were in the second year of their PhD program, 9 (32.1%) were in the third year of their PhD program, while 5 (17.9%) were in the fourth year and onwards of their PhD program.

Use of Digital Tools in Academic Research

Table 4. Frequencies, weighted mean, and overall response of the responses regarding the usage of digital tools among PhD students (N = 28).

Code	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Weighted Mean	Overall Response
DT1	12	12	3	1	0	28	4.25	Strongly Agree
DT2	14	11	2	1	0	28	4.35	Strongly Agree
DT3	12	13	3	0	0	28	4.32	Strongly Agree
DT4	13	12	2	1	0	28	4.32	Strongly Agree
DT5	15	11	2	0	0	28	4.46	Strongly Agree

Note: Scale for the weighted mean comparison of each item for overall response was strongly disagree (1.00 to 1.79), disagree (1.80 to 2.53), neutral (2.60 to 3.39), agree (3.4 to 4.19), strongly agree (4.2 to 5).

The findings of the use of digital tools in academic research by PhD students (DT1 to DT5) were presented in Table 4 and Figure 1. The overall weighted means of the items DT1 to DT 5 were 4.25 to

4.46, all falling in the strongly agree range. For item DT1, an overwhelming majority of 85.8% of respondents either agreed (42.85%) or strongly agreed (42.85%) that they frequently use digital tools in their research. Only 3.6% disagreed, while 10.7% remained neutral. Similarly, for item DT2, 50% strongly agreed and 39.3% agreed. This combined agreement rate of 89.3% indicated that PhD students heavily rely on digital platforms for their literature searches. For DT3, 89.3% of students (42.9% strongly agreed, 46.4% agreed) acknowledged that digital tools improve the organization of their research work. For DT4, 89.3% (46.4% strongly agreed, 42.9% agreed) confirmed that they use digital platforms to enhance their writing quality. Notably, for item DT3, no student disagreed, while for DT4, only one student (3.6%) disagreed. Likewise, for item DT5, 53.6% of students were strongly agreed and 39.3% were agreed that digital technologies save time during research and writing. Combined, 92.9% of participants acknowledged the time-saving benefits of these tools, with not a single respondent disagreeing.

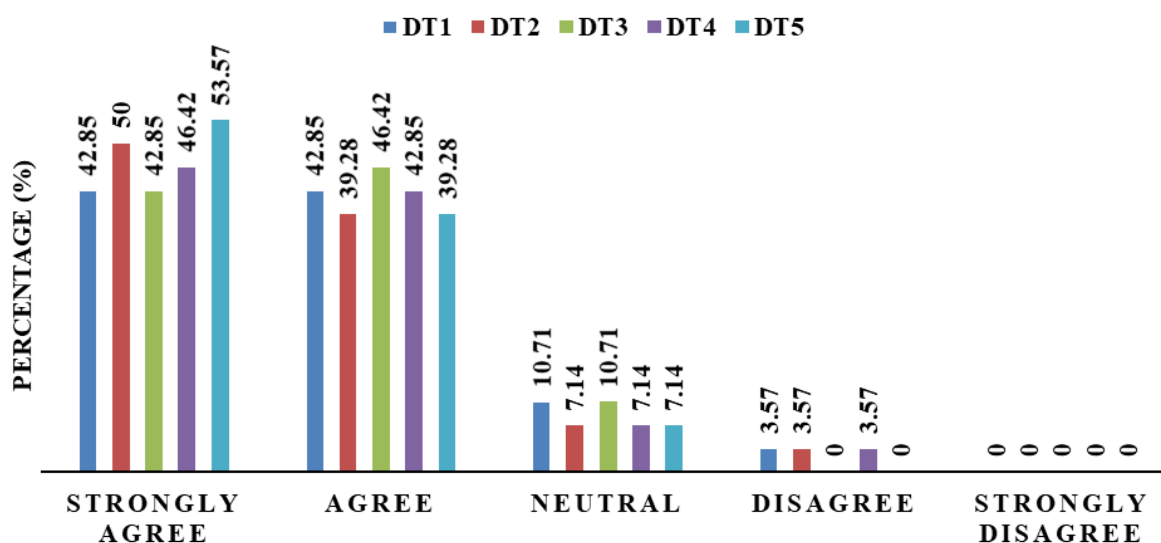


Figure 1. Percentage (%) of the responses regarding the usage of digital tools among PhD students (N = 28).

Meta-discourse Awareness among PhD Students

Table 5. Frequencies, weighted mean, and overall response of the responses regarding meta-discourse awareness among PhD students (N = 28).

Code	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Weighted Mean	Overall Response
MA1 11	12	4	1	0	0	28	4.17	Agree
MA2 11	13	3	1	0	0	28	4.21	Strongly Agree
MA3 10	12	4	2	0	0	28	4.07	Agree
MA4 13	12	2	1	0	0	28	4.32	Strongly Agree
MA5 13	11	3	1	0	0	28	4.28	Strongly Agree

Note: Scale for the weighted mean comparison of each item for overall response was strongly disagree (1.00 to 1.79), disagree (1.80 to 2.53), neutral (2.60 to 3.39), agree (3.4 to 4.19), strongly agree (4.2 to 5).

The findings of the meta-discourse awareness among PhD students (MA1 to MA5) were presented in Table 5 and Figure 2. The overall weighted means of the items MA1 to MA5 were 4.07 to 4.32, falling in agree and strongly agree range. For item MA1, 82.2% of respondents (39.3% strongly agreed, 42.9%

agreed) reported being aware of meta-discourse strategies. Only 3.6% of the respondents disagreed, while 14.3% remained neutral. In item MA2, 85.7% of students (39.3% strongly agreed, 46.4% agreed) confirmed that they consciously use transition markers to improve coherence in their writing. Only 3.6% disagreed, and 10.7% were neutral. Consequently, for item MA3, examining the use of engagement markers to guide readers, 35.7% were strongly agree and 42.9% were agree. However, 7.1% disagreed and 14.3% remained neutral. Similarly, item MA4, with an impressive 89.3% of respondents (46.4% strongly agreed, 42.9% agreed), acknowledged the importance of reader-friendly academic writing. Only 3.6% disagreed. For item MA5, 85.7% of respondents (46.4% strongly agreed, 39.3% agreed) confirmed that they apply meta-discourse features to strengthen their arguments.

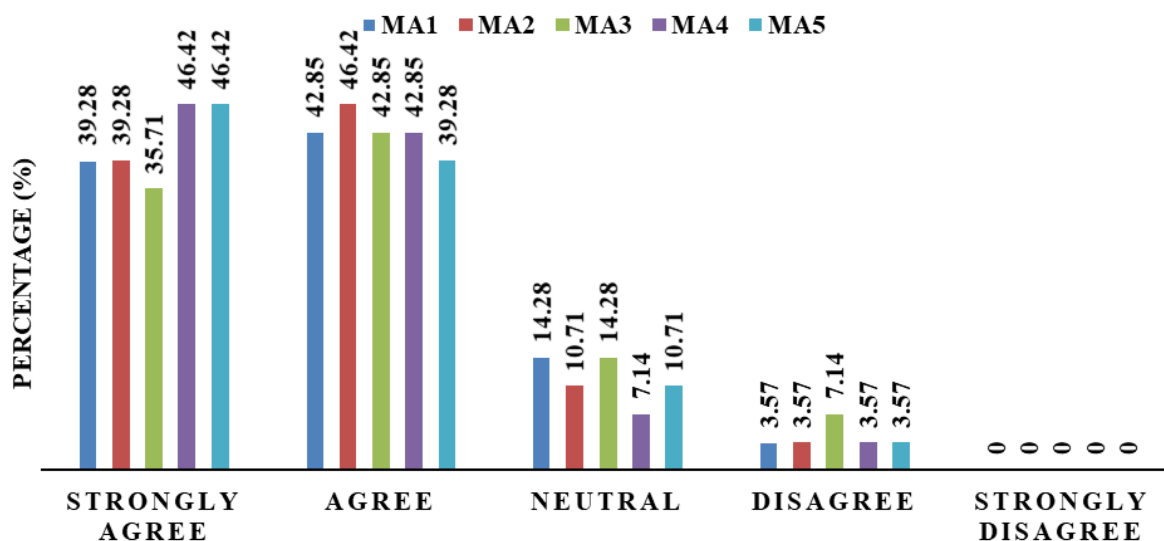


Figure 2. Percentage (%) of the responses regarding meta-discourse awareness among PhD students (N = 28).

Impact on Research Writing Quality and Productivity

Table 6. Frequencies, weighted mean, and overall response of the responses regarding research writing quality and productivity (N = 28).

	Code	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Weighted Mean	Overall Response
RP1	14	11	2	1	0	0	28	4.35	Strongly Agree
RP2	13	12	3	0	0	0	28	4.35	Strongly Agree
RP3	15	10	2	1	0	0	28	4.39	Strongly Agree
RP4	13	11	3	1	0	0	28	4.28	Strongly Agree
RP5	14	12	2	0	0	0	28	4.42	Strongly Agree

Note: Scale for the weighted mean comparison of each item for overall response was strongly disagree (1.00 to 1.79), disagree (1.80 to 2.53), neutral (2.60 to 3.39), agree (3.4 to 4.19), strongly agree (4.2 to 5).

The findings of the research writing quality and productivity of PhD students (RP1 to RP5) were presented in Table 6 and Figure 3. The overall weighted means of the items RP1 to RP5 were 4.28 to 4.42, falling in the strongly agree range. For item RP1, 89.3% of students (50% strongly agreed, 39.3% agreed) confirmed that digital tools improve the clarity of their research writing. Only 3.6% of the respondents disagreed, and 7.1% remained neutral. In item RP2, examining whether digital resources

enhance the overall quality of academic papers, 89.3% of students (46.4% strongly agreed, 42.9% agreed) affirmed this. Only 10.7% of the respondents were neutral. In item RP3, 89.3% of respondents (53.6% strongly agreed, 35.7% agreed) stated that their research writing productivity has increased due to digital tools. Only 3.6% disagreed. Similarly, for item RP4, 85.7% of respondents (46.4% strongly agreed, 39.3% agreed) confirmed that they complete research-writing tasks more efficiently using technology. In Item RP5, 92.9% of respondents (50% strongly agreed, 42.9% agreed) acknowledged that digital tools help them produce better-organized research outputs.

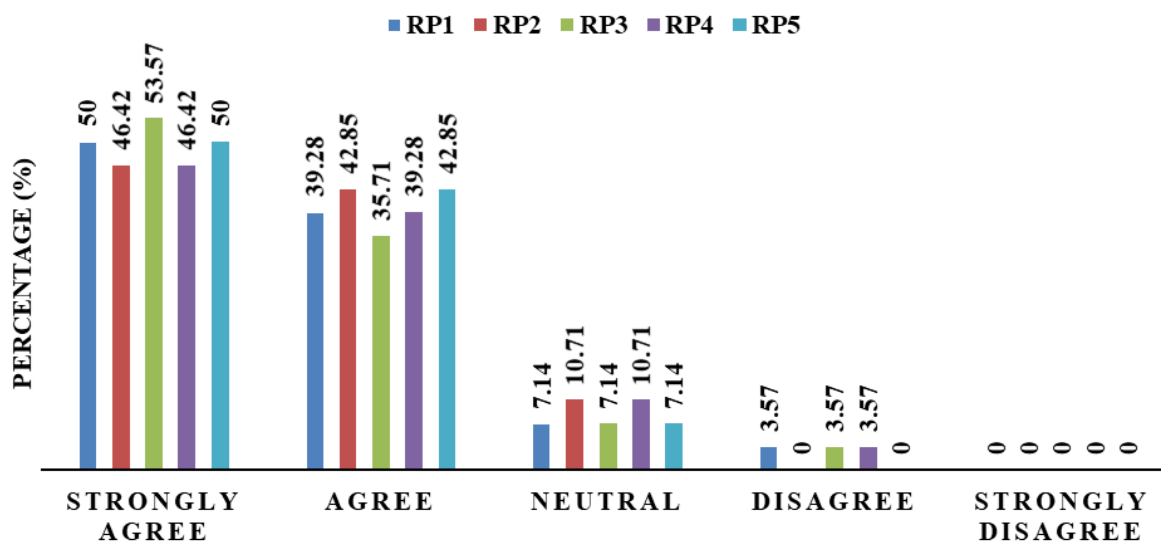


Figure 3. Percentage (%) of the responses regarding research writing quality and productivity (N = 28).

Challenges Faced by PhD Students

Table 7. Frequencies, weighted mean, and overall response of the responses regarding challenges faced by PhD students (N = 28).

Code	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Weighted Mean	Overall Response
CH1	6	11	6	4	1	28	3.6	Agree
CH2	8	12	5	3	0	28	3.89	Agree
CH3	7	13	4	3	1	28	3.78	Agree
CH4	8	14	4	2	0	28	4	Agree
CH5	5	11	6	5	1	28	3.5	Agree

Note: Scale for the weighted mean comparison of each item for overall response was strongly disagree (1.00 to 1.79), disagree (1.80 to 2.53), neutral (2.60 to 3.39), agree (3.4 to 4.19), strongly agree (4.2 to 5).

The findings of the challenges faced by PhD students (CH1 to CH5) were presented in Table 7 and Figure 4. The overall weighted means of items CH1 to CH5 were 3.5 to 4, falling in agree range. Item CH1, examining concerns about overreliance on digital technologies, 60.7% of respondents (21.4% strongly agreed, 39.3% agreed) expressed their concern. However, a 17.9% disagreed (14.3% disagreed, 3.6% strongly disagreed), and 21.4% remained neutral. Similarly, item CH2 examined difficulties in verifying AI-generated content. A combined 71.5% of students (28.6% strongly agreed, 42.9% agreed) acknowledged this challenge. Only 10.7% disagreed, while 17.9% remained neutral. For item CH3, 71.4% of respondents (25% strongly agreed, 46.4% agreed) expressed the need for additional training to effectively use digital tools. Only 14.3% disagreed (10.7% disagreed, 3.6% strongly disagreed), while 14.3% remained neutral. For item CH4 78.6% of respondents (28.6% strongly agreed, 50% agreed)

stating that their institution should provide more support for digital research tools. Only 7.1% disagreed, while 14.3% remained neutral. While for the item CH5, which addressed technical issues hindering the research-writing process, only 57.2% of students (17.9% strongly agreed, 39.3% agreed) acknowledged this challenge. A notable 21.4% disagreed (17.9% disagreed, 3.6% strongly disagreed), and 21.4% remained neutral.

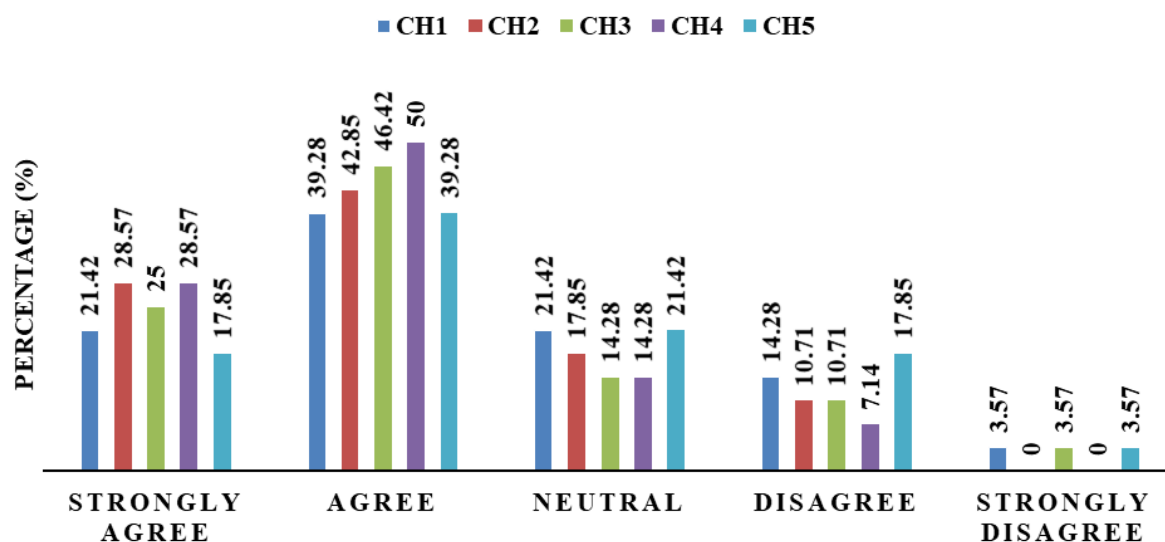


Figure 4. Percentage (%) of the responses regarding challenges faced by PhD students (N = 28).

Discussion

PhD students demonstrate a high level of engagement with digital tools in their research writing. Most of the PhD students reported that they are frequently using digital tools such as Google Scholar, AI-assisted writing tools, and reference managers in their academic work. This finding aligns with previous research studies documenting the widespread adoption of digital technologies in higher education (Alenezi et al. 2023; Mexhuani 2025). To support the academic work of PhD students, reference managers, AI-powered writing assistants, and literature discovery platforms are widely used (Al Fraidan 2025; Sontake 2025; Asgary and Parhizkar 2026). In this study, the strong positive perception of the use of digital tools among PhD students in Peshawar, Pakistan was found. It reflects a broader global trend toward technology integration in doctoral education.

The study found that PhD students possess moderate to high awareness of meta-discourse strategies. These findings are encouraging and suggest that doctoral students in Pakistan are developing the rhetorical awareness necessary for effective academic communication (Jiang and Hyland 2025). The slightly lower scores for engagement markers suggested that some meta-discourse strategies may be less familiar or less frequently used than others. This finding is consistent with research indicating that engagement markers as less conventional in certain academic cultures (Hyland 2018). First, PhD students receive significant exposure to academic texts during PhD. This implicitly develops their awareness of writing conventions. Second, supervisor feedback and coursework may explicitly address writing strategies. Third, the growing availability of digital writing tools may inadvertently raise awareness of text organization features.

Consequently, the use of digital tools improve writing clarity, enhance paper quality, and increase productivity (Mexhuani 2025). The relationship between the use of digital tools and research writing quality and productivity is consistent with broader research on technology in education (Yazon et al. 2019). Digital tools appear to serve as intellectual support (Alenezi et al. 2023). It reduce cognitive load

associated with citation formatting and literature searching. This allows students to focus more attention on higher-order writing concerns. Students also acknowledged difficulties in the use of digital tools such as verifying AI-generated content. Students agree that their universities should provide more support for digital research tools. This finding points to a gap between technology availability and the training to use it efficiently. Students appear to recognize that simply having access to digital tools is insufficient. They require guidance on how to integrate these tools (Sadigzade 2026).

Conclusion

From this study, it is concluded that digital tools play a significant role in enhancing research writing productivity among PhD students. PhD researchers demonstrate considerable awareness of meta-discourse strategies. Effective integration of digital resources contributes to better organization, clarity, and efficiency in academic writing. Challenges related to AI usage and technological dependence remain important concerns. In this context, universities should provide training and support for responsible and effective use of digital research tools. Besides, some concerns were also raised like overreliance of PhD students on technology, need of the verification of AI-generated content, need for training and institutional support.

Recommendation

Based on the key concerns raised, it is recommended to conduct workshops on academic writing and meta-discourse strategies. Provide formal training on AI-assisted research tools. Develop institutional guidelines for ethical use of AI in research writing. Enhance access to digital databases and research software. Encourage continuous professional development for doctoral researchers.

Delimitation of the study

This study was limited to PhD students enrolled in Social Sciences disciplines. The research was conducted only in selected universities of Khyber Pakhtunkhwa (KP), Pakistan. The study adopted a quantitative research approach and relied solely on questionnaire-based data collection. Qualitative methods such as interviews, focus group discussions, and observations were not included in the study. The findings were based on the responses provided by participants during the data collection period and reflect their perceptions at that particular time.

References

- Al Fraidan A (2025) Enhancing linguistic research through AI-powered reference management: A proposal for a voice-controlled academic assistant. *Edelweiss Applied Science and Technology* 9: 1–9
- Alenezi M, Wardat S, Akour M (2023) The need of integrating digital education in higher education: Challenges and opportunities. *Sustainability* 15: 4782
- Asgary S, Parhizkar A (2026) Momentous AI-aided search tools and services for academic and research tasks: a review of the literature. *Journal of Iranian Dental Association* 36: 29–42
- Bista K, Bista R (2025) Leveraging AI tools in academic writing: Insights from doctoral students on benefits and challenges. *American Journal of STEM Education* 6: 32–47
- Hyland K (2010) *Metadiscourse: Mapping interactions in academic writing*. *Nordic Journal of English Studies* 9: 125–143
- Hyland K (2018) *Metadiscourse: Exploring interaction in writing*. Bloomsbury Publishing
- Hyland K, Tse P (2004) Metadiscourse in Academic Writing: A Reappraisal. *Appl Linguist* 25: 156–177
- Ivey C, Crum J (2018) Choosing the right citation management tool: EndNote, Mendeley, RefWorks, or Zotero. *Journal of the Medical Library Association: JMLA* 106: 399

- Jiang F (Kevin), Hyland K (2025) Rhetorical distinctions: Comparing metadiscourse in essays by ChatGPT and students. *English for Specific Purposes* 79: 17–29
- Kuhi D (2022) Loyalty to Traditional Prescriptions or Facing the Challenge of Realities: An Investigation into the Status of Metadiscourse Awareness in Academic Writing Coursebooks. *Journal of English Language Pedagogy and Practice* 14: 221–242
- Mexhuani B (2025) Adopting Digital Tools in Higher Education: Opportunities, Challenges and Theoretical Insights. *Euro J of Education* 60: e12819
- Pearson WS, Abdollahzadeh E (2023) Metadiscourse in academic writing: A systematic review. *Lingua* 293: 103561
- Petrescu IE, Gole I, Balu FO, Sabie OM (2025) The Role of AI Tools in Increasing the Efficiency of Research and Teaching. *Proceedings of the International Conference on Business Excellence* 19: 656–663
- Sadigzade Z (2026) Metadiscourse Patterns in Human-Written vs. Generative AI-Authored Research Abstracts: A Comparative Corpus-Based Analysis. *Acta Globalis Humanitatis et Linguarum* 3: 44–54
- Sanosi A (2026) AI and Metadiscourse: a corpus analysis of ChatGPT revisions to EFL student writing. *Information Technologies and Learning Tools* 111: 156–171
- Silva N, Wickramaarachchi D (2025) Enhancing systematic literature reviews: Evaluating the performance of LLM-based tools across key systematic literature review stages. 1–6
- Sontake P (2025) A review on artificial intelligence (AI) tools in research writing. *International journal of scientific research and technology*
- Sreekanthaswamy N, Anitha S, Singh A, Jayadeva SM, Gupta S, Manjunath TC, Selvakumar P (2025) Digital tools and methods. Enhancing school counseling with technology and case studies. IGI Global Scientific Publishing, pp. 25–48
- Tabassum R, Ahmad M, Akbar M, Naz T, Hakeem M, Salim FN (2026a) A Multidimensional Study of Socioeconomic, Institutional, and Individual Factors Revealing the Causes and Consequences of Student Dropout Ratio. *Journal of Media Horizons* 7: 230–240
- Tabassum R, Ahmad M, Salim FN (2025) Key Attributes of Effective English Teachers: Higher Secondary Student Perspectives in Pakistan. *International Premier Journal of Languages & Literature* 3: 611–625
- Tabassum R, Ahmad M, Salim FN (2026b) Unlocking the Key Attributes of an Effective English Teacher: Insights from the Perspectives of Teachers at the Higher Secondary Level. *Research Mosaic* 6: 15–28
- Tahmasbi M, Fatahipour M, Gharagozloo N (2024) The Impact of Online Metadiscourse Markers Instruction on Iranian EFL Learners' Expository Writing: A Mixed Methods Study. *Research in English Language Pedagogy (RELP)* 12: 14
- Tamilselvi C, Dhanasakkaravarthi B, Devi R, Ebenezer AS, Dhanwanth B, Mohanaprakash TA (2023) A comprehensive study of AI-powered writing assistance tools and content spinning applications. 1104–1111
- Weisi H, Zandi M (2024) A mixed-method concurrent transformative study of metadiscourse markers employed by L2 speakers: does proficiency level matter? *Lang Test Asia* 14: 60
- Wichka MS (2025) Reflexive Metadiscourse and Reading Linguistics, Economics and Chemistry Research Articles by Tunisian Doctoral Students. *Arab Journal of Applied Linguistics* 10: 1–43

- Wongsa J, Chuenchaichon Y, Suwannasom T (2024) A Comparison of Metadiscourse Markers Used in English Research Article Introduction and Literature Review Sections Across Two Disciplines. *Journal of Community Development Research (Humanities and Social Sciences)* 17: 74–88
- Yazon AD, Ang-Manaig K, Buama CAC, Tesoro JFB (2019) Digital literacy, digital competence and research productivity of educators. *Universal Journal of Educational Research* 7: 1734–1743
- Yoon SY, Na-Young K (2022) The use of metadiscourse markers in mobile-assisted flipped learning in L2 writing. *Journal of Asia TEFL* 19: 180