Developing Research Skills for Postgraduate Students Using Digital Platforms

Heyam Al-Taj, Bassam Ghanem, Rami Al Shogran, Mohammad ALKaramneh

[1]Professor, Dean of the Faculty of Educational and Psychological Sciences - Amman Arab University, Jordan, heyam@aau.edu.jo [2]Associate Professor, Foundations of Education, Amman Arab University, Jordan, bghanem@aau.edu.jo, [3]Professor, Vice Dean of the College of Educational and Psychological Sciences - Amman Arab University, Jordan, ramishogran@aau.edu.jo, [4]Assistant Professor, Measurement and Evaluation, Amman Arab University, Amman, Jordan, m.karamneh@aau.edu.jo

Correspondence: heyam@aau.edu.jo

Abstract

Utilizing digital platforms to develop research skills presents a transformative approach for postgraduate students, enabling them to navigate and excel in the ever-evolving academic landscape. The current study aimed to identify the development of research skills for graduate students using digital platforms and to achieve its goals; the researchers developed a tool that consisted of (45) items distributed in four areas: preparing for scientific research, implementing scientific research steps, writing scientific research, and ethics of scientific research, it was applied to a sample of (208) male and female graduate students at Amman Arab University in Jordan, who were selected by simple random method. The findings revealed significant skill growth, with an average score of 3.89 and a standard deviation of 0.62. More precisely, the topic of 'Research Ethics' had the highest ranking, with an average score of 4.07.

In contrast, the topic of 'Implementation of Scientific Research Steps' received a lesser average score of 3.82. The use of search engines was found to have strengths, while electronic reference criticism had shortcomings, according to the detailed investigation. The introductions were well-written; however, the tables and images' presentation needed improvement. Notably, the study indicated that students' skill growth was consistent across gender, college, and whether or not they had completed a course in scientific research methodologies, indicating that digital platforms were beneficial across all of these factors. There were no discernible variations among these groups, suggesting that digital platform utilization uniformly stimulated postgraduate students' research skill growth. The results of this study show that online resources are helpful for graduate students at Amman Arab University in Jordan to improve their research abilities. The analysis revealed a notable enhancement in skills, as seen by an impressive average score of 3.89, across four critical areas: preparation, execution, writing, and the ethics of scientific research.

The most crucial aspect was research ethics. Some areas that may use some work include visually representing data and assessing references, but overall, I'm good at using search engines and writing introductions. The study's consistent findings across gender, college, and prior research course studies highlight the broad effectiveness of digital platforms in helping postgraduate students improve research competencies.

Keywords: Digital Platforms; Research Skills; Postgraduate Students; Education

1. Introduction

Everything is changing at a dizzying rate due to technological breakthroughs, particularly in the digital realm. Since the widespread use of radio in the 1920s, a century ago, educational institutions have used ICT. However, the greatest opportunity to revolutionize education has come from using digital technology in the last 40 years. The creation and dissemination of educational materials, LMSs, language apps, AR/VR, individualized tutoring, and assessments have all contributed to the growth of the education technology sector (UNESCO. (2023).

An essential component of attaining the Sustainable Development Goals put forth by UNESCO and embraced by organizations across the globe is education for sustainable development (UN, 2012; Chankseliani & McCowan, 2021).

The world has witnessed - and still is - significant technological developments, a qualitative leap in various areas of life in general, and the environment of the educational process of various kinds in particular, which led to the emergence of modern strategies and methods in education that were not previously known, including education and e-learning (Beer & Mulder, 2020). The spread of the Internet and its entry into most areas of life contributed to the world becoming more convergent, and the delivery of data and scientific and educational knowledge that resulted from the explosion of knowledge and technological development became more manageable and more accessible; this contributed to accelerating the achievement of the objectives of educational institutions in particular; By relying on what is called digital or technological learning, which contributes to the learner continuing to learn according to his energy and ability to absorb and learn (Garlińska et al., 2023).

E-learning is a method of education that delivers information to the learner, and modern communication mechanisms such as computers, networks, and multimedia are used. That is, the use of technology of all kinds in the delivery process in the shortest time, least effort, and most significant benefit, and in a way that enables the educational process to be managed and controlled and the performance of learners in it is measured and evaluated (Liu & Yu, 2023). This was confirmed by Koehel and Senator (2021) that digital learning and education are a form of contemporary university education. It is based on providing educational lectures using electronic media without committing to a specific time or place; thus, it is a means of supporting the learning process and transforming it from the method of indoctrination and receiving to creativity,

and it contributes to the development of self-learning skills, and to providing students and professors with skills to deal with modern technologies and technological means, and to interact with them positively. It supports distance university learning, relying on appropriate digital platforms. This matter has become an imposed and inevitable reality, especially due to the coronavirus pandemic. Meron & Tekmen Araci (2023) investigate the effectiveness of ChatGPT as a virtual assistant for designing higher education course materials in design studies, highlighting its time-saving and structuring abilities while noting its tendency to generate generic content and the need for significant human input and editing, while

The structural changes brought about by the digital environment and developments in information and communication technology via the Internet and others increased the availability of information and research data and its exchange between researchers in different languages in the world, whose societies approached the tremendous progress in means of communications and transportation and its methods; Which led to the expansion of the horizons of scientific research and the development of its tools to obtain the required data in the light of the so-called knowledge economy, which is a global scientific power competing with the economic and military powers (Haleem et al., 2022).

1.1 The Study Problem

The observer of the educational process notes that multiple changes have appeared in it, including curricula and courses, teaching and assessment strategies, in addition to changes in the administrative aspects in light of the applications of virtual classes in education at all educational levels, starting from kindergarten and ending with higher education institutions. These changes were accompanied by a great race in scientific research at the global level. To search for ways to develop community life, benefit from the positive changes resulting from scientific research and its applications, confront its adverse effects, if any, and cooperate in saving humanity from emergency crises.

In light of the coronavirus pandemic and the various changes it has brought about in the fields of life, especially education, and learning, and the accompanying use of modern technologies in the educational process, using digital platforms that have increasingly developed, the researchers saw doing this study, which aims to investigate the process of developing research skills for graduate students using digital platforms, especially scientific research, and mastering its skills through specialized educational courses is one of the most critical concerns in university teaching.

1.2 Study Questions

1. The current study sought to answer the following two questions:

2. First, what is the level of research skills development of postgraduate students using digital platforms from the students' perspective?

3. Are there statistically significant differences at the level ($\alpha = 0.05$) between the average responses of the study sample members about the level

of research skills development for graduate students using digital platforms due to the differences in the variables: gender, college, and studying a course in scientific research curricula?

1.3 The Study Importance

The theoretical importance of this study stems from its subject matter. Digital platforms and their role in learning and education are developing daily, and research in them has become urgent. The results of this study can enrich the Arab and international libraries with theoretical aspects in its field and subject; as for the practical side, the results of this study can benefit educational institutions in the different stages of education to develop education in line with electronic developments and solve its problems, if any. It can open the way for researchers to address the subject of developing different skills of students and teachers.

2. Previous Studies

Among the relevant studies that could be reached, in order from the most recent to the oldest, are the following:

Chimbo et al. (2023) investigate the difficulties encountered by students in South Africa who were engaged in online learning in an open and distance e-learning setting during the COVID-19 epidemic. The Community of Inquiry framework governs the research. This study employed a qualitative content analysis approach, analyzing the responses of thirty honors students to an open-ended topic. Participants are encouraged to express their ideas on collaborative learning online. The participants highlighted several important issues, including insufficient instructor feedback, communication, online discussion, and interaction related to teaching presence. The cognitive challenges encompass intricate modules, demanding inquiries, and a need for comprehensive feedback. The difficulties with social presence revealed a need for more online assistance, virtual contact, and online engagement between teachers and students, as well as among students. The study emphasizes the significance of teachers using several facilitation tactics within the Community of Inquiry framework to establish a productive online learning environment that supports students in distant studying.

Blankendaal-Tran et al. (2023) study delves into the discrepancy between what students believe they need and what they possess regarding digital research skills (DRS) as they embark on their journey into graduate-level science programs. A guiding framework of DRS was built by merging existing frameworks for research skills and digital literacy skills. This exploratory qualitative study uses semi-structured interviews with fifteen university professors to assess the seven-category DRS framework. We looked at both the students' actual DRS levels and their instructors' estimations of those levels when they started university science courses. Findings reveal a widespread need for competence in the following areas: research paper writing with digital tools, utilizing appropriate resources, and analyzing, manipulating, and visualizing data.

Foster et al. (2023) conducted a study highlighting the main problems and benefits of university well-being while admitting the need for further research into students' digital well-being. According to the JISC digital well-being report, digital wellness has several pros and cons. This paper examines how these factors have been considered in UK and Vietnamese educational institutions and highlights recent digital wellness studies at one Vietnamese university. This technical review paper summarizes fundamental organizational digital wellness principles and explores their implementation in the UK and Vietnam. The worldwide perspective of this evaluation is novel. Digital well-being involves both individual and societal/organizational perspectives. According to the JISC digital well-being report, digital wellness has several pros and cons. This paper examines how these factors have been considered in UK and Vietnamese educational institutions and highlights recent digital wellness studies at one Vietnamese university. Next, we will discuss digital well-being in higher education, comparing and contrasting UK and Vietnamese students' experiences and identifying knowledge gaps.

Alshammary and Alhalafawy (2023) conducted a study to answer whether online resources enhance educational results. To do this, a meta-analysis was conducted to examine the overall impact of various platforms on learning outcomes. Additionally, a set of mediating variables, including study period, topic area, student rating, and publication type, were examined to determine their impact. Thirty studies compared online education with more conventional classroom settings, and they were published between 2015 and 2021. We chose this era in particular because it coincided with the flourishing of digital platforms for education, which occurred during the fourth industrial revolution. No evidence of publication bias was found in these data since the total effect size, measured using the random effect model ($g = 0.278$; $p < 0.001$; $\alpha = 0.05$), was small and positive, ranging from (0.123-0.433) in favor of learning via digital platforms. Universities and e-learning centers may find this study's findings helpful in determining how to leverage digital platforms best to enhance learning results.

Songkram et al. (2023) studied potential online educational resource users' attitudes and activities. To evaluate and implement the adoption model in Thai education, an empirical study was done. The proposed study model was tested using structural equation modeling on 1,406 Thai students. Results suggest that students' attitudes (ATT), followed by internal factors like perceived utility (PU) and perceived ease of use (PEU), are more relevant in recognizing and using digital learning platforms. Technology self-efficacy (TSE), subjective norms (SN), and enabling conditions (FC) help comprehend digital learning platform approval. These findings are consistent with prior investigations, except that PU is the only variable negatively influencing behavioral intention. This study will address a gap in the literature review and show how a good digital learning platform might boost academic performance, benefiting academics and researchers.

Huang et al. (2023). This qualitative study examines DKS communities in online higher education to determine what makes students flourish and what this means for online learning. The study used twenty online teachers from before, during, and after the pandemic. Theme analysis was used to analyze in-depth interview data. Theoretical sampling selected informants. This study used multi-objective qualitative research to examine how DKS communities affect online tertiary education. Twenty informants who experienced online schooling during and after the epidemic were interviewed extensively to collect data. Informants were selected using theoretical sampling to ensure diverse viewpoints and ideas. The data was then analyzed thematically to find patterns and themes. This study illuminates DKS communities' role in distance learning institutions. These insights include student progress, DKS's pros and downsides, and online education's future.

Koehel and Senator (2021) conducted a study to reveal the role of digital platforms (Moodle platform as a model) in supporting distance university learning in light of the spread of the COVID-19 pandemic. The researchers adopted the descriptive-analytical approach, developed a questionnaire, and distributed it to (50) professors at the University of Setif in Algeria who used this platform in light of the pandemic. The results showed that employing this platform played a significant role in supporting university education, maintaining the health of professors and students, and limiting the spread of the epidemic.

Jayaluxmi (2020) studied graduate mathematics education students' digital platform experiences during the COVID-19 pandemic in light of the Fourth Industrial Revolution, which emphasizes rapid technology-integrated education and learning. Thus, schools are preparing for digital integration. The study studied the experiences of 31 students above in one KwaZulu-Natal teacher education institution. Two workshops and interactive discussion panels were held on Zoom, Moodle, and WhatsApp. The effectiveness of digital platforms was shown by examining qualitative data from workshops and panel discussions to discover participants' issues and strengths. They needed further instruction to use them better.

Prosekov et al. (2020) recommended planning scientific and research activities to boost university student research efficiency. The researchers tested 74 first-year students at the Institute of Education at Kemerovo University, Russia. The experimental group consisted of 36 students who watched electronic movies, remote-viewed scientific research sources, discussed their content with teachers, and completed research projects. Unlike the control group, the experimental group students learned theoretical and practical concepts while planning and executing scientific research. The results also showed improvements in research competency requirements. These students' research motivation improved, with 92% indicating the urge to continue research.

Sweidan & Areiqat Sweidan & Areiqat (2020) undertook a study to investigate how the digital gap at Al-Ahliyya Amman University affects

academic reputation, published scientific research, and the university presidency's quality commitment. To do so, the researcher used descriptive and analytical methods. A questionnaire was used to poll 630 employees. SPSS was used to analyze research questions and hypotheses. This study's most important finding is that the digital gap in all its manifestations statistically affects Al-Ahliyya Amman University's academic standards. The report's last recommendation is that educational institutions develop a long-term IT system upgrade and expansion strategy to offer students and teachers internet access and close the digital achievement gap.

Salman (2019) presented a research paper on global scientific platforms and their role in promoting scientific research and communication between researchers at the "Geophysical, Social, Human, and Natural Challenges in a Changing Environment" conference in Istanbul. The researcher adopted the deductive approach. One of the most prominent findings was the global interest of scientific and research organizations and institutions in the platforms for their prominent role in increasing communication between researchers, exchanging research ideas, and promoting scientific research in general.

Al-Rashidi (2018) surveyed educational administrators and instructors in Saudi Arabia's Al-Kharj educational district to determine the second-stage educational prerequisites for using electronic educational platforms. The researcher used the descriptive survey method, developed a questionnaire, and distributed it to a sample of (69) educational supervisors and (206) teachers. The results showed that all educational requirements—the general and technical infrastructure needed to use electronic platforms in education, such as computer and accessory quality—were met.

Bülent (2016) study aimed to determine the changes in student teachers' perceptions (a teacher candidate) towards the scientific research process and its steps, and their self-efficiencies in this process, during the course of the scientific research curriculum conducted using the "Learning Management System" (LMS), based on distance learning, designed and implemented according to blended learning, the study sample consisted of (16) student-teachers, of which (8) males and (8) females, who joined the course in Turkey, the "Scale of Self-Sufficiency for Scientific Research" was used to discover the perception of Self-efficacy of scientific research among students, the interview method was used to collect qualitative data from them, and the results showed that the perceptions of these students towards science and the scientific method in research changed after studying the scientific research curriculum course; Where they saw themselves as capable of research, and before that they saw that their research competencies were weak.

Muhammad's (2014) study aimed to know the role of the Internet in developing scientific research in Syrian universities and ways to benefit from it; the researcher adopted the descriptive-analytical approach, built a questionnaire, and distributed it to a sample consisting of (264) faculty members from the humanities and science faculties in the universities of

Damascus, Tishreen, Al-Baath, and (832) graduate students in the mentioned colleges and universities. The results of the study showed that both faculty members and students use the Internet in various scientific and research fields, that the Internet develops their research skills, and that the service of scientific research and the method of searching using search engines came in an advanced rank among the services that are benefited from via the Internet, and that there are no statistically significant differences in the role of the Internet in the development of scientific research due to each of the variables of gender and type of college.

2.1 Commenting on Previous Studies

It is noted from the studies that were previously presented that they are similar and different in many aspects; where there was a similarity in dealing with the issue of digital platforms, with a difference in the objectives of the studies, as for the field of scientific research, development, and promotion, the studies varied between the measures required to plan scientific and research activities that increase the research efficiency of university students, the role of the scientific research curriculum course in bringing about changes in their perceptions towards scientific research and what achieves their competencies in it, and the role of the Internet in its development, there was almost agreement in the use of the scientific research method used, and the data collection tools. The current study was distinguished in its subject, place, and society; It benefited from previous studies in writing theoretical literature and formulating questions and recommendations.

3. Methodology

3.1 Study Approach

The study followed the descriptive survey method for its suitability in achieving its purposes.

3.2 The study population and its sample

The study population consisted of all graduate students at Amman Arab University during the second semester of the year 2020/2021, and the number was (1008) male and female students and the sample consisted of (208) male and female students; and Table (1) shows the distribution of the study sample members according to its variables.

3.3 Study tool

For the purposes of answering the study questions and collecting data and information from respondents, the researchers developed a questionnaire that included several paragraphs related to its goal by referring in writing to some literature and previous studies related to its topics, such as studies of Salman (2019), and Al-Rashidi (2018), and Muhammad (2014), and using these and other studies, a questionnaire was developed that included four areas: preparing for scientific research, implementing scientific research steps, writing scientific research, and ethics of scientific research.

3.3.1 Validity of the content of the study tool and its correction

To verify the content validity of the study tool, it was presented to ten arbitrators in the fields of assets, educational administration and leadership, Arabic language, measurement, and evaluation in several Jordanian institutions and universities to express their views on the clarity of the paragraphs, their scientific and linguistic soundness, their suitability for the fields under which they fall, and what can be added or deleted from the paragraphs or amended. In light of the arbitrators' proposals and opinions, the number of the final paragraphs of the questionnaire reached (45) items. The following criteria were used to judge the arithmetic averages: a low degree of (1.00-2.33), a medium degree of (2.34 - 3.67), and a high degree of (3.68 - 5.00).

4. Study Results and Discussion

The first question: What is the level of research skills development of postgraduate students using digital platforms from the students' perspective? To answer this question, the arithmetic means and standard deviations of the postgraduate students' grades on the domains of the role of digital platforms were extracted, and Table (1) shows these results.

Table 1. Arithmetic averages and standard deviations of graduate students' grades to develop their research skills using digital platforms arranged in descending order

Order	Rank	Domains	Means	Standard deviation	The role of the platforms
4	1	Research ethics	4.07	0.70	High
3	2	Writing a scientific research	3.88	0.71	High
1	3	Preparation for scientific research	3.85	0.65	High
2	4	Implementation of scientific research steps	3.82	0.70	High
Total			3.89	0.62	

Table (1) shows that the development of research skills for postgraduate students using digital platforms came at a high level with an arithmetic mean (3.89) and a standard deviation (0.62). In detail, education through digital platforms in developing students' research skills and in all fields of study has a high role, Where the field of (scientific research ethics) ranked first with a mean (4.07) and a standard deviation (0.70), and the field (implementation of scientific research steps) came in the fourth and last place with a mean (3.82) and a standard deviation (0.70). This result may be attributed to the university's faculty members' interest in scientific research, its steps, writing, and ethics, whether through courses specialized in scientific research curricula or research conducted by students as a mandated activity during the various courses.

Table 2. Arithmetic averages and standard deviations of postgraduate students' grades for the items of the field (preparation for scientific research) are arranged in descending order

Item number in the domain	Rank	Item	Mean	STD	The role of the platforms
2	1	Use search engines to obtain information related to scientific research.	4.18	.820	High
8	2	View electronically published research and studies related to the research topic.	4.03	.930	High
10	3	Draft the idiomatic and procedural definitions of the study	3.96	.860	High
5	4	Search for the information required by the search through the appropriate electronic sources.	3.95	.890	High
3	5	Comprehensiveness and accuracy in choosing what information I am looking for.	3.92	.790	High
1	6	Search for references and documentation sources in the contents of digital libraries.	3.90	.950	High
4	7	Download electronic books and references required to carry out the research.	3.81	.900	High
7	8	Exchange of electronic information with others.	3.75	.970	High
9	9	Setting study boundaries and limitations	3.73	.870	High
6	10	Criticizing electronic references internally and externally.	3.29	1.00	High
Total			3.85	0.65	

It is noted from Table (2) that the development of research skills for graduate students using digital platforms in the field of (preparation for scientific research) came at a high level, with a mean of (3.85) and a standard deviation of (0.65), the arithmetic averages of the paragraphs ranged between (3.29-

4.18), and item (2), which states "Using search engines to obtain information related to scientific research" ranked first with arithmetic mean (3.85). A standard deviation (0.65) has a high role; this result may be because most search engines are now available free of charge via the Internet, and the search through them has become familiar. Item 6, "Criticism of electronic references internally and externally," came with an arithmetic mean (3.29) and a standard deviation (1.00), and an average role; it can be attributed the result to the lack of training in this skill, then the average role does not mean the weak, instead, it is an acceptable role, but it does not live up to the expected.

Table 3. Arithmetic averages and standard deviations of postgraduate students' estimates for the items of the domain (implementation of scientific research steps) are arranged in descending order

N	Rank	Item	Mean	STD	The role of the platforms
11	1	Accurately define the research problem	3.98	.840	High
20	2	Determine the study population	3.94	.790	High
23	3	Data collection, classification, and tabulation	3.90	.770	High
12	4	Formulation of the study problem and questions	3.89	.830	High
14	5	Choosing the appropriate research method for the study topic	3.88	.820	High
22	6	Distribution of the data collection tool to the study sample using appropriate methods	3.87	.850	High
17	7	Accurately collecting data from appropriate research sources	3.84	.870	High
21	8	Choosing the study sample by appropriate methods	3.82	.850	High
25	9	Interpreting and discussing results and making recommendations	3.81	.950	High
15	10	Choosing the appropriate research design for the study topic	3.80	.810	High
13	11	Formulating research hypotheses for problems whose methodology requires the formulation of hypotheses	3.79	.880	High
24	12	Use appropriate statistical methods to analyze data for its	3.77	.990	High

		interpretation			
16	13	Choosing the appropriate research tools to collect their data	3.73	.850	High
18	14	Preparing/developing a suitable tool for data collection	3.71	.880	High
19	15	Check the psychometric properties of research tools.	3.56	.880	Moderate
total			3.82	0.70	High

It is noted from Table (3) that the development of research skills for graduate students using digital platforms according to the field (implementation of scientific research steps) came at a high level, with an arithmetic mean (82.3) and a standard deviation (0.70), the arithmetic averages of the items ranged between (3.56-3.98), and item (11) which states "accurately identifying the research problem" ranked first with arithmetic mean (3.98) and a standard deviation (0.84 with a high role, this result may be attributed to the fact that the skill of defining the problem is one of the priorities of research skills, and every course in scientific research focuses on it, and this skill is critical to all other skills, as for item (19), which stipulates "checking the psychometric properties of the research tools." Although it came in the last rank with an arithmetic mean (3.56), a standard deviation (0.88), and an average role, its result can be attributed to the students' view that statistics and its related matters are difficult things compared to the rest of the scientific research skills.

Table 4. Arithmetic averages and standard deviations of postgraduate students' grades for the paragraphs of the field (writing scientific research) are arranged in descending order

N	**Rank**	**Item**	**Mean**	**STD**	**The role of the platforms**
30	1	Write an introduction to the research closely related to its topic and variables.	3.96	.910	High
27	2	Organize the research to contribute to communicating knowledge to the reader quickly.	3.94	.810	High
28	3	Draft the title in a way that accurately explains the research variables.	3.93	.840	High
29	4	Write a research summary in the required language that clearly illustrates its objectives, procedures, and results.	3.92	.840	High
26	5	Writing in sound research	3.91	.780	High

		language.			
31	6	Write the theoretical framework in the appropriate sequence.	3.90	.840	High
33	7	Writing summaries of previous studies to show their relationship to the current study.	3.88	.830	High
32	8	A statement of the study procedures and how they were carried out.	3.87	.820	High
36	9	APA documentation is at the core of the research and reference list	3.84	.990	High
35	10	A statement of the research results and recommendations drawn from the results, their analyses, and interpretations.	3.79	.860	High
34	11	Presenting the tables, figures, and graphics necessary in the research clearly.	3.78	.990	High
Total			3.88	0.71	

It is noted from Table (4) that the development of research skills for graduate students using digital platforms in the field of (writing scientific research) came at a high level with an arithmetic mean (88.3) and a standard deviation (0.71), the arithmetic averages of the items ranged between (3.78-3.96), and item (30), which states, "Write an introduction to the research closely related to its subject and its variables" ranked first with arithmetic mean (3.96) and a standard deviation (0.91 and a high role, this result may be because writing the introduction is one of the skills that students and teachers of scientific research courses are interested in. It gives a brief idea of the contents of the scientific studies. The item "displaying the tables, figures, and graphics needed in the research" ranked last with an arithmetic mean (3.78) and a standard deviation (0.99). However, it came at a high level, meaning there is an excellent degree of approval.

Table 5. Arithmetic averages and standard deviations of postgraduate students' grades for the items in the field of (scientific research ethics) arranged in descending order

N	Rank	Item	Mean	STD	The role of the platforms
45	1	Not to expose the respondents to any risks.	4.19	.850	High
43	2	Respecting the opinions and ideas of others and not offending them.	4.16	.820	High
44	3	Not to discuss matters contradicting the community's beliefs or customs and traditions.	4.13	.890	High
38	4	Scientific secretariat in documentation and information transfer.	4.11	.920	High
37	5	Respect the intellectual property of others.	4.08	.960	High
39	6	Objectivity in discussing results and impartiality.	4.07	.880	High
41	7	Have patience and determination in the search.	4.04	.870	High
40	8	Accept criticism of others.	4.03	.850	High
42	9	Obtaining the approval of the authorities and persons concerned with the research and its consequences.	3.86	.960	High
Total			**4.07**	**0.70**	

It is noted from Table (5) that the development of research skills for graduate students using digital platforms from the point of view of postgraduate students for the paragraphs of the field of scientific research ethics came at a high level with an arithmetic mean (07.4) and a standard deviation (0.70), The arithmetic averages of the items ranged between (3.86-4.19), and item (45), which states that “researchers should not be exposed to any kind of risks” ranked first, with an arithmetic mean of (4.19) and a standard deviation of (0.85 and a high turn, and in the last place came the item that reads “obtaining the approval of the parties and persons concerned with the research and its consequences.”

The second question: Are there statistically significant differences at the level ($\alpha = 0.05$) between the responses of the study sample members about the development of research skills for graduate students using digital platforms due to the different variables: gender, college, and a course study in scientific research curricula?

To answer this question, the arithmetic averages and deviations of graduate students' responses about the development of research skills for graduate students were extracted using digital platforms according to the different

variables (gender, college, and study of a course in scientific research curricula. Table 10 shows these results.

Table 6. Arithmetic averages and standard deviations of the responses of graduate students according to the different variables of (gender, college, course study in scientific research curricula)

Variables	Levels	Domains	Scientific research preparation	Steps to carry out scientific research	Writing a scientific research	Research ethics	Total score
Gender	Male	Mean	3.85	3.88	3.96	3.99	3.91
		Standard deviation	0.70	0.72	0.71	0.83	0.68
	Female	Mean	3.85	3.79	3.85	4.12	3.88
		Standard deviation	0.63	0.71	0.72	0.63	0.59
College	humanities	Mean	3.88	3.84	3.91	4.09	3.92
		Standard deviation	0.64	0.69	0.70	0.68	0.59
	Scientific	Mean	3.51	3.49	3.60	3.96	3.59
		Standard deviation	0.80	0.87	0.96	1.07	0.88
Study a course in scientific research	Yes	Mean	3.93	3.90	3.96	4.12	3.97
		Standard deviation	0.65	0.70	0.69	0.70	0.62
		Mean	3.56	3.50	3.61	3.90	3.6

methods.	No						2
		Standard deviation	0.62	0.66	0.76	0.72	0.55

It is noticed from Table (6) that there are apparent differences between the arithmetic averages of the responses of graduate students about the development of research skills for graduate students using digital platforms according to the variables of gender, college, and studying a course in scientific research curricula (Manova) and Table (11) shows these results.

Table 7. Results of multivariate analysis of variance (MANOVA) to indicate the differences between the arithmetic averages of the responses of the study sample according to the variables of each of the college gender and the study of a course in scientific research

Variables	**Source of variance**	**Sum of squares**	**df**	**Mean of squares**	**F**	**Sig**
Gender	Preparation for scientific research	**0**.005	1	**0**.005	**0**.013	**0**.908
	Implementation of scientific research steps	**0**.037	1	**0**.037	**0**.079	**0**.779
	Writing a scientific research	**0**.019	1	**0**.019	**0**.039	**0**.844
	Research ethics	1.206	1	1.206	2.464	**0**.118
	Total score	**0**.055	1	**0**.055	**0**.151	**0**.698
College	Preparation for scientific research	1.474	1	1.474	3.588	**0**.060
	Implementation of scientific research steps	**0**.784	1	**0**.784	1.660	**0**.199
	Writing a scientific research	**0**.872	1	**0**.872	1.777	**0**.184
	Research ethics	**0**.139	1	**0**.139	.283	**0**.595

	Total score	**0**.753	1	**0**.753	2.084	**0**.150
Study a course in scientific research methods	Preparation for scientific research	1.219	1	1.219	2.968	**0**.086
	Implementation of scientific research steps	**0**.367	1	**0**.367	**0**.776	**0**.379
	Writing a scientific research	**0**.159	1	**0**.159	**0**.325	**0**.569
	Research ethics	**00**.024	1	**0**.024	**0**.049	**0**.825
	Total score	**0**.264	1	**0**.264	**0**.731	**0**.394
ERROR	Preparation for scientific research	82.553	201	**0**.411		
	Implementation of scientific research steps	94.956	201	**0**.472		
	Writing a scientific research	98.638	201	**0**.491		
	Research ethics	98.352	201	**0**.489		
	Total score	72.614	201	**0**.361		
Total	Preparation for scientific research	89.439	207			
	Implementation of scientific research steps	104.160	207			
	Writing a scientific research	107.103	207			
	Research ethics	104.199	207			
	Total score	79.630	20			

Table (7) shows that there are no statistically significant differences between the arithmetic averages of the responses of the sample members on the development of research skills for graduate students using digital platforms at the level ($\alpha = 0.05$) according to the variables of gender, college, and a course in scientific research, the absence of differences in the responses may be because the study conditions are the same. The responding students are all from one university, and similar rules govern them.

4.1 Discussion of the results

The results show that postgraduate students who used digital platforms improved their research skills significantly, with a standard deviation of 0.62 and an overall arithmetic mean of 3.89. Of particular note is that "Research Ethics" came out on top, while "Implementation of Scientific Research Steps" came out on the bottom. This research confirms what other researchers have found: that digital platforms improve learning outcomes and that students are more likely to use them (Songkram et al., Songkram et al. (2023); Alshammary & Alhalafawy (2023).

Students in the "Preparation for Scientific Research" area demonstrated a solid ability to use search engines but struggled to evaluate electronic references critically. Consistent with the results of Blankendaal-Tran et al. (2023), who also found that science students lacked the necessary digital research skills, this points to the necessity for more targeted training. The strong performance in 'Writing Scientific Research' indicates the importance placed on well-structured and articulate writing; this finding aligns with Bülent's study (2016), which indicated that student's views of the scientific research process improved after their exposure to blended learning.

Students' skill growth was also not significantly different according to gender, college, or whether or not they had taken a scientific research methodologies course, according to the study. The findings of Al-Rashidi [20] on the preparedness of educational infrastructure for digital platforms and the idea put out by Foster et al. (2023) regarding the various impacts of digital wellness in educational settings are both bolstered by this consistency.

On the other hand, the study shows that digital platforms have their limits, especially when making generic material and needing much human input. Consistent with the findings of Chimbo et al. (2023) and Jayaluxmi (2020), this highlights the difficulties of online communication and the necessity for better digital resources for classroom instruction. Furthermore, the high ratings in 'Research Ethics' show that ethical considerations are essential in digital learning; this aligns with the worldwide emphasis on scientific platforms and their function in research enhancement, as Salman (2019) noted.

To summarize, this study's findings are in line with previous research and demonstrate that digital platforms can improve postgraduate research skills in

many ways. However, they also highlight some areas that could be improved, such as managing generic content generation and needing more targeted skill development.

Data Availability Statement: Data and materials supporting the results presented in this paper are available from the corresponding author upon reasonable request**.**

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

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