Evaluating the Effect of Online Research Methodology Course on Undergraduate Research Skills

Alarar A , Dashash M, Sahyouni

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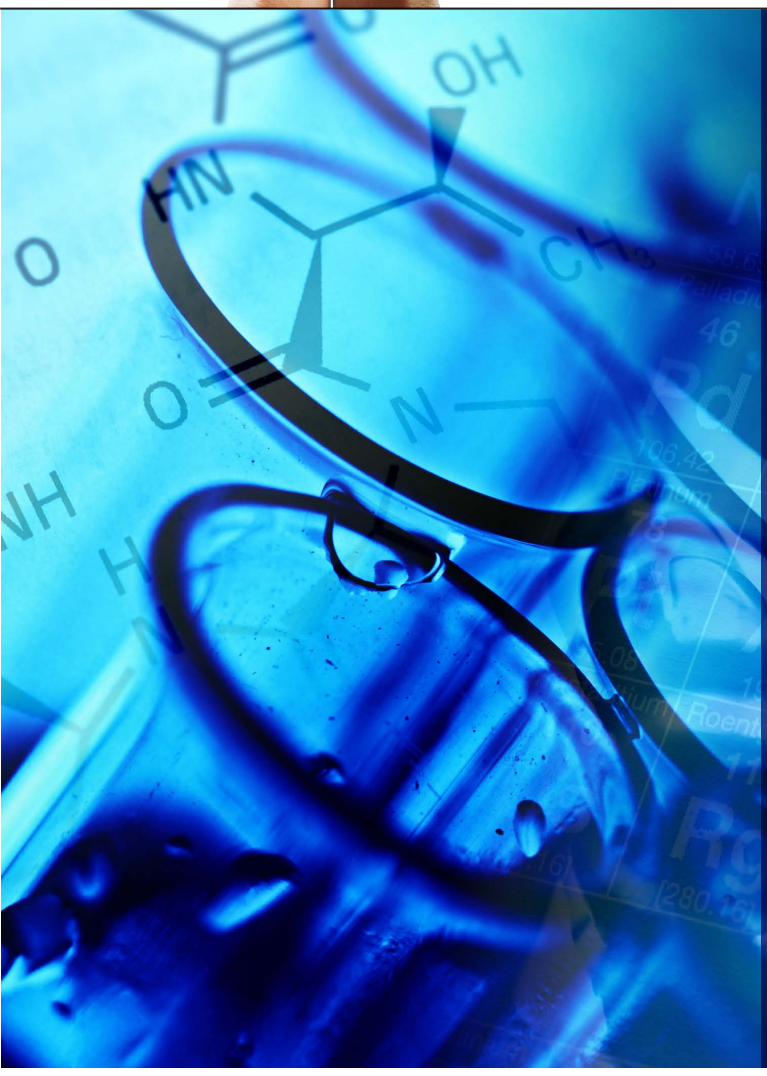

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Introduction

The World Journal of Medical Education and Research (WJMER) (ISSN 2052-1715) is an online publication of the Doctors Academy Group of Educational Establishments. Published on a quarterly basis, the aim of the journal is to promote academia and research amongst members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from around the world. The principal objective of this journal is to encourage the aforementioned, from developing countries in particular, to publish their work. The journal intends to promote the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting edge technology and those who need to innovate within their resource constraints. It is our hope that this will help to develop medical knowledge and to provide optimal clinical care in different settings. We envisage an incessant stream of information flowing along the channels that WJMER will create and that a surfeit of ideas will be gleaned from this process. We look forward to sharing these experiences with our readers in our editions. We are honoured to welcome you to WJMER.

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Contact	:	wjmer@doctorsacademy.org.uk

A WELCOME MESSAGE FROM THE EDITORS

Dear Reader,

It is our great pleasure to present the thirty-second edition of the World Journal of Medical Education and Research (WJMER). This issue brings together a diverse collection of scholarly articles that reflect current innovations, challenges, and opportunities in medical education, health sciences, and public health across global contexts. The contributions highlight the evolving nature of healthcare education, with a particular emphasis on learner development, equity, pedagogy, and improvement at a systems level.

The opening article by Alarar et al. evaluates the effectiveness of an online scientific research methodology course for undergraduate students at Syrian universities. Using pre- and post-course assessments, the authors demonstrate significant improvements in students' research knowledge and skills, underscoring the value of structured e-learning approaches in strengthening research capacity, particularly in crisis-affected and resource-limited settings.

In the following article, Ponce-Garcia et al. explore microaggressions in medical education and reframe them as cumulative, identity-based trauma rather than isolated interpersonal incidents. Drawing on interdisciplinary evidence, the paper highlights the biological, psychological, and educational consequences of chronic identity-based stress and calls for trauma-informed institutional reforms to foster inclusive and supportive learning environments.

The next study by Nojoum et al. examines Iraqi medical students' perceptions of undergraduate breast curricula during the COVID-19 pandemic. Through qualitative interviews, the authors identify key themes related to e-learning, gaps in breast disease education, and barriers to clinical examination. The findings reveal widespread dissatisfaction with current teaching approaches while highlighting structural challenges that were exacerbated by the pandemic.

Farooq et al. investigate the relationship between emotional intelligence and academic performance amongst undergraduate medical students in Pakistan. The study demonstrates a significant positive correlation between emotional intelligence and academic success, suggesting that emotional competencies may play an important role in student performance, stress management, and motivation within demanding medical programmes.

This issue also includes a narrative review by Pratham and Bhalekar on the therapeutic potential of natural compounds in neurotransmitter-related diseases such as Parkinson's and Alzheimer's disease. The authors discuss emerging evidence on compounds such as curcumin and flavonoids, highlighting their neuroprotective and anti-inflammatory properties while emphasising the need for further research to translate these findings into effective clinical applications.

Singha and Majumder focus on medical education for community health workers. The paper synthesises evidence on educational strategies that enhance competencies, motivation, and public health outcomes, advocating for competency-based, digitally-supported, and rights-based approaches to professional development as a foundation for equitable health systems.

The effectiveness of integrative case-based learning and case seminar approaches in teaching pathology laboratory concepts to PharmD students is examined by Garalla and Burgeia in the next study. The findings indicate that active learning strategies significantly improve knowledge acquisition, critical thinking, and clinical preparedness compared to traditional teaching methods, reinforcing the value of learner-centred pedagogies.

In the subsequent article, Ayub Khan et al. assess alumni perceptions of a Master in Health Professions Education (MHPE) program in Pakistan. Using the RE-AIM framework, the study highlights perceived gains in teaching capacity, curriculum development, and leadership skills, while identifying areas for improvement in educational evaluation and mentorship to maximise programme impact across career stages.

The final article by John et al. explores the use of data analytics in improving health education outcomes, presenting a human-centred framework that integrates technology, pedagogy, ethics, and organisational capability. The paper offers practical recommendations for education leaders, demonstrating how analytics can enhance learner engagement, institutional decision-making, and community health literacy when implemented responsibly.

We sincerely hope that you find the articles in this edition educational, thought-provoking, and relevant to your academic and professional interests. Together, these contributions reflect WJMER's ongoing commitment to advancing scholarship that informs practice, promotes equity, and strengthens health education globally.

Ms Karen Au-Yeung
Associate Editor

Dr Rebecca Williams
Associate Editor

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Evaluating the Effect of Online Research Methodology Course on Undergraduate Research Skills

Alarar A[1,2], Dashash M[1,2], Sahyouni A[1]

Institution
[1] *Syrian Virtual University, Damascus, Syrian Arab Republic.*

[2] *Damascus University, Damascus, Syrian Arab Republic.*

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Abstract:
Background: Universities play a crucial role in advancing scientific research by fostering an environment that support researchers through their careers and ensures their continued success. Online education in scientific research methodology may hold significant value. This study aimed to evaluate the effectiveness of an online course "scientific research methodology" in improving the learning outcomes of undergraduate students at Syrian Universities.
Materials and Methods: The pilot study included 10 undergraduate students at Syrian Virtual University. An electronic content covering key topics in scientific research was developed, delivered, and explained to the participants via the Syrian Virtual University platform. Pre- and post-course tests were administered to assess the course's impact.
Results: Wilcoxon signed-rank test showed a significant improvment in students' overall test scores after completing the course ($z = -2.81$ $P = 0.005$), indicating the effectiveness of the course in enhancing knowledge and skills of participants.
Conclusion: The findings suggest that this online course can successfully improve undergraduate students' knowledge and skills in scientific research. The results hold valuable implications for learners, educators, and policymakers in designing effective e-learning environments to support education and resilience during crises.

Key Words:
Online Course; Scientific Research Methodology

Corresponding Author:
Dr Amjad Alarar; E-mail: amjadalarar@gmail.com

Introduction

Online learning has developed increasingly over the past few years, with a notable surge during COVID-19 pandemic when education institutions had to rely solely on distance education through online learning platforms[1].

In an online learning environment, it is essential to stimulate collaborative engagement, reduce feeling of isolation, and encourage deep learning[1].

As a form of distance learning, online learning has long been integrated into the American education system and has recently become the largest sector of distance education[2]. It involves using multimedia technologies and the Internet to improve educational quality by providing media access, distance collaboration, and support services[3].

The goal of e-training is to ensure that technology effectively contributes to developing individuals' skills and knowledge while supporting their career advancement[4]. E-training effectively addresses specific objectives such as identifying training needs, streamlining training delivery and development, offering necessary support, enabling interaction between the trainer and trainees and providing continuous assessment via digital system[5].

Despite the extensive knowledge available online, many researchers lack fundamental skills to undertake research appropriately. As noted by Cattaneo and Chapman, 22% of scientific researchers experience difficulties initiating scientific research[6].

Researchers should have critical thinking skills and problem-solving skills, including the competencies to identify, define and analyse problems to develop interventions solutions[7].

Scientific analysis involves data processing using diagrams and statistical methods to examine differences and relationships among variables[7].

Communication skills are equally important for effectively summarizing and explaining research objectives, motivations, findings and conclusions, while tailoring messages to the audience's knowledge level[8].

Scientific research skills, encompass various competencies that transform students into discoverer and an innovator rather than passive recipients these include observation, accurate citation, scientific writing, and summarization[9].

Such skills enable researchers to select appropriate research designs, locate information sources, formulate research problems, design experiments, and develop solutions[10].

This study, the first of its kind in the Syrian Arab Republic, was undertaken to assess the effectiveness of a newly developed online course in improving undergraduates' knowledge and skills related to scientific research methods.

Materials & Methods

This study was approved by the Ethical Approval Committee at the Syrian virtual university (number 90/0, date 19/1/2022). Scientific content was developed within the Medical Education master's program at the Syrian Virtual University, comprising seven educational units: The nature of scientific research, methodology, research skills, the role of the internet in scientific research, writing and publishing of scientific research, problem- solving challenges and constraints, problem formulation, and creative thinking skills[11,12]. The content was reviewed and modified under the supervision of a group of medical education program professors at the university after multiple discussion sessions. Subsequently, test questions covering the entire content were created.

All undergraduate students at Syrian Virtual University were invited via email to participate in the course, excluding those who had previously completed a course on scientific research skills. Twenty- five undergraduate students enrolled, but only ten were accepted.

The university administration created special user accounts for all participants on the SVU platform and invited them to take a pre-test on a scheduled date.

The course designer created the test, which included 50 questions divided across the seven course topics: the first topic had 7 questions, the second 6, the third 18, the fourth 4, the fifth 4, the sixth 4, and the seventh 7.The questions were a mix of multiple- choice and true/false formats. Each question was worth two points, making the total possible score 100 points. Students were allowed one minute per question, with a total time limit of 50 minutes. The pre-test link was sent to participants via email to complete the test and calculate their scores.

The course content was uploaded to the SVU platform as PowerPoint presentations and educational videos. The course consisted of 10 lectures each lasting between 40-60 minutes. Two lectures were scheduled weekly in the evenings to maximize student attendance and engagement. The entire course spanned five weeks.

The course designer delivered the lectures and facilitated a scientific forum for student- tutor discussions and questions.

Virtual classes were created for synchronous participation, and recorded lectures were uploaded afterward for asynchronous access.

Additionally, features such as lecture reminders and notifications were used to maintain student engagement throughout the course.

Upon completing the course, students completed a post-test consisting of the same questions and following the same criteria as the pre-test, administrated through a Google Form. Comparison pre- and post-test results allowed assessment of students' progress in knowledge and skills, thereby evaluating the course's effectiveness.

Statistical Analysis

The researcher utilized the Statistical Package for Social Sciences (SPSS) to analyze data related to assessing students' knowledge and skills acquired in scientific research methodology through the online course. This involved calculating the aggregate scores for each unit of the course, determining the mean value for each item within the units', and performing analysis.

The Wilcoxon Signed Ranks Test was used to examine differences in overall course performance before and after the online course:

Specifically, the Wilcoxon Signed Ranks Test was applied to compare student's pre-test and post-test results to evaluate the course's effectiveness in enhancing their knowledge and skills in scientific research methodology).

Results

Studying the differences at the level of each unit / before and after / applying the online course

Table 1 presents the post-test findings, indicating a clear range between minimum and maximum values across the assessed components. The mean scores demonstrate variability in learners performance, while the standard deviations reflect moderate dispersion within the data. These results suggest that performance levels were not uniform across domains, with certain areas showing more consistent attainment than others.

Unit	Results of pre-test				Results of post-test			
	Minimum	Maximum	Std. Deviation	Mean	Minimum	Maximum	Std. Deviation	Mean
Nature of Scientific Research	4.00	14.00	3.24	7.60	10.00	14.00	1.75	11.80
Scientific Research Methodology	2.00	10.00	2.70	5.20	6.00	12.00	2.35	8.80
Scientific research skills	10.00	24.00	4.37	18.20	24.00	34.00	3.27	30.60
The role of the Internet in scientific research	4.00	8.00	1.75	6.20	2.00	8.00	1.93	5.20
Writing and publishing scientific research	2.00	8.00	1.70	5.00	2.00	8.00	1.99	6.20
Challenges and constraints of scientific research	2.00	4.00	1.03	2.80	4.00	8.00	1.75	5.80
Problem-solving, decision-making, and creative thinking skills	0.00	8.00	2.39	5.80	0.00	12.00	3.53	8.60

Table 1: *The results of students in each unit of the course*

The findings in ***Table 2*** suggest that the course was most effective in enhancing students understanding of the fundamental concepts and methodologies of scientific research, as well as their awareness of challenges and constraints in conducting research. However, the absence of significant improvement in units such as internet use, scientific writing and publishing, and problem-solving skills may indicate that these areas require more practical training, extended time, or supplementary resources to achieve measusrable progress.

In the units (nature of scientific research), (scientific research methodology), (scientific research skills) and (challenges and constraints to scientific research) the study found that *P*-value were less than 0.05 which is in favor of the post-test.

Table 2 presents the Wilcoxon Signed Ranks Test results for each unit of the course, showing the test statistic (Z) and the corresponding p-value. The results indicate statistically significant improvement ($p < 0.05$) in students' performance after the course in the "Scientific research methodology", "Scientific research skills" and "Challenges and constraints of scientific research" units.

This means students showed meaningful gains in knowledge and skills in these areas. However, for the units: the role of the Internet in scientific

Unit	Z	P-value
Nature of scientific research	-2.620-[b]	0.009
Scientific Research Methodology	-2.263-[b]	0.024
Scientific research skills	-2.810-[b]	0.005
The role of the Internet in scientific research	-1.508-[c]	0.132
Writing and publishing scientific research	-1.222-[b]	0.222
Challenges and constraints of scientific research	-2.392-[b]	0.017
Problem-solving, decision-making, and creative thinking skills	-1.550-[b]	0.121

Table 2: Wilcoxon functions and the significant function of the test

research, writing and publishing scientific research, problem-solving, decision-making, and creative thinking skills. The p-values were greater than 0.05, indicating no statistically significant difference between pre- and post-test results. Thus, the course did not show measurable improvement in these specific topics based on this data.

Studying the differences at the total level of the course / before and after / applying for the online course

The differences between students' pre- test and post-test results after completing the online course were analyzed using the Wilcoxon Signed Ranks Test to evaluate the effectiveness of the course in improving their knowledge and skills in scientific research methodology.

According to ***Table 3***, the test showed a Z value of -2.810 and a two-tailed P-value of 0.005 for the difference between post-test and pre-test scores. Since the P-value is less than 0.05, this indicates a statistically significant improvement in students' overall test scores after completing the course.

Discussion

This research aimed to evaluate the effectiveness of an online course on scientific research methodology in enhancing students' knowledge.

	Asymp. Sig. (2-tailed)	**Z**
Post-test score - Pre-test score	0.005	-2.810-[b]

Table 3: *Difference between pre-test and post-test scores*

This course covers the basics of scientific research, characteristics of successful researchers, principles of topic selection, adherence to the scientific method, research steps, documentation standards, strategies for addressing challenges, and techniques for maximizing research benefits from them. Targeted at undergraduate students, the course allows learners to access the university's website at any time, enter the course, download lectures, and study at their own pace and convenience.

Students were trained to systematically write scientific research and to effectively utilize the Internet and electronic libraries to enrich their information. This course also emphasizes developing creative thinking and problem-solving skills.

While previous studies have addressed scientific research skills, few have focused on training courses specifically designed for new researchers' number of publications that addressed the course for new researchers are limited. Consequently, many novice researchers often lack formal training in research skills and instead rely on prior experience rather than structured education[13]. This gap often leaves them unprepared to handle unexpected challenges arising from research questions and outcomes[14].

Statistically significant differences were found between pre- test and post-test scores, indicating that students substantially improved their knowledge and skills in scientific research methodology, after completing the online course. This confirms the course's effectiveness.

These findings align with previous research by Durmaz and Mutlu (2014), Seon and King (2000), Hueso-Montoro et al (2016), Isosomppi and Maunula (2016), all of which reported improvements in in students' research skills after similar interventions. For instance, Durmaz and Mutlu (2014), conducted a study with 43 Turkish university students divided into experimental (n = 23) and control (n = 20) groups. Their results demonstrated the course' success in enhancing scientific research skills and contributing to educational and research quality reforms[15].

Seon and King (2000), developed a course in the US, that included topics such as time management and stress reduction alongside research skills, leading to improved academic performance and research skills among participants[16].

Hueso-Montoro et al (2016) evaluated a course for health science students in Spain and found that 80% of participants showed significant gains in research skills and knowledge after completing the course[17].

Similarly, Isosomppi and Maunula (2016) reported improved performance among students at the Open University after a course integrating theoretical and practical training on dissertation writing and research methods[18].

The success of the current online course can be attributed to clear identification of training needs which guided the design of relevant objectives and content, ensuring the course and students' requirements.

The course content and delivery methods aligned closely with student needs, increasing demand, engagement, and skill consolidation.

The course provided psychological motivation by reinforcing students' confidence and fostering a competitive spirit to achieve high marks. Use of written materials and images catered to various learning styles, while interactive forums encouraged

student participation and facilitated question-and-answer exchanges. The flexibility to review and download lectures at any time empowered students to reinforce their learning.

Easy access to learning materials and a user-friendly platform contributed to the course's success. Students were encouraged to explore scientific research topics independently via the Internet, motivating them to find quality resources and breaking the monotony of traditional classes, which enhanced attention and engagement.

It focused on practical skills and problem-solving more than just theoretical knowledge, supporting learners in applying what they learned.

Overall, this online course successfully addressed an important topic relevant to future researchers and provided a comprehensive, skill-based approach to scientific research training. However, this study included only undergraduate students at the SVU and the research should be followed up and compared with traditional education to include other universities.

Conclusion

The study aimed to evaluate the impact of an online course on enhancing students' knowledge of scientific research methodology. The course effectively contributed to the development of student' knowledge, skills and competencies in scientific research. Additionally, the study recommends that educators and stakeholders focus on strategies to improve course design and encourage students to be creative and innovative in scientific research, moving beyond traditional educational approaches.

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