

The Extent of Undergraduate Student Participation in Conducting Scientific Research at The University of Nizwa in the Sultanate of Oman

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Abstract: The study aimed at investigate the extent of undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman. Additionally, the study aimed to identify whether there were statistically significant differences, at the significance level ($\alpha \leq 0.05$), in the means of the study variables, namely gender and specialization. To achieve these objectives, an analytical descriptive approach was employed, and a questionnaire was developed to gather data from a sample of 380 undergraduate students, representing both male and female students across all disciplines out of a total of 5821 students. The study results showed that:

The findings of this study indicate a high level of participation by undergraduate students in conducting scientific research at the University of Nizwa in the Sultanate of Oman. However, the results also revealed statistically significant differences ($\alpha \leq 0.05$) in the responses of the study sample members due to the gender variable, with male students exhibiting higher levels of participation, and the specialization variable, with literary majors showing greater levels of participation.

The study proposes a number of interventions to increase the level of involvement of faculty members in scientific research conducted by undergraduate students at the University of Nizwa. These interventions involve the establishment of an annual competition for scientific research conducted in partnership with undergraduate students, as well as the provision of annual financial incentives for faculty members who publish at least one research paper in peer-reviewed scientific journals in conjunction with undergraduate students during the academic year. Such measures are expected to promote faculty engagement and incentivize collaborative research efforts between faculty members and undergraduate students at the University of Nizwa.

Keywords: faculty members, undergraduate students, scientific research, University of Nizwa, Sultanate of Oman.

مدى مشاركة طلبة البكالوريوس في إجراء البحث العلمي بجامعة نزوى بسطنة عمان

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المستخلص: هدفت هذه الدراسة إلى تحديد مدى مشاركة الطلاب الجامعيين في الأبحاث العلمية في جامعة نزوى في سلطنة عُمان، وتحديد ما إذا كانت هناك فروق ذات دلالة إحصائية عند مستوى ($\alpha \leq 0.05$) في متوسط متغيرات الدراسة، وهي الجنس والتخصص. ولتحقيق هذه الأهداف، استخدمت الدراسة المنهج الوصفي التحليلي، وتم تطوير استبيان لجمع البيانات من عينة مكونة من 380 طالبًا وطالبة جامعيًا، يمثلون جميع التخصصات، من أصل 5821 طالبًا وطالبة. وأظهرت نتائج الدراسة ارتفاع مستوى مشاركة الطلاب الجامعيين في الأبحاث العلمية بجامعة نزوى في سلطنة عمان. ومع ذلك، كشفت النتائج وجود فروق ذات دلالة إحصائية ($\alpha \leq 0.05$) في إجابات أفراد عينة الدراسة بسبب متغير الجنس، حيث أظهر الطلاب الذكور مستويات أعلى من المشاركة، ومتغير التخصص، حيث أظهرت التخصصات الأدبية مستويات أعلى من المشاركة.

وتقترح الدراسة عددًا من التدخلات لزيادة مستوى مشاركة أعضاء هيئة التدريس في الأبحاث العلمية التي يجريها الطلاب الجامعيون في جامعة نزوى، وتشمل هذه التدخلات إقامة مسابقة سنوية للأبحاث العلمية بالتعاون مع الطلاب الجامعيين، بالإضافة إلى توفير حوافز مالية سنوية لأعضاء هيئة التدريس الذين ينشرون بحثًا واحدًا على الأقل في المجلات العلمية المحكمة بالتعاون مع الطلاب الجامعيين خلال العام الأكاديمي. ومن المتوقع أن تساعد هذه التدخلات على زيادة مشاركة أعضاء هيئة التدريس وتحفيز الجهود المشتركة في البحث بين أعضاء هيئة التدريس والطلاب الجامعيين في جامعة نزوى.

الكلمات المفتاحية: أعضاء هيئة التدريس، طلاب جامعيون، أبحاث علمية، جامعة نزوى، سلطنة عمان.

Introduction:

Scientific research is an essential and effective component for societies that are keen to survive and continue in light of global competitiveness. History, logic, and reality declare that scientific research is creativity and an industry that is far from bureaucracy, committees, arrangements, and ornate buildings. It can take place in the corridors of schools, universities, institutions, and agencies. Scientific research must adhere to objectivity and honesty in transferring knowledge from others without attributing it to him, as well as delving into contemporary problems and creativity in science topics.

The need of societies for scientific research and studies has become increasing day by day. The world is in competition and a race to obtain the largest possible amount of knowledge that guarantees it superiority over others. The main function of scientific research is to provide better conditions for human survival and well-being, and the progress of peoples and societies depends on the progress of scientific research. Familiarity with scientific research methodologies and the rules followed, starting from defining and describing the problem, through choosing a specific methodology for data collection, and ending with analyzing data and drawing conclusions, is one of the necessary matters in theoretical and applied sciences (Qutb, 2021).

Participation in scientific research plays a crucial role in undergraduate students' academic and personal development. Research experiences provide students with opportunities to develop critical thinking skills, enhance their problem-solving abilities, and gain practical knowledge in their field of study. Moreover, research participation can help students build a strong foundation in their chosen discipline, increase their confidence, and improve their communication skills. Therefore, universities should encourage and support undergraduate students' involvement in scientific research by providing them with the necessary resources, training, and mentorship. This can help prepare them for future academic and professional success, while also contributing to the advancement of scientific knowledge.

There are several factors that affect student involvement in scientific research, including research skills, institutional and material support, financial and academic incentives (Hunter, Laursen & Seymour, 2007, 36-74).

According to a report by the National Research Council, interest in student involvement in scientific research is increasing in American universities because it can improve the learning experience and develop students' skills (National Research Council, 2003).

Al-Farra (2004) confirmed that the basic stage of education is witnessing a shift towards interest in scientific research in the knowledge society, as it is one of the methods of producing new knowledge, and thus contributes a major role in keeping pace with the modern revolution and economic and social development. This is what the results of Al-Muqebel's study (2011) showed that scientific research in the university environment contributes to the expansion of students' culture and qualifies them to deal with educational problems in the light of scientific foundations and the application of what they have learned in Range.

It also works to find creative designs for the learning environment and organizes it in a scientific way. And improving the curricula to keep pace with the developments and requirements of the times, and the practice of scientific research helps the university student in developing academic preparation skills, and the researcher recommended the need to establish specialized units in universities that guide students and provide material and moral assistance in their research work.

Scientific research is a fundamental and effective element for the development, progress, and sustainability of societies. The history of science, as well as its logical and practical applications, demonstrates that scientific research is a creative process that can take place anywhere, from the corridors of educational institutions to home-based research endeavors. It involves the exploration of contemporary issues, the

The postgraduate stage is a crucial period for the training and preparation of individuals for scientific research, which is widely recognized as one of the core functions of universities. Scientific research plays a pivotal role in enhancing students' skills and elevating the status of universities, and is a fundamental pillar of human knowledge and a key indicator of global sophistication. This assertion is supported by Abu Jahjouh's (2013) study, which aimed to investigate the effectiveness of problem-based and cognitive learning approaches in developing scientific research skills among students enrolled in the research methodology course at Al-Aqsa University. The findings of the study revealed no significant interaction between the cognitive approach and teaching methodology in terms of enhancing students' skills in scientific research or increasing their motivation towards it.

The report of the International Commission on Education for the Twenty-First Century is reinforced by the findings of Rabee's (2000) study, which highlights the need for a comprehensive reassessment of the educational system in light of the information revolution and the technological advancements that have emerged. This is essential to ensure that students are adequately prepared for a future that is increasingly influenced by technological innovations and informatics.

Inaya (2008) identified a range of essential skills that scientific researchers must possess, including a deep and genuine interest in their research subject, patience, perseverance, scientific integrity, skepticism, and observational skills. Additionally, researchers must possess a variety of research skills, such as the ability to formulate and prepare ideas, manage research concepts, execute research methodology, systematically organize research plans, and present research findings in a structured and coherent manner. These skills are critical for conducting high-quality scientific research and producing outputs that are reliable, valid, and contribute to the advancement of scientific knowledge.

The significance of scientific research for university students was investigated by several researchers using field studies, including Nimr's (2022) study. The results of the study revealed statistically significant differences attributed to scientific ranking, with no significant differences observed in other areas. Furthermore, the study found that students in scientific colleges exhibited greater levels of participation in scientific research compared to those in Literary majors colleges. These findings underline the importance of scientific research for university students and highlight the need to encourage greater participation in research activities, particularly among students in Literary majors disciplines.

In a study conducted by Al-Makhlafi (2021), postgraduate students were found to possess moderate levels of all scientific research skills, with documenting references ranking first and using statistical treatments ranking last.

Al-Alim and Badarneh (2021) conducted a study that examined the level of scientific research skills among graduate students in the faculties of education at Palestinian universities from the perspective of faculty members. The results indicated a significant level of proficiency in these skills. Furthermore, no statistically significant differences were found based on gender or years of experience, but differences were observed in relation to academic rank, with assistant professors demonstrating higher levels of proficiency compared to associate professors. The study suggests several recommendations to enhance the quality of scientific production, including improving research practices among graduate students and increasing the role of faculty members in supervising student theses and dissertations.

Al-Khattabiyya (2019). The study used the descriptive survey approach, and the sample consisted of 440 postgraduate students. The averages of the sample's estimates according to the sex variable and the type of university variable, except for Range of the Deanship of Scientific Research.

Al-Qarala (2017) conducted a study that assessed the level of research competence and achievement among postgraduate students. The results revealed a moderate level of proficiency in both areas, and no statistically significant differences were observed in the responses provided by the sample in relation to the variables of gender, specialization, and job title.

In a study conducted by Al-Zaghoul and Al-Handal (2016), the level of scientific research competencies among postgraduate students was found to be high. Furthermore, the study found no statistically significant differences in the responses provided by the sample with regards to the variables of gender and program of enrollment.

Sutasuwan, Sumalee, and Supombat (2016) conducted a study in China that examined the research skills of postgraduate students studying in the College of Education at public and private universities in Bangkok. The results indicated that these students experienced low levels of proficiency in research skills and had moderate levels of research skill needs.

Based on the studies provided, some comparisons can be drawn regarding the level of research skills and engagement among students in different academic disciplines and institutions.

Nimr's (2022) study found that students in scientific colleges showed greater levels of participation in scientific research compared to those in literary major's colleges. This may suggest that the academic major has a significant impact on research engagement. However, the study did not examine the factors that may have influenced these differences.

Al-Makhlafi's (2021) study highlighted the need to enhance students' research skills, particularly in areas that require more attention and improvement. This finding is consistent with the recommendations provided by Al-Alim and Badarneh (2021) to enhance the quality of scientific production.

Al-Zaghoul and Al-Handal's (2016) study found a high level of scientific research competencies among postgraduate students, with no statistically significant differences based on gender and program of enrollment. This suggests that research engagement and skills may be influenced by factors other than gender and academic discipline.

Al-Qarala's (2017) study revealed a moderate level of proficiency in research competence and achievement among postgraduate students, with no significant differences found based on gender, specialization, and job title. This indicates that research skills and engagement may be relatively consistent among postgraduate students.

Overall, the studies suggest the need for tailored interventions to enhance research skills and engagement among students, particularly those in literary major's disciplines, and to promote research culture in academic institutions.

In the Sultanate of Oman, the government encourages students to participate in scientific research and provides the necessary financial and institutional support to facilitate this (Ministry of Higher Education, 2019).

Scientific research plays a pivotal role in the development of any society, and universities are the main institutions responsible for producing new knowledge. Undergraduate students, as the next generation of researchers, need to be adequately prepared to engage in scientific research. This study aims to investigate the extent of undergraduate student participation in conducting scientific research at the University of Nizwa in the Sultanate of Oman.

Statement of the Problem:

The researchers conducted a number of studies to reveal the reality of scientific research in Arab environments, including: Al-Marhabi (2012) study, which aimed to identify the competencies of the knowledge economy in university education, at Taibah University. Its results showed

that the competence of searching for information and thinking was moderate, confirming the existence of research skills of the university student that enhance his interest in aspects of scientific research such as problem-solving skills, analysis and information gathering, which includes collecting, analyzing, organizing and then presenting.

Al Muqebel (2012) conducted a study aimed at identifying the reality of scientific research skills among Taibah University students and pinpointing the causes of their weaknesses in research skills. The study revealed that all respondents agreed on their inadequate ability to write scientific research and lack of knowledge on how to search for sources. It was evident that the application of library and research curricula in secondary education was weak. Another study by Al-Rahimi and Al-Mardini (2011) aimed to investigate the reality of research creativity in the Arab world, and the results indicated a decrease in the level of research creativity, attributed to the scarcity of internationally published research papers and a limited number of patents in the Arab world.

Based on the aforementioned issues, the research team proposed to investigate the problem of research skills among undergraduate students in the University of Nizwa community. The team comprises bachelor students from two different disciplines and the first researcher, an assistant professor in the Department of Education and Human Studies at the College of Arts and Sciences. To identify the research problem, the team conducted an exploratory study by conducting semi-structured individual interviews with eleven male and female students from different disciplines and academic years affiliated with the University of Nizwa. The interview questions were open-ended questions, which aimed to explore the students' perspectives on the research skills problem.

- 1- Have you ever participated in scientific research with a university professor or within a research team at the university? If yes, what role(s) did you play within the research team?
- 2- What skills did you acquire or develop through your participation in scientific research with faculty members?
- 3- What recommendations would you suggest to encourage and enhance the participation of undergraduate students in scientific research with faculty members at universities?

The study conducted semi-structured individual interviews with eleven male and female students from different disciplines and academic years affiliated with the University of Nizwa. The results showed that only five out of eleven students participated in any form of scientific research. None of the participants had previously participated in research teams at the University of Nizwa, and their involvement in research was limited to one educational project with the Ministry of Education during their general diploma studies. This indicates a lack of involvement of undergraduate students in scientific research by faculty members at the University of Nizwa.

The study participants recommended that undergraduate students be encouraged to participate in research teams at the university level, particularly in field research, to develop their scientific research skills and prepare them for future educational and professional opportunities. This confirms the need for undergraduate students to acquire research skills and to be actively involved in research opportunities.

The study identified several reasons for the non-participation of some members of the research sample, including time constraints due to coursework and study costs, difficulty in balancing study and research participation, and the lengthy duration of scientific research. These factors suggest a lack of a research culture, misconceptions about the research process, inadequate task distribution among team members, and insufficient activation of research opportunities for undergraduate students. Some students also cited their inability to use statistical analysis programs as a barrier to participating in scientific research.

Based on these findings, the researchers identified a research gap that calls for a field study to investigate the level of undergraduate student participation in scientific research at the University of Nizwa in the Sultanate of Oman and to propose developmental procedures. Therefore, the problem of the current study aims to answer the following questions:

1. What is the extent of undergraduate student participation in scientific research at the University of Nizwa in the Sultanate of Oman?
2. Are there any significant differences, at a significance level of $\alpha \leq 0.05$, in the responses of the study sample of undergraduate students regarding the degree of participation in scientific research at the University of Nizwa in the Sultanate of Oman, based on gender and specialization?
3. What are the recommended measures to increase the participation of faculty members in promoting undergraduate student involvement in scientific research at the University of Nizwa in the Sultanate of Oman?

Study Objectives:

The current study aims to achieve several objectives, including:

1. Assessing the extent of undergraduate student participation in conducting scientific research at the University of Nizwa in the Sultanate of Oman.
2. Investigating whether there are any statistically significant differences, at a significance level of $\alpha \leq 0.05$, in the responses of the study sample of undergraduate students regarding their degree of participation in conducting scientific research at the University of Nizwa in the Sultanate of Oman, based on their gender and specialization.

3. Providing recommended measures to increase undergraduate student involvement in conducting scientific research at the University of Nizwa in the Sultanate of Oman. These developmental measures could enhance the research skills of undergraduate students and promote their participation in scientific research activities.

The Significance of the Study:

This study is significant both theoretically and practically.

- **Theoretically**, the study is important due to the significance of its focused topic. Despite its importance, this topic remains understudied in Omani universities. Moreover, scientific research is a primary function of universities and demands the development of research skills among undergraduate students, similar to postgraduate students.
- **Practically**, the study's results may aid faculty members in enhancing the research skills of undergraduate students. Additionally, the study may offer officials and decision-makers at the University of Nizwa valuable information to improve the programs and curricula offered to students, thus promoting scientific research skills and further activating committees dedicated to developing students' research abilities. These practical implications could benefit the university and its students by enhancing their research skills and preparing them for future academic and professional opportunities.

Limitations of the Study:

This study has several limitations, including human limits, spatial boundaries, time limits, and objective boundaries. The human limits of this study are undergraduate students enrolled at the University of Nizwa during the academic year 2022/2023. The spatial boundaries of this study are limited to the University of Nizwa, located in the Sultanate of Oman. The time limits of this study are the academic year 2022/2023. Finally, the objective boundaries of this study are limited to three areas: preparing a research plan, collecting information and data, and field application in the Sultanate of Oman. These limitations should be taken into consideration when interpreting the results of this study and generalizing its findings beyond the specified boundaries.

Terminology Used in the Study:

- **Scientific research:** Al-Khatib (1405 AH, 21) defines scientific research as "the process that leads to discovering the truth in sciences through a set of scientific rules that guide the mind's course and determine its process until it reaches a known outcome." Aqeel (1979, 25) defines scientific research as "a systematic, experimental, and controlled investigation into the interrelationships between different aspects."
- **Research skills:** Shannan and Kassab (2016, 10) define research skills as "the ability of researchers to improve their cognitive and innovative skills in a manner that promotes acceptance of new ideas, creativity, and discovery."
- **The current study defines research skills operationally** as the ability of students to proficiently and efficiently prepare and execute the steps of scientific research. These skills include identifying research problems, formulating hypotheses or research questions, and acquiring the skills of scientific writing, such as precision of expression, formulation, criticism, and analysis. The study also measures the adherence to the steps of scientific research through the responses of the study sample to a research tool developed for this purpose.

3- Study methodology and procedures.

Study methodology:

The current study utilized a descriptive analytical approach, which is considered the most appropriate approach for the nature of this study. This approach involves describing the phenomenon under investigation and quantitatively portraying it by collecting standardized information, categorizing it, analyzing it, and subjecting it to careful examination (Al-Sultaneya & Al-Jilani, 2012, p. 133).

Study Population: The study population included all male and female undergraduate students enrolled in the University of Nizwa, totaling 5,821 students, with an average of 4,805 females and 1,016 males, according to university statistics for the 2022/2023 academic year (University of Nizwa, 2022).

Study Sample: The entire population was selected as the sample for this study, and the questionnaire was distributed electronically via email. A total of 380 valid questionnaires were retrieved, representing 6.5% of the study population, which is sufficient for the purposes of this study according to Thompson's equation (Thompson, n.d.). These questionnaires were used for statistical analysis in the current study.

$$n = \frac{N \times p(1-p)}{\left[N - 1 \times \left(d^2 \div z^2 \right) \right] + p(1-p)}$$

Table (1) shows the distribution of the study sample in relation to the total population of the study according to its variables.

Table (1) The study sample was characterized and described based on its variables.

Variable	Level/Category,	Number	Percentage	Total
Gender	Male	123	32.4%	380
	Female	257	67.6%	
Specialization	Literary majors	249	65.5%	
	Scientific majors	131	34.5%	

The Research Instrument and Its Variables:

To answer the study questions, the research team developed a tool for the study, which is a questionnaire consisting of three domains that measure the reality of student participation in conducting scientific research, with a total of 20 items. The first domain is "preparing the research plan," which includes six items. The second domain is "collecting information and data," which includes five items. The third domain is "field application in research," which includes nine items. The team adopted the Likert five-point scale to measure the level of participation (always, often, sometimes, rarely, never), and assigned corresponding weighted values of 5, 4, 3, 2, and 1, respectively.

Validity of the Research Instrument:

1. **Face Validity:** Apparent honesty, or the honesty of the validators, was utilized to assess face validity. The research instrument was distributed to a group of eight academic specialists and researchers, who provided their feedback on the tool.
2. **Construct Validity:** To determine the construct validity of the research instrument, the Pearson correlation coefficient was computed between the total Grades of each domain and the total Grade of the instrument, as shown in Table (2). This approach allowed for an evaluation of the degree to which the different domains of the instrument are associated with each other and with the overall construct being measured.

Overall, the use of both face and construct validity approaches enhances the credibility and rigor of the research instrument and the findings of the study.

Table (2) The study tool's construct validity was assessed using the Pearson correlation coefficient.

	Pearson correlation coefficient
Preparation of the research plan	0.867**
Information and data collection	0.927**
Field application in research	0.949**

** function at level (0,01)

Table (2) demonstrates that the research instrument exhibited high construct validity, with Pearson correlation coefficients ranging from 0.867 to 0.949. Thus, the instrument is deemed valid for the purposes of the current study.

To ensure the stability of the research instrument, it was administered to a sample of 35 male and female students outside of the original study population, and Cronbach's alpha coefficient was computed for each domain separately.

Table (3) The Cronbach's alpha coefficient was used to measure the stability of the two scales in the study.

Areas of student participation in conducting scientific research	Alfa Cronbach coefficient
Preparation of the research plan	0.861
Information and data collection	0.861
Field application in research	0.935
Total	0.886

Stability and Validity of the Research Instrument: Table (3) shows that the research instrument exhibited high stability, with Cronbach's alpha coefficients ranging from 0.861 to 0.886 for the total Grade and each domain Grade. These results indicate that the research instrument is reliable and consistent in measuring the construct of interest, and is thus suitable for use in the current study.

Field Study Procedures: Range study procedures involved verifying the validity of the research instrument by soliciting feedback from experts and specialists in Range of scientific research. The final version of the instrument was then submitted to the Deanship of Scientific Research and Graduate Studies at the University of Nizwa to obtain ethical approval for conducting research involving human subjects.

Upon obtaining ethical approval, a researcher was assigned to administer the instrument in Range. The researcher was tasked with collecting data from participants and ensuring that the research procedures were carried out in accordance with ethical and professional standards. These procedures were essential to ensure the validity and reliability of the research findings.

Statistical Methods Used: Following the electronic data collection process, the collected data were analyzed using the Statistical Package for Social Sciences (SPSS) program. The means and standard deviations were calculated to answer the first research question. The degree of reliability of the research instrument was assessed using Cronbach's alpha coefficient. The construct validity of the research instrument was evaluated using the Pearson correlation coefficient. The T-test was used to detect potential differences based on the variables of gender and specialization.

The use of these statistical methods allowed for a comprehensive analysis of the collected data, providing insights into the reliability and validity of the research instrument, as well as identifying potential differences in the results based on different variables. The findings from these analyses were critical in drawing accurate and valid conclusions from the study.

4- Study results and discussion.

Criteria for Judging the Results: To assess the results of the study, the responses on the Likert scale were converted into numerical values based on a pre-determined scoring system. The cell length was calculated by subtracting the lowest value of the scale from the highest value and dividing the result by the largest value in the scale. For example, in a five-point Likert scale ranging from "always" to "never," the cell length would be calculated as $(5-1) / 5 = 0.8$.

This value was then added to the lowest value in the scale to determine the upper limit of the cell. Table (4) illustrates this method of calculating the cell length and upper limit for each response category on the Likert scale.

Using this scoring system allowed for a standardized and objective assessment of the responses, enabling the researchers to draw accurate conclusions from the data. The results of the study and their implications are discussed in detail in the following sections.

Table (4) Criterion for judging the results of the study

Range	Degree
4.21 - 5	Very High
3.41 - 4.20	High
2.61 - 3.40	Medium
1.81 - 2.60	Low
1 - 1.80	Very Low

Research Question 1: The first research question aimed to investigate the level of undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman.

To answer this question, the means and standard deviations of the responses from the study sample were computed. These values were calculated based on the scoring system used for the Likert scale and were used to assess the level of participation of the students in different domains of scientific research, including the preparation of research plans, data collection, and field application.

The results of this analysis provide insights into the level of participation of undergraduate students in scientific research at the University of Nizwa, and can be used to identify areas for improvement and development in Range of scientific research at the university.

Table (5) The means and standard deviations for the study variables were sorted in descending order based on the means.

Rank	Number	Range	Means	Standard deviation	Grade
1	2	Preparation of the research plan	3.880	0.879	High
2	3	Information and data collection	3.815	0.821	High
3	1	Field application in research	3.649	0.797	High
Total			3.781	0.763	High

Results of Research Question 1:

Table (5) presents the means and standard deviations for the degree of undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman. The results indicate that the degree of participation is high, with means ranging from 3.649 to 3.880 and standard deviations ranging from 0.797 to 0.879.

The domain of data collection ranked first in terms of the degree of participation, with a mean of 3.880 and a standard deviation of 0.879, indicating a high level of participation in this area. Range application stage ranked second, with a mean of 3.815 and a standard deviation of 0.821, indicating a large extent of participation. The preparation stage of the research plan ranked third, with a mean of 3.649 and a standard deviation of 0.797, also indicating a large degree of participation.

These results suggest that undergraduate students at the University of Nizwa are actively engaged in scientific research and are participating to a high degree in various stages of the research process. These findings have important implications for enhancing the research culture and academic excellence at the university, as well as promoting the development of scientific research in the Sultanate of Oman.

The research team attributes the high level of undergraduate students' participation in scientific research at the University of Nizwa to the keenness of faculty members to promote students' involvement in research activities. This is evident in their emphasis on research projects, graduation projects, and other research activities conducted by professors. Additionally, the university's operational plan emphasizes the importance of education based on scientific research and the development of students' skills in this field through the courses offered in various undergraduate programs.

These factors have contributed to creating a research-oriented culture at the university, where students are encouraged to engage in scientific research and are supported by faculty members in various stages of the research process. This has resulted in a positive impact on the academic performance and skills of the students, as well as the overall research output of the university.

The results of the present study are consistent with the findings of Al-Alim and Badrana (2021), who reported a high level of scientific research skills among postgraduate students in the faculties of education in Palestinian universities, according to the views of faculty members. However, the results of the current study differ from the findings of Sutasuwan, Sumalee, and Supsombat (2016), who reported that postgraduate students studying education in public and private universities in Bangkok experienced low levels of research skills.

Furthermore, the results of the present study are different from those of Nimr (2022), who reported a moderate level of scientific research among Najran University students, as well as Al-Makhlafi (2021), who found that postgraduate students possessed moderate levels of scientific research skills. Similarly, Al-Qarala's study (2017) reported a moderate level of research competence and research achievement among postgraduate students.

These differences in the results may be attributed to variations in the research context, sample size, and methodology employed in each study. Nonetheless, the findings of the present study provide valuable insights into the level of undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman, which can inform the development of strategies and policies for promoting scientific research and academic excellence at the university.

Research Question 2:

The second research question aimed to investigate whether there are statistically significant differences, at the significance level of $\alpha \leq 0.05$, in the responses of the study sample of undergraduate students regarding their participation in scientific research at the University of Nizwa in the Sultanate of Oman, based on the variables of gender and specialization.

To answer this question, the means and standard deviations of the degree of participation in scientific research were extracted according to the variables of gender and specialization. The study explored the potential differences in participation levels between male and female students, as well as between students from different academic specializations.

The results of this analysis are presented in the following tables, which illustrate the means and standard deviations for each group and variable. These findings provide insights into potential variations in the level of participation in scientific research among undergraduate students at the University of Nizwa, based on gender and specialization.

The first variable examined in the study was gender.

Table (6) Independent Samples T-Test for Gender-Based Differences in Undergraduate Students' Participation in Scientific Research at University of Nizwa, Oman

Gender	Number	Means	Standard Deviation	Values "T"	Degrees of Freedom	Sig
Male	123	3.999	0.544	3.922	378	0.000
Female	257	3.677	0.830			

The results of the independent samples t-test presented in Table 6 indicate that there are statistically significant differences ($\alpha \leq 0.05$) attributed to the effect of gender, with males showing a higher degree of participation in scientific research compared to females. This suggests that the gender variable has an effect on the degree of undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman. The research team attributes this finding to the greater interest of male students in research projects, as compared to female students. This difference may be due to females' focus on achieving high academic achievement.

These results are consistent with the findings of Nimr's study (2022), which reported statistically significant differences in the development of scientific research skills among students based on gender. However, they differ from the results of previous studies conducted by Al-Alam and Badarneh (2021), Al-Khatibeh (2019), Al-Zaghloul and Al-Handal (2016), and Al-Qarala (2017), which did not report any statistically significant differences in participation levels based on gender. These variations in the findings may be attributed to differences in the research context, sample size, and methodology employed in each study.

The second variable examined in the study was specialization.

Table (7)Independent Samples T-Test for Specialization Variable in Undergraduate Students' Participation in Scientific Research at University of Nizwa, Oman

Specialization	Number	Means	Standard Deviation	Values "T"	Degrees of Freedom	Statistical Significance
Literary majors	249	3.919	0.605	4.984	378	0.000
Scientific majors	131	3.520	0.947			

The results of the independent samples t-test presented in Table 7 indicate that there are statistically significant differences ($\alpha \leq 0.05$) attributed to the effect of specialization, with literary majors showing a higher degree of participation in scientific research compared to non-literary majors. This suggests that the specialization variable has an effect on the degree of undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman. The research team attributes this finding to several factors, including the availability of greater opportunities for literary majors to participate in research and scientific conferences, as well as the relatively shorter time required to complete research projects in the literary majors, as compared to scientific majors that require more time-consuming applied and experimental research. This may lead to reluctance among students to participate in research that takes a long time to complete.

The findings of the present study differ from those reported by previous research studies on the effect of college and program specialization on undergraduate students' participation in scientific research. Specifically, the results of the current study contrast with Nimr's study (2022), which reported statistically significant differences in favor of scientific colleges over Literary majors colleges, as well as the studies conducted by Al-Makhlafi (2021), Zaghoul and Al-Handal (2016), and Al-Qarala (2017), which did not report any statistically significant differences attributed to students' program or specialization. These variations in the findings may be attributed to differences in the research context, sample size, and methodology employed in each study.

Research Question 3:The third research question addressed by the study pertained to identifying potential measures for enhancing undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman. Based on the results of Range study and a review of the relevant theoretical literature, the study proposes a number of recommendations, as follows:

Based on the study's findings and a review of relevant literature, the following recommendations are proposed to enhance undergraduate students' participation in scientific research at the University of Nizwa in the Sultanate of Oman:

1. Organizing an annual competition for scientific research in collaboration with undergraduate students, and presenting a summary of the top three research projects at the university's annual celebration, under the supervision of the Deanship of Scientific Research and Graduate Studies.
2. Including the preparation and publication of joint scientific research papers with students as a requirement for academic promotions, with a minimum of three research papers required to apply for a higher scientific degree during the period of holding a scientific rank.
3. Requiring faculty members to renew their work contracts by preparing joint scientific research with undergraduate students at the university, with a minimum of two research papers required during the contract period.
4. Granting an annual financial reward to faculty members for publishing at least one research paper during the academic year in peer-reviewed scientific journals, in collaboration with undergraduate students at the university.
5. Developing and enhancing the scientific research skills of undergraduate students at the University of Nizwa by offering a course on scientific research methods as part of their undergraduate programs, to encourage them to initiate scientific research projects in collaboration with faculty members.
6. Implementing an awareness plan to promote the importance of scientific research at the individual, institutional, and societal levels, with the Institute of Lifelong Learning collaborating with university faculty members to carry out this plan.

5-Conclusion.

- Scientific research is becoming increasingly important for individuals and institutions, as it plays a critical role in generating and advancing knowledge in various fields. This knowledge can guide and improve the functioning of state institutions, help address current challenges and problems, and ultimately enhance the services provided to the community.

- The goal of this study was to assess the level of undergraduate students' engagement in scientific research at the University of Nizwa in the Sultanate of Oman, taking into account their gender and academic specialization. Additionally, the study aimed to propose developmental measures to enhance students' participation in scientific research at the university.
- To achieve these objectives, the study employed a descriptive analytical approach and used a questionnaire as its primary data collection tool. The questionnaire was characterized by a high degree of validity and reliability, making it a suitable instrument for conducting the study. The University of Nizwa is a large institution, and the findings revealed statistically significant gender-based differences ($\alpha \leq 0.05$), with males showing a higher degree of participation in scientific research compared to females.
- Overall, the study contributes to our understanding of undergraduate students' engagement in scientific research, and provides valuable insights for developing effective strategies to enhance their participation in research activities at the University of Nizwa and beyond.

Proposed research ideas:

The following research ideas are suggested for future studies:

1. Investigating the effectiveness of student research teams in promoting sustainable development in the Sultanate of Oman.
2. Examining the challenges that undergraduate students face in participating in research teams at higher education institutions.
3. Proposing a vision for enhancing the current state of student scientific research at the University of Nizwa.

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