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Program of Training for Acquisition of Research Skills in Teaching Methods for Mathematics Faculty Members at The University Level

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ABSTRACT

The main aim of this paper is to identify research skills needed for a training program in Mathematics teaching methods designed for newly started math faculty members in order to improve their research aptitude, moreover, the study tries to find out which aspects of research skills are more needed for the training program. The analytical descriptive method is used. A questionnaire for collecting data was prepared. The validity, reliability, and consistency of the questionnaire were checked. A random sample covered 7 private universities 50% of the private universities in the Kurdistan Region of Iraq were chosen. The (SPSS) was used, and mean, standard deviation correlation, and ANOVA were used for processing the data. The study found out there is a crucial need for research skills in all six research aspects.

Introduction

In today's society, higher education institutions play a critical role in determining the pathways of social and economic growth in a highly competitive environment, and it is a driving force in economic prosperity and social change (Ramsden, 2003).

The expansion of the use of modern information and communication technology (ICT) and so-called multimedia in the teaching, research, and skills needed in the labor market has led to the emergence of a competitive global university market, in which universities compete for financial resources that enable them to establish their

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existence among highly reputable universities, through which they can encourage students to study and attract companies to invest in them.

Universities around the world aim to ensure the overall quality of administrative, educational, and research activities and to monitor the outputs in the labor market in order to maintain their position and status among universities at the local, regional, or global levels (Taher, 2018).

Universities around the world give more attention to how to improve staff abilities and skills in teaching and research, with a strong belief that their qualifications are insufficient to meet the challenges imposed by the new environment for their work. So there emerged an unprecedented interest in the training of faculty members, researchers, and management personnel (Nithyanantham, V., R., & Hasan, S. R. 2019).

As a result of the aforementioned, academic staff members need to have tools for enhancing their teaching techniques. One of the most efficient ways to enhance mathematics teaching and learning at the university level is to train faculty members in research skills in teaching approaches.

Problem statement

Without a doubt, scientific research actively contributes to the growth of societies in a variety of disciplines, which in turn contributes to both their renaissance and prominence at the global level. According to Bin Tareef (2009), scientific research is crucial for any nation to attain sustainable development because it advances society and helps to create a better future. Additionally, Longres & Scanlon, (2001) discuss how scientific research may aid in establishing social justice.

For example, at the University of Massachusetts Boston, which focuses on the effective training of teachers, we find that one of the most important skills that the university seeks to impart to them is the skills of scientific research. If we discuss the educational field specifically, scientific research can contribute to making the desired shift in this field, which explains why developed countries have a great interest in research skills (Rotman & Messelaar, 2005).

This paper attempts to design a training program for mathematics teaching staff on research skills in math education, in order to enable the teaching staff to use

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research-based methods of teaching. The program will be built depending on the actual needs of a math faculty member for research skills in math education.

Research questions

The following are the study's questions:

1. How do research techniques enhance mathematics teaching methods at universities in Iraq's Kurdistan Region?
2. What are the strategies for enhancing teaching methods at the university level?

The significance of the study

Training mathematicians in scientific research techniques can be very beneficial for their professional growth in terms of teaching and learning mathematics. Its significance extends beyond simply improving teaching methods to include important issues that can have a direct impact on students' math proficiency while also cutting down on the time needed to learn it. In this context, Gupta et al. (2006) indicate the potential benefits of using research skills in advising students even before they enroll in mathematics programs, which helps to save time and effort and reduce costs, in addition to the potential benefits of using them in effective planning for teaching mathematics, putting the teaching process into practice, and evaluating the results.

Advanced universities tend to adopt research-based methods of teaching. Accordingly, possessing research skills has become a necessity for a university faculty member in order to perform his mission in accordance with the academic standards adopted by advanced universities. The results of this paper will facilitate the task of mathematics staff members at the university level in the Kurdistan Region of Iraq to meet the required standard of a research-based method of teaching. In addition, this paper provides a training program for the math faculty members in order to acquire the research skills required to develop teaching methods as well as research skills in general.

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The study's objectives

This study aims at

1. To create a list of the research skills needed in math instruction.
2. To find out the extent of research skills needed.
3. To examine whether there are any significant differences in the degree of the skill requirements across axes and between universities.

The scope of the research

The scope of the study was limited to:

1. Private universities in Erbil, Iraq's Kurdistan Region.
2. The mathematics teaching staff members and other related disciplines, such as statistics, accounting, engineering sciences, physics, and technological sciences,
3. The academic year 2022-2023

A literature reviews

The importance of incorporating scientific research into the enhancement of mathematics teaching and learning has been underlined by a number of studies, including the ones listed below: According to Al-Kubaisi (2001), universities today are no longer only focused on attaining their historical objectives but also expanding their operations to include scientific and technological aspects of life as well as the analysis of society's shifting demands.

According to Al-Salem and Saleh (2002), one approach the university administration could use to help faculty members increase their research skills and behavioral aptitudes to deal with changes in the institution's internal and external environments is training.

Zoelph, A. and Samir, M. (2003) believe that training currently occupies a vital place among the activities of universities in order to improve the efficiency of the university and develop the skills of its employees, including faculty members. Training is a means by which employees achieve promotions and higher jobs.

According to Al-Nazir and Muhammad bin Abdullah (2004), the aim of the study was to provide a training program for developing intermediate mathematics teaching

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skills. According to the study, the qualifications of math instructors in the Kingdom of Saudi Arabia are lacking, particularly when it comes to employing technology to enhance learning, foster mathematical reasoning, and solidify mathematical concepts. The study included recommendations for setting up a program for developing the qualifications of math teachers.

According to Masri (2004), the university's mathematics faculty members have other responsibilities than teaching as well, including doing research.

According to Payne and Chamberlain (2004), a researcher may not have the necessary abilities to complete research work and must get training in those skills. This leads to a variety of issues with the completion of research tasks in math education.

Gupta et al. (2006), concentrated on the significance of training faculty members in research skills and their impact on student success. Therefore, the aim of their study was to forecast undergraduate students' mathematical achievement.

The researchers employed a questionnaire to gather data in order to determine the prediction of students' progress in math classes. The outcomes demonstrated that factors such as academic background, teaching hours, methods, types of technology employed, and teacher rank also contributed to student achievement.

Lamanauskas and Augiene (2009) emphasized the importance of scientific research and the need to concentrate on imparting its skills to instructors and students. They also determined the key driving forces for and barriers to such engagement. The researchers continued by saying that students' ability to learn as well as their openness to the developed world depends on their ability to develop scientific research skills. They, therefore, regarded these abilities as some of the most important primary indicators of students' proficiency. The researchers recommended figuring out how to stimulate students' scientific curiosity in a way that benefits the teaching process.

Al-Maliki, Abdul-Malik Bin Misfer (2010). The purpose of his study was to assess the effectiveness of a training program for mathematics teachers to develop active learning skills and its effect on student achievement. The study came to the conclusion that the training program had helped to improve teachers' average performance compared to their performance prior to exposure to the training program, and the difference was significant. It also found that training teachers had

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a significant impact on raising students' achievement compared to their achievement prior to the teachers' exposure to training.

Courtney K., et al. (2013) provide examples of how the National Council of Teachers (NCTM) in the United States has created a foundation for teachers to be trained in practical skills for resolving mathematical problems that require the use of scientific reasoning.

Nada (2013) states that faculty members must constantly learn new skills to carry out their responsibilities as educators in an effective manner. The use of current technology as a source of communication and information has given research in math education a new dimension that renders the researcher's abilities inadequate if the researcher's knowledge of research methodologies and strategies is not updated on a regular basis.

According to Taher, N. A. H. (2021), universities should devote time and resources to educating their staff on the technological advancements that influence both the university's internal and external environment. Skills pertaining to research methods and strategies are among the most important things that need training. Because of this, the university must concentrate on training programs, particularly in the area of research, to help staff members acquire the necessary skills to deal with the demands of rapid change.

ESG (2015) indicates that the Bologna Declaration served as the foundation for the universities of the European Union countries' adoption of the scientific research skills that a researcher should possess as one of the fundamental requirements for European universities in their teaching and scientific activities.

Abuelenien (2016) states that one of the key criteria for adapting universities to the quick changes in information and communication technology, community needs, and human resource development is training in the context of rapid technological innovation.

According to Taher, N. A. H. (2019), "Acquisition research skills in math education is not only a task related to the promotion of the personal faculty member's skills, but also reflects on the performance of the teacher, the outcomes of the student's learning, and to what extent the outputs are relevant to the labor market needs in solving the problems of work and keeping pace with scientific progress."

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Taher, N. A. H. (2019), also states that "Training in the rapid technological innovation environment has become one of the major requirements of adapting universities to the rapid changes in information and communication technology, the needs of the communities, and human resource development."

Research Methodology

The analytical-descriptive approach has been adopted for the data collection, organization, and processing in the study.

Population and sample of the study

The target population of this study included all 14 private universities in the Kurdistan Region of Iraq. The sample for the study consisted of seven private institutions that were randomly selected. It covered Tishk University, Chihan University, Lebanese French University, Knowledge University, Bayan University, Erbil University, and Catholic University, accounting for 50% of the private universities in the Kurdistan Region.

Study procedure

The subsequent steps are carried out:

First, based on a pilot questionnaire, theoretical research, and practical investigations, a list of research skills was created. The validity and efficacy of the pilot list of studies were examined in light of the advice of several professionals and experienced university faculty members.

Second: A questionnaire for data collection was constructed in accordance with prepared research skills; it had two sections, the first of which offered instructions for respondents on how to reply to the questionnaire's items. The items distributed along six axes were included in the second section.

The questionnaire's consistency, reliability, and validity were examined.

The Statistical Package for Social Sciences (SPSS) was used to analyze the study's data.

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Research Findings

1. **Results related to the first objective, which is to create a list of the research skills needed in math instruction.**

   The study constructed the following list of research skills identified by faculty members as crucial skills that should be regarded in conducting research in math education and should be included in the training program: The list contains 44 skills, distributed into 6 axes as follows:

The first axis is start-up skills, which include:

- Utilizing research sources (books, e-books, scientific journals, and websites).
- Choosing a research topic from Theoretical studies and empirical studies.
- Creating a research title.
- Formulate research questions, objectives, and hypotheses.
- Defining terms both theoretically and operationally determining appropriate.
- Identifying statistical methods.
- Writing proposal.

The second axis is data collection skills.

- Primary data.
- Secondary data.
- Quantitative data (survey and experimental).
- Qualitative data (interview and observation).
- Longitudinal data.
- Cross-sectional data.
- Identification and representation of samples.
- Classification and analysis of data.

The third axis is quantitative research design skills (both survey and experimental):

- Survey.
- Comparative research.
- Relational research.
- Experimental research.
- Queasy semi-experimental research.

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- Designing of questionnaires.
- Definition of variables.
- Validity reliability, consistency, and internal consistency of the instrument.

The fourth axis is qualitative Research Design Skills.

- Interview with open-ended questions.
- Interview-specific questions.
- Direct observation by the researcher.
- Observation through technological means.
- Observation with others (shared).
- Interview Ethics.
- Ethics of observation.

The fifth axis: Writing Skills:

- Abstract.
- The introduction.
- Theoretical and privies studies.
- Methodology.
- Findings and discuss results.
- Conclusions.
- Recommendations and suggestions.

The sixth axis: References and Citing Skills

- Use of different reference models.
- Citing.
- References.
- Books.
- Journals.
- Electronic means.
- Thesis and dissertations.

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2. Results related to the second objective, which is to find out the extent of research skills needed

A. The study discovered that research skills are truly needed in math education across all axes, with the overall mean of the replies being (2.28), out of (3.00). The responses ranged from the greatest mean for the fifth axis (2.43) to the lowest mean for the fourth axis (2.15). The data is shown in the following table.

Table (1) illustrates the Mean and Std. Deviation

	First axis	Second axis	Third axis	Forth axis	Fifth axis	Sixth axis	Total resolution
N	83	83	83	83	83	83	83
Mean	2.41	2.25	2.21	2.15	2.43	2.25	2.28
Std. Deviation	.498	.512	.523	.554	.630	.661	.476

B. For the first axis, the mean score for all responses is (2.41), while the means of the questions ranged from 2.60 (skill No. 1) to 2.32 (skill No. 2). The data is shown in the following table.

Table (2) illustrates the Mean and Std. Deviation

	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	First axis
N	83	83	83	83	83	83	83	83
Mean	2.60	2.32	2.42	2.45	2.34	2.40	2.35	2.41
Std. Deviation	.670	.683	.681	.650	.718	.660	.706	.498

C. For the second axis, the mean score for all responses is (2.25), while the means of the questions ranged from 2.52 (skill No. 15) to 2.07 (skill No. 12). The data is shown in the following table.

Table (3) illustrates the Mean and Std. Deviation

	Q 8	Q 9	Q10	Q11	Q 12	Q 13	Q 14	Q 15	second axis
N	83	83	83	83	83	83	83	83	83
Mean	2.35	2.15	2.26	2.19	2.07	2.12	2.33	2.52	2.25
Std. Deviation	.720	.773	.717	.735	.677	.681	.703	.669	.512

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D. For the third axis, the mean score for all responses is (2.21), whereas the means of the questions ranged from 2.28 (skill No. 19) to 2.07 (skill No. 20). The data is shown in the following table.

Table (4) illustrates the Mean and Std. Deviation

	Q 16	Q 17	Q 18	Q 19	Q 20	Q 21	Q 22	Q 23	Third axis
N	83	83	83	83	82	83	83	83	83
Mean	2.26	2.23	2.16	2.28	2.07	2.27	2.19	2.24	2.21
Std. Deviation	.700	.750	.695	.646	.644	.686	.735	.704	.52313

E. The fourth axis's overall mean of responses is (2.15); the questions' means ranged from 2.29 (skill No. 29) to 2.06; and (skill No. 25). The data is shown in the following table.

Table (5) illustrates the Mean and Std. Deviation

	Q 24	Q 25	Q 26	Q 27	Q 28	Q 29	Q 30	Forth axis
N	83	83	83	83	83	83	83	83
Mean	2.12	2.06	2.15	2.13	2.08	2.29	2.24	2.15
Std. Deviation	.699	.722	.723	.689	.669	.654	.678	.5539

F. The fifth axis's overall mean of responses is (2.43), whereas the averages of the particular questions ranged from 2.52 (skill No. 31) to 2.32 (skill No. 25). The data is shown in the following table.

Table (6) illustrates the Mean and Std. Deviation

	Q 31	Q 32	Q 33	Q 34	Q 35	Q 36	Q 37	Fifth axis
N	83	83	83	83	83	83	83	83
Mean	2.52	2.47	2.41	2.36	2.44	2.47	2.32	2.43
Std. Deviation	.705	.704	.718	.740	.768	.721	.783	.62905

G. For the sixth axis, the mean score for all responses is (2.25); nevertheless, the means of the questions ranged from 2.31 (skill No. 38) to 2.17. (skill No. 44). The data is shown in the following table

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Table (7) illustrates the Mean and Std. Deviation

	Q 38	Q 39	Q 40	Q 41	Q 42	Q 43	Q 44	Sixth axis
N	83	83	83	83	83	83	83	83
Mean	2.31	2.27	2.22	2.23	2.29	2.24	2.17	2.25
Std. Deviation	.728	.721	.782	.766	.777	.754	.718	.66120

3. **Results related to the third objective, which is to examine whether there are any significant differences in the degree of the skills required within axes and between universities.**

A. The results of the ANOVA demonstrate that there are differences in the estimation of necessary research skills in the fifth axis that are significant; the value of (sig) is.031, which is less than.05. The values of (sig) for the remaining axes are, in order,.240,.285,.280,.218,.054, which indicate that there are no significant differences between these axes. The results demonstrate that the difference is most pronounced on the fifth axis (writing research), where this axis' mean is (2.43).

B. There are no significant differences in the skills needed for research between universities.

Conclusions

The aforementioned findings demonstrate that private universities in the Kurdistan Region of Iraq have a critical need for research skills among their faculty members across all disciplines, as evidenced by the fact that the mean faculty responses outperformed the theoretical mean (2) in all categories of research skills. The findings are consistent with real life at universities, where new starter staff often report that they face many problems while conducting research.

Recommendations

The following is what the researcher recommends:

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1. Faculty member training programs for conducting research in math education should be adopted by the Kurdistan Region of Iraq's Ministry of Higher Education and Scientific Research.
2. Universities should implement training programs on research techniques for math teachers with various levels of experience.
3. It is important to set up training programs that only cover the specialized knowledge needed in each profession.
4. To prepare trainers for new training techniques and advancements in the field of training, training courses should be conducted.
5. Specialized departments or units should be established by the universities in the region to train the teaching staff in scientific research techniques as part of a unified program with continuity.
6. As one of the requirements for scientific promotion, universities rely on faculty members' attendance at a set number of courses on scientific research techniques.

Suggestions for further research studies:

1. Conducting a study on new teachers' research abilities in relation to their various specialties.
2. Conduct an investigation into professional instructors' research abilities.
3. Comparative research on the research abilities required of in-service science, humanities, medicine, and applied sciences teachers
4. Conducting comparative research on the impact of training on groups of faculty members who received training as well as those who did not is essential.
5. Carrying out research on how training at universities affects students' academic success.

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بەرنامەی ڕاهێنان بۆ بەدەستهێنانی کارامەیی تۆێژینەوە لە شێوازەکانی فێرکردن بۆ ئەندامانی فاکەڵتی بیرکاری لە ئاستی زانکۆ

پوختە

ئامانجی سەرەکی ئەم تۆێژینەوەیە دیاریکردنی کارامەییەکانی تۆێژینەوەیە کە پێویستن بۆ پڕۆگرامێکی ڕاهێنان لە شێوازەکانی فێرکردنی بیرکاری کە بۆ ئەندامانی تازە دەست بەکاربووی فاکەڵتی بیرکاری دارێژراوە بە مەبەستی باشترکردنی توانای تۆێژینەوەکانیان، جگە لەوەش تۆێژینەوەکە هەوڵدەدات بزانێت کام لایەنی کارامەییەکانی تۆێژینەوە زیاتر پێویستە بۆ بەرنامەی ڕاهێنان.هەروەها، شێوازی وەسفکەری شیکاری بەکاردەهێنرێت تیایدا. پرسیارنامەیەک بۆ کۆکردنەوەی زانیارییەکان ئامادەکراوە. ڕەوایی و متمانەپێکراوی و یەکدەنگی پرسیارنامەکە پشکنینیان بۆ کراوە. نمونەیەکی هەڕەمەکی هەڵبژێردراوە کە ٧ زانکۆی ئەهلی هەرێمی کوردستان دەگرێتەوە. (SPSS) بەکارهاتووە، و مامناوەندێتی، پەیوەندی لادانێکی ستاندارد، و ANOVA بۆ پڕۆسێسکردنی داتاکان بەکارهێنراوە. تۆێژینەوەکە دەریخستووە کە پێویستییەکی زۆر هەیە بۆ لێهاتوویی تۆێژینەوەکە لە هەر شەش لایەنی تۆێژینەوەکەدا.

برنامج تدريبي لاكتساب مهارات البحث في طرق التدريس لأعضاء هيئة تدريس الرياضيات على مستوى الجامعة

الملخص

الهدف الرئيسي من هذه الورقة هو تحديد المهارات البحثية اللازمة لبرنامج تدريبي في طرائق تدريس الرياضيات مصمم لأعضاء هيئة تدريس الرياضيات المبتدئين من أجل تحسين كفاءتهم البحثية ، فضلاً عن ذلك تحاول الدراسة معرفة جوانب المهارات البحثية الأكثر حاجة لبرنامج التدريب. تمّ استخدام الأسلوب الوصفي التحليلي. وأعدت الباحثة استبياناً لجمع البيانات، تم التحقق من صدقه وثباته وإتساقه الداخلي تمّ اختيار عينة عشوائية تتكون من 7 جامعات خاصة في اقليم كوردستان العراق. تم استخدام (SPSS) ، والمتوسط الحسابي، ومعامل الإرتباط ، والانحراف المعياري، و ANOVA لمعالجة البيانات. وجدت الدراسة أن هناك احتياجات أساسية لمهارات البحث في جميع جوانب البحث الستة.