Developing Future Skills in Teacher Education: Insights from Omani Pre-service Teachers

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ABSTRACT

This study uses a quantitative methodology, employing a structured questionnaire, to examine the effectiveness of courses offered by Rustaq College of Education in enhancing students' future skills. The study focuses on pre-service teachers' perceptions within the context of the Omani Future Skills Paradigm Framework. The study results show that these courses play a critical role in developing essential competencies, particularly in embracing diversity and open-mindedness. The study also identifies areas for improvement, including the need for ongoing development, and clearer problem articulation. The study found that students value interactive learning, and respectful collaboration in diverse teams. This study provides insights that could improve teacher education by prioritizing future skills and informing professional development programs for teachers.

Keywords: future skills, higher education, preservice teacher, teacher education.

INTRODUCTION

For education research today, future skills have become an essential area. While higher education institutions have traditionally excelled in teaching established curricula, they often encounter challenges in preparing students for future demands. Discussions surrounding future skills highlight digital literacy but are often complicated by ambiguity (Kotsiou et al., 2022). Equipping students with

essential skills is important in higher education to ensure they are ready for a rapidly changing world. Efforts are underway to anchor future skills in educational theory in response to employers' demand for specific skills (Aliu et al., 2022). Furthermore, universities are promoting student well-being, life skills, and implementing interventions to support growth-oriented outcomes, with continuous efforts to adapt courses to improve students' skills (Chu & Takahashi, 2024; Karunarathne & Calma, 2024; Attipoe, 2024).According to the Omani national framework for future skills, one of the essential qualities of teachers is their professional preparedness to meet future demands, as highlighted by other sources evaluating teacher preparation (Davis & Morrow, 2021). Furthermore, teachers should have extensive knowledge of both subject matter and teaching methodology, while continuously updating their competencies and skills to align with workplace requirements (Ferguson, 2023; Masud et al., 2022; Chuang, 2021). Other abilities include the qualification of learning skills, such as lifelong learning and self-directed learning (Mhlanga, 2023; Baevski et al., 2020; Eysenbach et al., 2018), as well as the ability to use technology effectively and create a conducive learning environment (Du et al., 2023; Glaese et al., 2022; Qarkaxhija et al., 2023). Recognizing the significance of cultivating future skills within the context of the Omani Future Skills Framework, this study aims to enhance the development of such skills among pre-service teachers. It evaluates the effectiveness of the courses provided by Rustaq College of Education (RCE) at the University of Technology and Applied Sciences (UTAS) in Oman on students' growth in future skills. This study aligns with the Omani Framework for Future Skills and aspires to offer valuable insights that can inform other future skills frameworks. To guide this investigation, the study has formulated the following research questions:

1) What are the definitions of future skills?
2) What frameworks exist for understanding future skills?
3) What are the pre-service teachers' opinions on the contribution of RCE courses to enhancing their future skills?

Achieving this objective will improve our understanding of future skills and inform us how we can improve our courses. To collect data, 128 pre-service teachers at RCE at UTAS completed questionnaires. The most important finding is that the courses introduced at RCE considerably improve students' applied and technical skills. These courses improve planning, decision-making, and creative problem-solving abilities in both academic and professional settings. However, areas for further improvement remain, such as implementing ideas through unconventional and diverse methods, effectively using communication tools to achieve various objectives, and fostering teamwork and collaboration skills. The study results can be used to improve courses in colleges of education by incorporating a stronger focus on future skills in teacher education. Additionally,

the study findings could be used for professional development programs for teachers.

LITERATURE REVIEW

Future skills are defined as essential competencies that enable learners to adapt, thrive, and work effectively in a rapidly changing world, making optimal use of information, media, and technology, solving complex problems, and acting in highly emergent contexts (The Ministry of Education & Ministry of Higher Education, 2021; Ehlers, 2022; Passing, 2003; Samochowiec, 2022). These skills are important for various dimensions of life, including social, economic, and political spheres. They go beyond mere preparation for potential futures, emphasizing active participation in shaping the future collaboratively (Samochowiec, 2022). Despite the long-standing discussion on future skills, there remains conceptual ambiguity regarding which specific skills fall under this category (Kotsiou et al., 2022; Weng, 2015). Beyond mere readiness for potential eventualities, future skills entail active participation in collaboratively shaping forthcoming trajectories (Samochowiec, 2022). Future Skills and 21st Century Skills are two different concepts. Future Skills include a variety of abilities needed to prepare for future challenges, whereas 21st Century Skills focus on essential skills for success in this era. Although both aim to equip individuals for the future, Future Skills have a broader scope, while 21st Century Skills are more specifically tailored to the present era's demands (Kotsiou et al., 2022). Temiz, G. (2024) showed that teaching with 21st-century skills offers various opportunities, though it also presents challenges related to contextual factors. Various frameworks and models have been proposed to categorize and prioritize future skills. According to Ehlers (2022), future skills can be divided into three main categories. The first is subject-development-related competencies, which include skills that enable individuals to develop themselves, learn autonomously, and act confidently and ethically in complex and uncertain situations. These skills involve learning literacy, self-efficacy, self-determination, reflective competence, decision-making competence, initiative, ambiguity competence, and ethical competence. The second category is object-related competencies, which refer to skills that help individuals interact creatively, analytically, and systemically with specific objects, topics, or tasks, even in emergent contexts. Examples of these include design thinking, innovation competence, systems competence, and digital literacy. Finally, organization-related competencies consist of skills that enable individuals to communicate, cooperate, and collaborate effectively within social, organizational, and institutional environments, thereby creating meaning and value for the future. This category includes sensemaking, future and design competence, cooperation competence, and communication competence. Another model, the 3W model (Wissen, Wollen, Wirken), is used to explain the skills required for future

shaping, emphasizing the importance of knowledge, motivation, and action (Samochowiec, 2022). The 3W model comprises three components: Wissen (Knowledge), Wollen (Motivation), and Wirken (Action). The first component stresses the importance of gaining and understanding relevant information about the future, including its potential challenges and opportunities. The second component highlights the importance of a proactive mindset, a desire to make a positive impact, and the motivation and willingness to actively shape the future. The third component focuses on applying knowledge and motivation to implement ideas and initiatives that contribute to creating a desired future. In essence, the 3W model encourages individuals to acquire knowledge, develop a desire to make a difference, and act toward building a better future (Samochowiec, 2022). Kotsiou (2022) identified nine categories of skills for the future: critical thinking, creativity, collaboration, communication, adaptability, global awareness, entrepreneurship, emotional intelligence, and digital literacy. The Omani national framework for future skills classifies future skills into three primary domains: essential skills, applied skills, and technical skills, as illustrated in Figure 1. Essential skills help learners acquire and effectively use knowledge, including abilities like reading, writing, mathematics, languages, self-awareness, self-management, and social awareness. Applied skills enable learners to apply their knowledge and essential skills in diverse contexts, including problem-solving, critical thinking, creativity, innovation, communication, collaboration, and leadership. Lastly, technical skills empower learners to use technology and information across various fields, covering digital literacy, media literacy, information literacy, financial literacy, scientific literacy, and environmental literacy, as specified by the Ministry of Education and the Ministry of Higher Education in Oman.

Figure 1: *Omani National Framework for Future Skills*
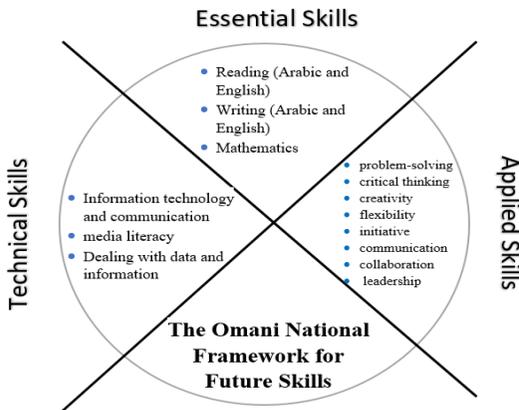
Note. This model was produced by the Ministry of Education & Ministry of Higher Education in Oman, 2021.

In today's rapidly changing job market, educational institutions must prioritize key aspects to ensure that students are equipped with the skills and knowledge necessary for success. These essential elements include workplace integration, global awareness, digital literacy, reflective practice, and career management proficiency. Several studies highlight an important gap between the skills students believe they possess, and the proficiencies employers seek in potential candidates (Al-Busaidi & Tuzlukova, 2021; Martini et al., 2021). While students recognize the value of academic coursework in fostering skill development, they may underappreciate the potential benefits of extracurricular activities and support services (Martini et al., 2021; Swingler et al., 2019). By incorporating these crucial elements into educational frameworks, higher education institutions can help bridge the skills gap and equip students with the competencies necessary for success in today's dynamic workplaces. Bridging the skills gap is essential for Omani teacher education, particularly as the country undergoes significant reforms to align with Vision 2040, emphasizing the importance of a knowledge-based economy. Teachers play an important role in this transformation; however, many encounter challenges integrating modern pedagogical practices, digital literacy, and critical thinking into their teaching. Closing this gap is vital to ensure that teachers are adequately equipped to meet the demands of contemporary education and effectively contribute to the country's progress (Oman Vision 2040 Implementation Follow-up Unit, 2020).

Additionally, measuring program outcomes (POs) serves as a key relationship between the skills required by industry, the curriculum, and the knowledge and abilities students possess. POs ensure that the program's curriculum aligns with societal needs and that students acquire the knowledge and skills necessary to become successful professionals (Amirtharaj et al., 2022). Therefore, this study aims to: Analyzing preserves teachers' views on the role of the RCE at the UTAS in developing technical and applied skills in alignment with the Omani Future Skills Framework. Determining the differences in viewpoints among the sample responses based on major, gender, and academic year.

RESEARCH METHOD

A quantitative methodology was employed based on the study's objectives (Kaplan, 2004). The study employed a structured questionnaire to gather preservice teachers' perspectives on the contribution of RCSs in fostering future skills within the context of the Omani Future Skills Framework. This approach was chosen for this study to ensure systematic data collection and facilitate statistical analysis. This method effectively captures measurable patterns and draws generalizable conclusions from large groups, which is key for studying perceptions and identifying trends (Creswell & Creswell, 2017). A structured questionnaire ensures consistency and reduces researcher bias, making it particularly suitable for

exploring the skills gap in Omani teacher education to yield actionable insights. The development and flow of the questionnaire are illustrated in Figure 2.

Figure 2

The Questionnaire Components
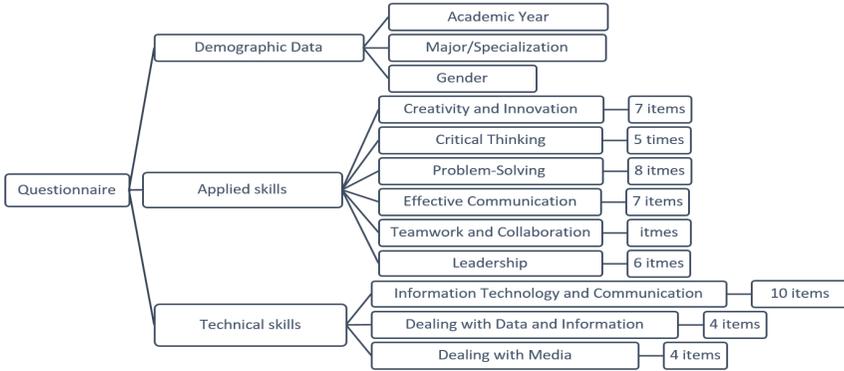
The questionnaire utilized a 5-point Likert scale: strongly agree, agree, neutral, disagree, and strongly disagree (Alabi & Jelili, 2023). This Likert scale was chosen because it effectively captures the nuances of participants' perceptions and attitudes, quantifies subjective opinions, and measures constructs like agreement and confidence in a manner that is both reliable and easy to analyze (Joshi et al., 2015). The study employed the Qualtrics XM platform to distribute questionnaires and collect data.

Participants

The study population consisted of 416 students registered in their third and fourth years for the Fall 2023 semester at RCE at UTAS. Data was collected by distributing a questionnaire to 147 preservice teachers, of which 19 questionnaires were deemed invalid. Consequently, the number of valid questionnaires used in the study was 128. The questionnaire was completed by students from various disciplines at RCE, as shown in Table 1.

This study relied on insights from students in their third and fourth academic years, as they have completed many advanced courses. Mathematics has the highest representation among academic disciplines, accounting for 44%, followed by English at 22%. Chemistry, Physics, and Biology have lower percentages, with Chemistry being the least represented at 8.33%. The respondent pool is slightly skewed toward males, who constitute 59.09%, while females comprise 40.91% of the participants.

The study employed various data analysis tools, including Statistical Package for Social Sciences (SPSS) version 27, to analyze the study results.

Several analyses were conducted: Cronbach's alpha test was used to verify the reliability of the questionnaire; means, standard deviations, and ranks were calculated; an independent sample t-test was performed to compare the mean responses of different groups; and an independent sample Kruskal-Wallis's test was used to compare the means of group responses. The Kruskal-Wallis test is a non-parametric alternative to one-way ANOVA, making it particularly suitable for comparing medians across multiple independent groups when assumptions of normality are not met or when sample sizes are small (Hollander, 2013). The t-test, on the other hand, is used to compare the means of two independent groups under the assumption that the data is approximately normally distributed, and the sample size is appropriate enough. Additionally, the scale provided in Table 2 was adopted to determine the degree to which the questionnaire items met the level of acceptance among the sample.

Table 1: *Characteristics of the Participants*

Response rate and characteristic	No. of respondents (% of sample)	Total of all students	Percentage of the sample out of the total students
Academic Year (Overall N = 128)			
Year 3	62/128 (48.44%)	236	26.27
Year 4	66/128 (51.56%)	180	36.67
Academic disciplines (Overall N = 128)			
English	26/128 (20.31%)	87	29.89
Mathematics	58/128 (45.31%)	101	57.43
Chemistry	10/128 (7.81%)	90	11.11
Physics	15/128 (11.72%)	55	27.27
Biology	19/128 (14.84%)	83	22.89
Gender (Overall N = 128)			
Male	76/128 (59.38%)	195	38.97
Female	52/128 (40.64%)	221	23.53

Table 2: *The Degree to Which the Items of the Questionnaire Met the Level of Acceptance Among the Sample*

Degree	Low	Medium	High
Mean	1.00 – 2.60	>2.60 – 3.40	>3.40 - 5

Note: *Reprinted from Alkharusi, H. (2022). A descriptive analysis and interpretation of data from Likert scales in educational and psychological research. Indian Journal of Psychology and Education, 12(2), p. 15.*

To verify the validity of the apparent scale, it was submitted to professors for review, to modify or remove certain items within the questionnaire. This process aimed to improve the accuracy and objectivity of the study measurements (Taherdoost, 2016). The researchers employed Cronbach's alpha test to ensure the reliability of the study tool. This method is adopted to examine the reliability of survey analysis results by assessing the consistency of responses among participants. By validating the results through coefficient tests, this test determines the feasibility of disseminating the findings to the community (Bujang et al., 2018). The coefficient results are presented in Table 3.

Table 3: *Reliability Statistics of the Questionnaire*

Number of cases	Number of questions	Cronbach's alpha
40	59	0.984

Note: The value of Cronbach's alpha, which is 0.984, shows that the questions in the questionnaire are highly reliable and consistent. This high coefficient suggests that the survey is a good tool for measuring what it was designed to measure.

RESULTS

Applied Skills:

Descriptive statistics were calculated for the sample responses regarding the role of RCE at UTAS in fostering technical skills aligned with the Omani Future Skills Framework. Obtained results are presented in Tables 4, 5, 6, 7, 8, and 9.

Based on the mean scores and assigned levels, it can be concluded that students of RCE have a positive attitude toward the role of courses in fostering creativity and innovation. The item "Working on innovative ideas to make a tangible contribution" received the highest mean score of 4.08 and the highest rank, showing that respondents believe it is highly important to actively participate in innovative endeavors within their academic field. According to the survey results, the two statements "encouraging the presentation of new and unconventional ideas" and "developing new ideas and effectively implementing them" received high mean scores of 4.05 and 3.98, with positive ranks. This shows that students generally agree with these statements. The statement "openness and responsiveness to new and diverse perspectives" was also agreed upon by the students, but the mean score and standard deviation indicate a moderate level of agreement with some variability in responses. This suggests that while students perceive this area positively, there is some diversity in their responses.

Creativity and Innovation:

Table 4: *Descriptive Statistics of Participants' Responses to Creativity and Innovation Skills* (*N*=128)

	Mean	Std. Deviation	Level	Rank
Openness and responsiveness to new and diverse perspectives	3.77	.898	High	5
Viewing failure as an opportunity for learning involves small successes and repeated mistakes	3.59	1.007	High	7
Encouraging the presentation of new and unconventional ideas	4.05	.975	High	2
Implementing ideas using unconventional and diverse methods	3.70	.967	High	6
Working on innovative ideas to make a tangible contribution to the field I am studying	4.08	1.039	High	1
Developing new ideas and effectively implementing them	3.98	1.023	High	3
Gradually or partially innovating new ideas	3.89	.958	High	4

Table 5: Descriptive *Statistics of Participants' Responses to Critical Thinking Skill*s (*N*=128)

	Mean	Std. deviation	Level	Rank
Accepting criticism of the ideas I present	3.96	.951	High	4
Presenting different perspectives on given alternatives	3.95	.912	High	5
Purposeful analysis based on logical arguments to reach valid judgments	4.07	.998	High	3
Analyzing and evaluating my ideas to enhance and multiply my innovative efforts	4.10	1.018	High	2
Accepting the perspectives of others without bias or self-centeredness	4.22	1.019	High	1

However, the statement "viewing failure as an opportunity for learning" received a lower mean score and a higher standard deviation, indicating more variability in responses. This suggests that students have differing views on failure as an opportunity for learning. Students place considerable value on the

implementation of innovative practices to attain tangible results and to develop and execute new ideas. While they demonstrate an openness to diverse perspectives, some inconsistencies suggest a need to strengthen the focus on the practical benefits of these practices. Additionally, differing opinions about viewing failure as a learning tool highlight an important area for improvement within the curriculum.

Critical Thinking:

Table 6: *Descriptive Statistics of Participants' Responses to Problem-Solving Skills* (*N*=128)

	Mean	Std. deviation	level	Rank
Identifying the problem clearly and specifically	3.91	1.004	High	7
Proposing various solutions to the problem	3.92	.875	High	6
Analyzing aspects related to the problem	3.84	1.015	High	8
Planning to find appropriate ways to solve the problem	4.20	.905	High	1
Responding flexibly to changing circumstances around the problem	3.98	.855	High	4
Evaluating different solutions to the problem and choosing the most suitable	3.94	.970	High	5
Solving various types of unconventional problems using non-traditional and creative methods	4.04	.873	High	3
The ability and skill to make decisions	4.17	.870	High	2

Based on the mean scores and assigned levels, it can be inferred that the courses offered at RCE have substantially contributed to the development of critical thinking skills. The relatively low standard deviations across all the statements show a consistent level of agreement among the respondents. The highest mean score of 4.22 and rank was given to "accepting the perspectives of others without bias or self-centeredness," suggesting that the courses strongly emphasize the importance of being open-minded and impartial when considering other people's viewpoints. Additionally, "analyzing and evaluating my ideas to enhance and multiply my innovative efforts" and "purposeful analysis based on logical arguments to reach valid judgments" received high mean scores of 4.10 and 4.07, respectively, indicating strong agreement with the value of analytical thinking and logical reasoning in the courses. According to that students value

open-mindedness, self-analysis for improving ideas, and logical reasoning. Consistent agreement across responses suggests the courses effectively promote critical thinking skills.

Problem Solving:

Based on the Likert scale survey, the courses offered at RCE have positively contributed to the development of problem-solving skills. The assigned levels and mean scores demonstrate that respondents agree on the effectiveness of the courses in various aspects of problem-solving. The relatively low standard deviations across all statements show consistent agreement among the respondents. According to the survey results, the two critical aspects of problem-solving are "planning to find appropriate ways to solve the problem" and "the ability and skill to make decisions." These statements received the highest mean scores of 4.20 and 4.017, respectively, and are considered the most crucial aspects of problem-solving enhanced by the courses. As a result, Students agree that the courses improve their ability to plan solutions and make informed decisions when problem-solving. This agreement points to the courses' effectiveness in building these crucial skills.

Effective Communication (Oral and Written):

Table 7: *Descriptive Statistics of Participants' Responses to Effective Communication Skills* (*N*=128)

	Mean	Std. deviation	Level	Rank
Listening effectively to others to achieve the intended meaning	3.99	.918	High	4
Using communication tools effectively to achieve various goals (news, guidance, motivation, persuasion)	3.84	.943	High	7
Using symbols, graphics, and expressions to describe and simplify presented information to others	3.91	.891	High	5
Expressing ideas and opinions effectively using communication tools	4.13	.891	High	1
Possessing verbal and non-verbal communication skills	4.02	.960	High	3
Speaking fluently in front of others	4.09	.959	High	2
Communicating effectively in diverse and multilingual environments	3.91	1.035	High	5

The mean scores and assigned levels indicate an overall positive response toward the contribution of courses at RCE to developing various aspects of effective communication, as covered in the Likert scale survey. The relatively low standard deviations across all statements suggest a consistent level of agreement among respondents for each aspect of effective communication. "Expressing ideas and opinions effectively using communication tools" received the highest mean score and rank, suggesting that students view the courses as highly effective in developing communication skills. Additionally, the statements related to "speaking fluently in front of others" and "possessing verbal and non-verbal communication skills" received high mean scores and positive ranks, indicating consistent agreement on the importance of courses in enhancing fluency and overall communication skills. According to that, Students agree that the courses improve their communication skills, particularly using tools, public speaking, and verbal/non-verbal communication. This agreement highlights the courses' effectiveness in developing well-rounded communicators.

Teamwork and Collaboration:

Table 8: *Descriptive Statistics of Participants' Responses to Teamwork and Collaboration Skills* (*N*=128)

	Mean	Std. deviation	Level	Rank
Committing to the rules, laws, and instructions of the group	3.96	.891	High	8
Recognizing the importance of responsibility in teamwork	4.16	.909	High	2
Working effectively and respectfully with diverse groups	4.14	.920	High	3
Making necessary concessions to achieve a common final goal for the group	4.11	.872	High	6
Acquiring substantial knowledge through interactive engagement with members of my group in social situations	4.17	.833	High	1
Building and collaborating with a team	4.07	.932	High	7
Evaluating the group's work and that of other groups in a sound manner	4.12	.819	High	5
Designing web-based cognitive tasks on research, thinking, information analysis, and evaluation through collaborative efforts with my peers within my group	4.14	1.010	High	3

Based on the Likert scale survey, the mean scores and assigned levels suggest a positive overall perception of the effectiveness of courses offered by RCE in fostering teamwork and collaboration among students. Additionally, the relatively low standard deviations across all statements show consistent agreement among respondents for each aspect of teamwork and collaboration covered in the survey. "Acquiring substantial knowledge through interactive engagement with members of my group in social situations" received the highest mean scores of 4.17 and 4.16. This suggests that respondents consider interactive learning and knowledge acquisition to be the most crucial aspect of teamwork. Statements related to "recognizing the importance of responsibility in teamwork," "working effectively and respectfully with diverse groups," and "making necessary concessions to achieve a common final goal for the group" received high mean scores and positive ranks, indicating consistent agreement on the importance of responsibility and effective collaboration. While all statements have high mean scores, there is slight variability in the level of agreement. Mean scores range from 3.96 to 4.17, suggesting that respondents perceive acquiring knowledge through interaction as slightly more crucial than other aspects. As a result, Students value interactive learning, responsibility, respectful collaboration in diverse teams, and compromise for common goals. The emphasis on collaborative knowledge construction appears particularly effective.

Leadership:

Table 9: *Descriptive Statistics of Participants' Responses to Leadership Skills* (*N=128*)

	Mean	Std. deviation	Level	Rank
Leading work teams	3.81	.830	High	5
Having sufficient influence on others in most contemporary issues	4.05	.797	High	3
Making decisions quickly	4.08	.857	High	2
Having the ability to work under pressure	3.84	.876	High	4
Having the ability to motivate and encourage	4.20	.854	High	1
Providing ample opportunities for the practice of leadership skills	3.73	.920	High	6

According to the Likert scale survey, the courses introduced at RCE have been perceived positively by the students in terms of various aspects of leadership covered in the survey. The mean scores and assigned levels suggest an overall positive perception of the courses' effectiveness. The relatively low standard deviations show a consistent level of agreement among the respondents for each

aspect of leadership covered in the survey. "Having the ability to motivate and encourage" received the highest mean scores of 4.20 and 4.08. Statements related to "having sufficient influence on others in most contemporary issues" and "making decisions quickly" also received high mean scores and positive ranks, indicating consistent agreement on the importance of influence and prompt decision-making in leadership within the courses. Accordingly, students estimate motivation, influencing others, and decisive decision-making as key leadership skills developed by the courses. This agreement highlights the courses' effectiveness in fostering these qualities.

Table 10: *Descriptive Statistics of Participants' Responses to Information Technology and Communication Skills (N =128)*

	Mean	Std. deviation	Level	Rank
Using technology as a tool for research, organization, evaluation, and information delivery	4.11	.872	High	4
Completing and submitting all tasks and assignments on time through dedicated electronic platforms for each course	3.91	.926	High	9
Possessing a culture of academic integrity in conveying and exchanging information through documentation and proper attribution	4.06	.937	High	5
Understanding the importance of modern technologies and their contribution to scientific progress in this era	3.80	.942	High	10
using digital technology, communication tools, and social networks Successfully to access information management	4.19	.894	High	2
Efficiently and effectively accessing information (time) and (sources)	4.29	.871	High	1
Understanding the ethical and legal issues related to accessing and using information	4.02	.773	High	6
Verifying the accuracy of information presented on websites	4.12	.875	High	3
Using digital libraries and virtual museums to obtain information	3.99	.960	High	7
Designing computer models as evidence of technological literacy in applying problem-solving steps	3.98	.968	High	8

Technical Skills:

Descriptive statistics were computed for the sample responses regarding the role of RCE at UTAS in fostering applied skills aligned with the Omani Future Skills Framework. The results obtained are presented in Table 10.

Information Technology and Communication:

The results show that RCE is performing well in teaching technology and information management courses. Students strongly agree that these courses have helped them develop their technology skills for various purposes. They find it easy to access information efficiently and effectively, suggesting a high level of digital literacy and resourcefulness. The overall mean score for all aspects related to technology and information management is high. While the mean score for timely submission through electronic platforms is relatively lower at 3.91, it is still above the midpoint, indicating a generally good but improvable practice. Subsequently, Students agree that the courses improve their technology skills and ability to access information effectively. While electronic submission practices are generally good, there's room for improvement.

Dealing with Data and Information:

Table 11: Descriptive Statistics of Participants' Responses to Dealing with Data and Information Skill (*N*=128)

	Mean	Std. deviation	Level	Rank
Collecting data from reliable and diverse sources	4.06	.970	High	2
Organizing data and presenting it in different ways for easy handling	4.02	.715	High	3
Analyzing and interpreting data for practical use	4.16	.867	High	1
Making informed decisions based on the available data	4.01	.779	High	4

Based on the survey findings, analyzing and interpreting data for practical use emerges as the most effective aspect, achieving a notably high mean score of 4.16, securing its position as the foremost among the four aspects. Following closely, collecting data from reliable and diverse sources ranks second with a commendable mean score of 4.06. Organizing data and presenting it in various ways for easy handling, despite a slightly lower mean score of 4.02, holds the third position, showing proximity to the second-ranked aspect. In contrast, making informed decisions based on available data garners the lowest mean score of 4.01, placing it fourth among the aspects evaluated. According to that, students excel at

analyzing and interpreting data, followed by strong data collection skills and proficient data presentation. While data-informed decision-making is good, it presents a relative area for growth.

Dealing with Media:

Table 12: Descriptive Statistics of Participants' Responses to Dealing with Media Skills (*N*=128)

	Mean	Std. deviation	Level	Rank
Producing appropriate media content	3.79	1.040	High	3
Analyzing media content	4.08	.857	High	1
Evaluating media content	3.77	1.052	High	4
Using media in education and learning	4.04	.983	High	2

Based on the survey findings, analyzing media content stands out as the highest-rated aspect among the four, with a substantial mean score of 4.08, suggesting that stakeholders perceive this component as particularly effective or well-executed. Following closely, using media in education and learning garners a mean score of 4.04, securing its position as the second-highest rated aspect. In contrast, producing appropriate media content ranks third with a mean score of 3.79. Lastly, evaluating media content receives the lowest mean score of 3.77, positioning it as the fourth-ranked aspect. As a result, students excel at analyzing media content and effectively use media in education. Producing and evaluating media content, while positive, represent relative areas for improvement.

The difference between the means of the responses:

The disparity in means among respondents within the study sample according to major, gender, and academic year was assessed using SPSS 27 as follows:

The difference between the means of the responses of the study sample according to major:

The study utilized the independent samples kruskal-wallis test to measure the differences in means among respondents based on their majors. The results are as follows:

Table 13: *Pairwise Comparisons of Major* (*N*=128)

Sample 1-Sample 2	Test statistic	Std. error	Std. test statistic	Sig.	Adj. Sig.a
Chemistry-Physics	-.150	15.111	-.010	.992	1.000
Chemistry-English	2.692	13.774	.195	.845	1.000
Chemistry-Mathematics	-17.871	12.674	-1.410	.159	1.000
Chemistry-Biology	-37.645	14.461	-2.603	.009	.092
Physics-English	2.542	12.002	.212	.832	1.000
Physics-Mathematics	-17.721	10.722	-1.653	.098	.984
Physics-Biology	-37.495	12.785	-2.933	.003	.034
English-Mathematics	-15.178	8.736	-1.737	.082	.823
English-Biology	-34.952	11.172	-3.129	.002	.018
Mathematics-Biology	19.774	9.784	2.021	.043	.433

Note: Each row tests the null hypothesis that sample 1 and sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050. Significance values have been adjusted by the Bonferroni correction for multiple tests.

According to Table 13, there is a statistically significant difference between the means of Chemistry and Biology (p = 0.009), even after applying the Bonferroni correction (Adj. Sig. = 0.092).

Figure 3: *Independent-Sample Kruskal-Wallis Test Results*
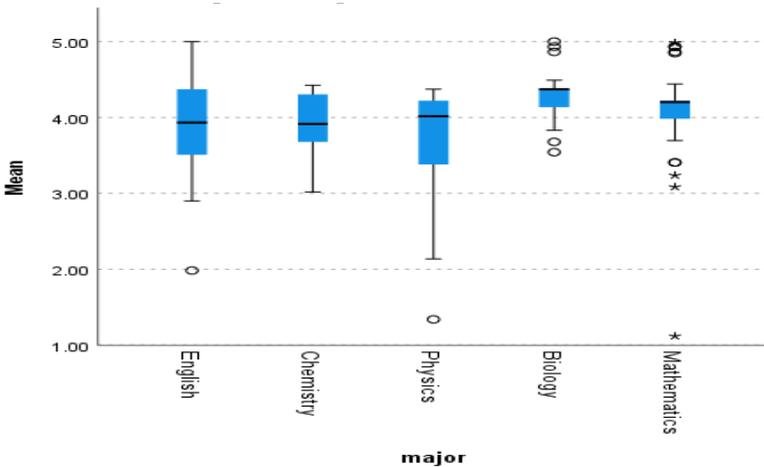
Similarly, the difference between the means of Physics and Biology is statistically significant (p = 0.003), with the significance remaining after adjustment (Adj. Sig. = 0.034). Additionally, the difference between the means of English and Biology is statistically significant (p = 0.002) and remains significant following the adjustment (Adj. Sig. = 0.018). However, while the difference between the means of Mathematics and Biology is marginally significant (p = 0.043), it loses significance after Bonferroni correction (Adj. Sig. = 0.433). In general, these results show notable variations in averages among some subjects, especially when comparing Biology with Chemistry, Physics, and English. However, the significance levels vary, and adjustments have been made to account for multiple comparisons to reduce the likelihood of false positives.

The difference between the means of the responses of the study sample according to gender:

The study utilized the independent samples t-test to measure the differences in means between respondents based on their gender. The results are provided in Table 14.

Table 14: *The Difference Between Responses' Means Based on Gender*

Gender	N	Mean	Std. deviation	t	df	Sig. (2-tailed)
Male	76	4.04	.58	0.682	126	0.48
Female	52	3.96	.70			

From this table, there is a small variation in the average values among male and female participants. However, this difference lacks statistical significance according to the provided significance value (p = 0.48). Therefore, no statistically significant difference was observed between male and female responses regarding the contribution of the courses introduced by RCE at UTAS in enhancing students' technical and applied skills.

The difference between the means of the responses of the study sample according to the academic year:

The study used the Independent-Samples T-test to compare means by academic year, as shown in Table 15.

Table 15: *The Difference Between Responses' Means Based on The Academic Year*

Year	N	Mean	Std. deviation	t	df	Sig. (2-tailed)
3	62	3.98	0.5464	-0.4312	126	0.667
4	66	4.03	0.70977			

Based on Table 15, the average values of responses from academic year 3 and academic year 4 show a slight variation, but this difference is not statistically significant (p = 0.667). Therefore, there is no significant difference between the two groups regarding the effectiveness of the courses introduced by RCE at UTAS in developing students' technical and applied skills.

DISCUSSION AND CONCLUSIONS

In conclusion, the results indicate a predominantly favorable outlook among participants regarding the efficacy of the courses implemented by RCE in fostering applied and technical skills within the academic domain. These findings align with the conclusions drawn in Al Farsi's (2022) study. The highest-ranked statements underscore the importance of accepting diverse perspectives without bias, emphasizing the significance of open-mindedness in academic and professional contexts. Participants also highlighted the importance of planning, decision-making, creative problem-solving, and expressing ideas, fluency, and communication skills. Other emphasized skills include responsibility, effective collaboration, interactive knowledge acquisition, motivation, influence, and prompt decision-making. Despite the positive attitudes toward RCE-taught courses and their role in enhancing students' future skills, several areas for improvement were identified. These include encouraging continuous improvement in submission practices to strengthen the digital learning environment, implementing ideas using unconventional methods, offering diverse viewpoints, identifying and analyzing problems, using communication tools effectively, adhering to group rules and guidelines, fostering teamwork, and providing ample opportunities for leadership skill development. Accordingly, professional development programs could consider these skills and focus on student-centered practices, as Asegedom and Weldemariyam (2024) and Henning et al. (2024) recommended. Acknowledging the study's limitations, including potential biases in participant responses and the restricted generalizability due to its application in a specific context (RCE at UTAS) and a focus on a particular specialization (Mathematics, Science, and English). Teacher education programs could utilize these findings to improve the skills of pre-service teachers in the future.

The study aimed to determine the role of courses introduced by the RCE in improving students' future skills in alignment with the Omani Future Skills Framework. The range of skills that students perceived as being achieved reflects the courses' efficiency in improving future skills, especially in accepting diversity and highlighting the importance of open-mindedness in academic and professional contexts. Additionally, the courses fostered problem-solving, planning, decision-making, and creative problem-solving skills in these settings. However, some areas for improvement include encouraging continuous improvement, implementing ideas using unconventional and diverse methods, providing varying viewpoints on available options, and clearly and specifically identifying problems. RCE can use the study results and can be used by RCE to improve its role in improving students' future skills. Additionally, the study findings can inform professional development programs by highlighting the skills that faculty should emphasize in courses across various colleges. The study also identified key course attributes by strengthening perceptible skills and recognizing less palpable ones, which may contribute more meaningfully to improving the overall efficacy of the courses introduced by universities. The scope of this study was limited in terms of the study sample and culture. The study sample did not include multiple universities, being restricted to the RCE in Oman. Additionally, the study was limited by its focus on the Omani Future Skills Framework, its population (students at the RCE at UTAS), its location (Rustaq College of Education), its time frame (fall semester in 2023), and its use of a single study tool (questionnaire).

This study explores pre-service teachers' perceptions of their preparedness within Omani teacher education. Its uniqueness lies in its focus on a specific cultural and educational context, enriching global teacher preparation literature. However, identified limitations highlight essential areas for future research to improve and expand these findings. Future research should prioritize longitudinal studies on skill development, utilize mixed methods for deeper insights, enable cross-cultural comparisons, assess skill-enhancement interventions, create robust skill assessments, and target research toward specific skill gaps like data-driven decision-making and media literacy.

IMPLICATIONS

This study explores pre-service teachers' perceptions of their preparedness within Omani teacher education. Its uniqueness lies in its focus on a specific cultural and educational context, enriching global teacher preparation literature. However, identified limitations highlight essential areas for future research to improve and expand these findings. Future research should prioritize longitudinal studies on skill development, utilize mixed methods for deeper insights, enable cross-cultural comparisons, assess skill-enhancement interventions, create robust

skill assessments, and target research toward specific skill gaps like data-driven decision-making and media literacy.

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