

Research Article

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Author for correspondence:

Houda Abdullah Mohammed Al-Housni

✉ alhousni@squ.edu.om

✉ College of Education, Sultan Qaboos University

A Vision for Leveraging Artificial Intelligence to Nurture Gifted Students in Higher Education Institutions

Houda Abdullah Mohammed Al-Housni^{ID}, Fathi M Abunaser^{ID}, Asma Mubarak Nasser Bani-Oraba^{ID}

Abstract

Background/purpose. The study aimed to develop a vision for employing artificial intelligence to nurture gifted students in higher education institutions.

Methods. Data were collected and analyzed using a descriptive-analytical approach to achieve the study objectives. The study sample consisted of faculty members from several Omani universities: Sultan Qaboos University, the University of Nizwa, Sohar University, the University of Technology and Applied Sciences in Sohar, and the National University of Science and Technology's International Maritime College of Oman. A questionnaire was used as the main instrument for data collection.

Results. The study reached a proposed vision for the use of artificial intelligence to nurture gifted students in Omani higher education institutions. It also revealed the most significant expected challenges to achieve this vision.

Conclusion. The results of the study enhance the achievement of Oman Vision 2040 by seeking to spread the culture of talent, creativity and innovation among higher education institutions and including it in development plans.



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1. Introduction

The recent period has witnessed a significant expansion in gifted and talent care programs worldwide and their orientation towards localizing and establishing them in education institutions. Therefore, these programs need evaluation, development, and follow-up strategies to keep pace with educational and cognitive changes. These strategies must be based on the latest research trends, identifying the needs of gifted and talented people and providing them with appropriate support. In the Sultanate of Oman, the Ministry of Higher Education, Scientific Research and Innovation and other relevant authorities are responsible for achieving the objectives of these programs effectively and tangibly. We believe that raising children is the real learning of people, and it represents the ideal formation of everyone and their human capital, which is their shield from blood or backwardness from other peoples.

In the context of the information age, the concept of artificial intelligence (AI) has attracted the attention of the whole world and has become more and more integrated with the elements of life, especially in education. Given the importance of artificial intelligence, the Sultanate of Oman has sought to be among the countries adopting and developing artificial intelligence technologies. To achieve this, Royal Decree No. 90/2020 was issued establishing the Ministry of Transport, Communications and Information Technology, including its organizational structure, the National Center for Space, Advanced Technology and Artificial Intelligence, in August 2020 (Ministry of Transport, Communications and Information Technology, 2022). Then, work was done on two tracks by establishing the National Program for Artificial Intelligence and Advanced Technologies and the National Space Program.

The top priority of the National Program for Artificial Intelligence and Advanced Technologies is to focus on the education sector, as it is one of the most fundamental sectors and is the main artery for supplying the nation with human energies that drive the wheel of development. The use of artificial intelligence in this sector will contribute effectively to its development to keep pace with digital and technical developments. Many studies, including a study by Al-Haliliya (2018), have stated that artificial intelligence has enabled the automation of the educational process and, thus, its development and improvement.

In this context, the Sultanate of Oman seeks—according to Oman Vision 2040—to achieve high-quality education by integrating technology, enhancing creativity and innovation, building future skills and entrepreneurship, and developing student talents using artificial intelligence. Artificial intelligence also enhances scientific research by providing tools and techniques that help collect and analyze data accurately and effectively, which contributes to achieving significant progress in these two fields, and it has become a tool that saves time and effort for any learner due to the ease of accessing, analyzing, and understanding information (Oman Newspaper, 2023). Some studies, such as a 2018 study by Ajjam, a 2020 study by Zrouki and Falta (2020), and a study by Slimi and Villarejo-Carbalido (2024), have stated that artificial intelligence not only supports learning through data collection but also supports a very important category, which is the gifted and talent category.

Al-Hamidiya (2023) explained that due to the importance of the gifted and talented category, the Sultanate has paid special attention to them by establishing the Youth Center, which enjoys special patronage from His Highness Sayyid Theyazin. The center is considered the largest and most important entity for young talents and translates the lofty directives to develop the skills and talents of young people.

Given the Sultanate's special interest in AI due to its major role in driving the wheel of civilizational progress and building the future, and as gifted and talented students are distinguished minds capable of creativity and innovation, there must be a vision to activate artificial intelligence in discovering and enriching these talents in the Sultanate of Oman at the level of higher education

institutions. An institution's vision is the comprehensive framework for the institution's goals and directs its activities towards achieving the future specified within it. The vision is considered a basic source of continuity and decision-making, and it also represents the starting point that directs institutions towards the future and identifies the challenges that leaders must face. Thanks to the vision, the ambitious goal becomes specific, and leaders work to achieve it and make it a reality for the organization (Al-Makhlafi, 2023). For that, the current study came to develop a proposed vision to activate artificial intelligence in caring for gifted and talent students in Omani higher education institutions.

Based on the above, the study problem can be formulated using the following main question: What is the proposed vision for employing artificial intelligence in nurturing gifted and talented students in Omani higher education institutions? The three sub questions are:

1. What is the degree of academic leadership practice in Omani higher education institutions in using artificial intelligence in nurturing gifted and talented students from the point of view of faculty members?
2. Are there statistically significant differences in the degree of academic leadership practice in Omani higher education institutions in using artificial intelligence in nurturing gifted and talented students from the point of view of faculty members attributed to the variables of academic rank, academic specialization, and university?
3. What are the requirements and challenges of employing intelligence in nurturing gifted and talented students from the point of view of faculty members?

2. Literature Review

2.1. The Concept of Artificial Intelligence

Laudon and Laudon (2010) defined artificial intelligence as a field that aims to simulate human intelligence capabilities and develop intelligent systems that exhibit characteristics similar to human behavior. This is done by using computing and technology to create programs and models based on rules and learning and adaptive algorithms to perform complex tasks (Laudon & Laudon, 2010, p. 227).

With the development of technology and continuous research in this field, the capabilities of artificial intelligence are constantly increasing and are being applied in a variety of fields such as e-commerce, medicine, industry, and data analysis, pushing technology to new levels of development and human benefit. Stoykova & Shakev (2023) defined AI as "everything that aims to develop computerized information systems in a way that enables them to act and think in a manner similar to humans, while at the same time storing accumulated human knowledge and experiences and using them in the decision-making process" (p. 10). Artificial intelligence is of great importance in many fields, including engineering, medicine, and the military, as well as preserving human expertise and making complex decisions (Al-Retimi, 2018).

Artificial intelligence is seen in the Sultanate as an important enabler in enhancing the productivity of economic sectors. His Majesty Sultan Haitham bin Tariq referred in his February 23, 2023 speech to the importance of innovation, artificial intelligence, and advanced technologies in various institutions. The Sultanate ranked 48th internationally and sixth in the Middle East in the Government AI Readiness Index 2020 issued by Oxford Insights (Atheer, 2021). The Sultanate has many competitive advantages in artificial intelligence and advanced technologies, the most important of which are an attractive climate for investments, support for employing technology, and the benefit of the submarine cables available in the Sultanate.

2.2. Talent and the Gifted and Talented

Countries have been interested in talent, the gifted and talented, and the creative since ancient times, and perhaps the beginning was in ancient Sparta, where interest in the gifted and talented began in the field of leadership, horsemanship, and fighting skills (Colangelo & Davis, 2011); then came the Greeks, whose interests were related to teaching mathematics, logic, speech, debate, and politics and excellence in them, and Plato's Academy selected students according to specific criteria related to intelligence and endurance.

Colangelo and Davis (2011) mentioned that interest then moved to Europe; its renaissance was carried out by a group of scientists, artists and writers, such as Da Vinci, Picasso, and Dante, who received moral and material support and encouragement. As for the Chinese, their view of talent was close to the modern view, as talent in their view was based on four principles: first; the multiplicity of talent, so they focused on reading, writing, arithmetic, leadership, and reasoning; second, that there are children who have average abilities, which they will be able to develop later, and there are children of the "prodigy" type; third, that training is the effective method for developing talent in children; and fourth, that all children regardless of their social class should have the opportunity to be educated (Colangelo & Davis, 2011). In contrast, the Japanese cared for the children of the samurai, by teaching them history, language, morals, values, and training in martial arts (Davis & Rimm, 2004).

Throughout the Islamic ages, Arab Muslims were interested in the talented and creative. Children who showed brilliance, intelligence, quick wit, strong memory, and the ability to memorize were enrolled in the councils of scholars and taught religious sciences, language, mathematics, medicine, philosophy, and logic. Many of them excelled, such as Ibn Sina, Ibn Rushd, Al-Khwarizmi, Ibn Khaldun, and others.

The 20th-century interest in giftedness spurred mental measurement, cognitive expansion, and professional efforts, Francis Galton linked talent to heredity, while Alfred Binet, with Simon, developed the first intelligence scale in 1905 and introduced mental age (Shurkin, 1992). The American scientist Lewis Terman (1877–1956) also translated several scales and produced the Stanford Binet Intelligence Scale in 1916. This scale is considered one of the most important for identifying gifted and talented people in the modern era (Colangelo & Davis, 2011).

Accordingly, gifted and talented people are people who have special abilities and talents in one or more academic or nonacademic fields that are socially accepted and appreciated.

2.3. Identifying Gifted and Talented students

Identifying early talents and intelligence is a complex process that includes assessing the mental, creative, and academic abilities; special talents; and personal characteristics of children. This identification aims to discover early readiness and provide the necessary support to develop children's distinguished abilities (Nazeer, 2015).

There are three basic stages in the process of identifying gifted and talented students, which are:

1. Initial screening using the nomination method: The nomination can come from a teacher, parent, peer nomination, and self, and at this stage, an achievement file (Portfolio) can be used in the process of extracting initial data about the student. Initial screening scales are used and often include lists of behavioral characteristics and their forms. It is important to adopt a greater number of initial nomination methods to avoid depriving some gifted and talented children (Ritchotte, J et al., (2016).

2. Application of gifted and talent identification tests: In this stage, various tests and behavioral characteristics scales, in addition to thinking skills tests and critical thinking tests are used (Khalil, 2022).

3. Enrolling gifted and talent people in programs specific to them, in light of their results on the tests and scales that were applied to them: This is in light of their educational, teaching, psychological, and guidance needs and their inclinations. Personal interviews can be conducted with students, and their creative products such as articles, innovations, research, and so forth can be evaluated. The identification procedures and integration of students into the appropriate gifted and talented programs are not sufficient; rather, they must be evaluated continuously during the program using various means and methods, such as: achievement files, project evaluations, and behavioral characteristics lists.

2.4. Nurturing Gifted and Talented Students in the Sultanate of Oman

The Sultanate of Oman has paid attention to its gifted and talent children, and education is free from the first grade to the end of secondary school. In 2009, the Ministry of Education in Oman decided that the best description to be given to those students who possess exceptional abilities is the description “excellent.” It is common to call this category “gifted and talented” in member states of the Arab Bureau of Education for the Gulf States, but calling them “excellent” is a specificity for this category in Oman to describe those who have superior or above-average abilities. This word “excellent” was determined by the Ministry of Education in Oman to be used in official documents describing gifted and talented students: “Those who have the readiness and abilities that distinguish them from their peers, and are valuable to society in one or more of the following areas encompass key domains of individual potential and development: mental ability, academic achievement, creative thinking, social leadership, motor ability, and literary and skill-based arts. Each area represents a distinct dimension of talent and aptitude, contributing to a comprehensive understanding of personal and academic growth.

And they therefore need the necessary psychological, social and educational care to develop their abilities and demonstrate them in the school community and outside.” However, after that, no efforts were made to serve these people, and the most that was done for this group was to provide them with an advanced curriculum, or through differentiated teaching methods followed by teachers) Sultan et al., 2018). Students in these schools are expected to work individually on specific tasks, while also working in groups on tasks given to the whole class. For example, in the Qur’an schools mentioned earlier, students take turns reading a surah, then meet with the teacher individually to recite the surah and receive feedback after they are assessed. This is known as “mentoring,” a modern term in gifted and talent education. According to Westhuizen and Maree (2006), mentoring is a universal and timeless way of nurturing those with special abilities, and it has been practiced for ages, from cultures where mastery requires mentoring of promising beginners.

In 1970, specifically with the discovery of oil, the Sultanate of Oman sought to follow the example of the member states of the Arab Bureau of Education for the Gulf States in caring for the gifted and talent, and took some practical steps toward this in conjunction with the opening of girls’ schools and accelerated programs for students with exceptional abilities. The first school for the gifted and talent for girls was established in 1981. At the level of higher education, Sultan Qaboos University established the Gifted Discovery and Care Project in 1997, with the aim of developing a set of tests related to identifying and standardizing the education of gifted and talented students, developing enrichment programs in mathematics and science, and training a group of science and mathematics teachers to design enrichment programs in these two subjects. Since its establishment, the university has been keen to support summer programs in cooperation with the Ministry of Education, in

addition to adopting a project to create standards and tests aimed at identifying the gifted and talented (Arab Center for Educational Research for the Gulf States, 2020).

The Takatuf Pioneers Program is a program supported and funded by Oman Oil Company. The program seeks to support distinguished students with outstanding academic achievements. The best Omani talents are selected to participate in the program, and the most talented ones are selected from among them to obtain international missions funded by the program. Talented students receive great care in this program, as it provides them with a set of skills and abilities that will benefit them in university life and beyond, such as communication and research skills, critical thinking and problem-solving skills, effective and creative use of information technology, and university-level coursework and learning skills (Arab Center for Educational Research in the Gulf States, 2020).

The most prominent experience in the field of gifted and talent care is the experience of Sultan Qaboos University; the university sought the help of its faculty members as researchers to develop tools for identifying gifted and talented people; an integrated, standardized battery for identifying gifted and talent people was completed, including standardizing the Gifted and Talented Evaluation Scale (GATES). Kadhim et al. (2010) studied the GATES's psychometric properties for use in identifying gifted and talent people in the Sultanate. The scale consists of five dimensions: general abilities, academic skills, creativity, leadership, and artistic talent. In a study by Lamb (2012), when the scale was applied to a sample of 709 male and female students from grades five through 10 in basic education schools from seven different educational regions, the results showed that the scale has high values of validity and reliability.

2.5. AI and Gifted Students: Exploring the Relationship

Artificial intelligence plays a major role in providing the required agility for educating gifted and talented students, as it contributes effectively to refining their talents and providing them with many skills, in addition to updating their career paths (Assas, 2023). This category is distinguished by characteristics such as the ability to sense problems and phenomena, monitor problems in society, and address them in unprecedented creative ways (Alawi, 2019). Gifted and talented students also have the ability to use technology effectively. In addition to their distinguished skill in searching for and accessing information and choosing the most appropriate to use in solving information problems, they also have the skill of building knowledge bases through artificial intelligence (Al-Busaidi & Bouazza, 2019).

These students also differ in their preference for obtaining information in more than one way, using the movement of the brain, body, and senses, and achieving it through vision, hearing, thinking, reasoning, visualization, analysis, and intuition. These approaches to learning can be satisfied using different learning styles (Costello, 2012). One example of the use of artificial intelligence in talent development is its use in developing enrichment programs, especially in many schools and universities in the Kingdom of Saudi Arabia. Machine learning programs analyze the given information to obtain the required conclusions and then provide suggestions through the obtained data (Shute & Zapata-Rivera, 2012). There are two ways in which artificial intelligence can be used: creating models for learners that enrichment program designers can use to plan for active interaction for students during the lesson, and the second is providing the opportunity to receive interactive self-learning from the system based on student behaviors to ensure improvement in the learning process (Al-Ahmadi, 2020).

3. Methods

3.1. Research Design

The researchers used the descriptive analytical approach, which describes specific phenomena and events, in addition to collecting information, facts, and observations related to them, describing

their circumstances, and reporting their condition as it is without the researcher's intervention in it. This approach is appropriate for this type of research and aims to collect data from reality, answer questions, classify and analyze data to reach results, and develop recommendations and proposals. This study examines the degree of academic leadership practice in using AI for gifted student care in Omani higher education institutions, as perceived by faculty members. The independent variables include gender, years of experience, institution, college type, academic rank, and leadership role, all of which are observable within the study sample

3.2. Sample and Data Collection

The research population consisted of faculty members in Omani higher education institutions in the Sultanate of Oman. The study sample included faculty members in a number of those institutions, and the number of responses reached 171 responses. Table 1 shows the distribution of the sample members according to its variables.

Table 1. Distribution of Study Sample Members According to Variables

University	Sex		College		Rank					University Experience			Leadership position		Total	%
	Male	Female	Scientific	Humanity	lecturer	Assistant	Associate	doctor	Professor	One to 10 years	10 to 20	More than 20 years	Leading	Non-Leadership		
Sultan Qaboos	21	37	21	3	30	16	9	4	19	35	20	38	58	33.9 %		
Nizwa	26	32	22	32	15	4	3	19	23	12	18	36	54	31.6 %		
Sohar	7	12	14	14	9	2	1	4	19	3	8	18	26	15.2 %		
National University / International Maritime Oman School	18	17	5	20	1	1	9	7	6	5	17	22	12.9 %			
University of Technology and Applied Sciences Sohar	6	7	4	5	4	1	1	1	6	4	3	8	11	6.4 %		
Grand Category Total	96	75	105	66	73	59	24	15	52	57	62	78	93			
Total														171	100 %	

Table 1 shows that out of 171 faculty members, 56.1% were males (96) and 43.9% were females (75). Professors made up 8.8% (15 members) of the study sample, associate professors 14% (24 members), assistant professors 34.5% (59 members), and lecturers 42% (73 members). Most participants (36.3%) had over 20 years of experience; 16.4% had 1–5 years of experience, 14% had 6–10 years, 21.1% had 11–15 years, and 12.3% had 16–20. Faculty from scientific colleges comprised 61.4% (105 members) of the study sample, while those from humanities colleges made up 38.6% (66 members). Notably, 100% of the study sample expressed interest in employing technology in university teaching. The results show a good balance between genders, academic disciplines, and

levels of experience, indicating that the sample is adequately representative of the diversity among faculty members.

3.3. Study Tools

The study used a questionnaire of faculty members in Omani higher education institutions as a primary tool for collecting data and information from the study sample to reveal, from their point of view, the degree of academic leadership practice in Omani higher education institutions in using artificial intelligence to enrich student talents. Previous studies, such as Abuzaqia (2018), were used in preparing the questionnaire, which included two axes: identifying gifted and talented students and enriching gifted and talented students' learning and the degree of academic leadership practice in Omani higher education institutions in using artificial intelligence to care for gifted and talent students. The responses to each paragraph were given weight as follows: strongly agree (5 points), agree (4), neutral (3), disagree (2), and strongly disagree (1).

3.4. Validity of the Research Tool

The questionnaire, which consisted of 33 paragraphs, was presented to seven arbitrators, three of whom were from the Department of Educational Foundations and Administration at Sultan Qaboos University, two from the Department of Curricula and Teaching Methods at Sultan Qaboos University, and two from the Ministry of Education. The arbitrators made a few observations, including the rephrasing of some paragraphs and the deletion of some of them. The number of paragraphs in the questionnaire reached 31 paragraphs after making the amendments.

3.5. Reliability of the Research Tool

The stability of the tool was confirmed using Cronbach's Alpha coefficient for each paragraph of the research tool and the tool. The reliability coefficient for the tool as a whole was 0.971, which is considered a very high-reliability coefficient. Table 2 shows the reliability coefficient for the two axes of the research tool.

Table 2. Reliability Coefficients Using Cronbach Alpha for Instrument Axes

M	Questionnaire axes	Cronbach alpha coefficient
The first	The first axis is the disclosure of gifted and talented students.	0.969
The second	The second axis is enriching gifted and talented students.	0.969
The resolution as a whole		0.971

The scale of judging the degree of academic leadership practice in Omani higher education institutions also used to evaluate the use of artificial intelligence to enrich student talents through the arithmetic average of the responses to each question of the tool (Table 3).

Table 3. Scale to evaluate the degree of academic leadership practice in Omani higher education institutions in the use of artificial intelligence to nurture gifted and talent students

Scale levels	Arithmetic mean	Degree of Practice of Academic Leadership Artificial Intelligence
Strongly agree	4.3–5	Very large
I agree	3.3–4.2	Large
Neutral	2.3–3.2	Medium
Disagree	1.3–2.2	Small
Strongly disagree	1–1.2	Very small

3.6. Data Analysis

The quantitative data were entered into the SPSS program, and the relevant variables were identified; then, the arithmetic means were calculated, and a one-way ANOVA was used. The arithmetic means were used to answer the first question, and the one-way ANOVA was used to answer the second question. Regarding the third question, the frequencies and percentages were calculated, and the responses were arranged according to the percentages. Based on the results of questions 1–3, a proposed vision was built. The vision was then presented to seven arbitrators from the study sample of experts in universities, and the vision was modified according to their suggestions.

4. Results

To determine the proposed vision for employing AI in nurturing student talents in Omani higher education institutions, the study adopted the following questions, and their results were as follows.

Results Related to the First Question:

What is the degree of academic leadership practice in Omani higher education institutions in using artificial intelligence to nurture gifted and talented students from the point of view of faculty members? To answer this question, the means and standard deviations for the survey axes and items were calculated. Table 4 shows the extent to which academic leaders in Omani higher education institutions use AI to enrich gifted and talented students from the perspective of faculty members according to the survey axes.

Table 4. Means and standard deviations for each axis of the survey

N	Questionnaire axes	Means	Standard deviation	Rank	Degree of practice
1	Identification of gifted and talented students.	3.63	.662	1	Large
2	enriching gifted and talented students.	3.62	.617	2	Large
Total		3.62	.620		Large

It is observed from Table 4 that the highest mean score is for the first axis, identification of gifted and talented students, which reached 3.63, indicating a high degree of practice. The second axis, enrichment of gifted and talented students, came with a mean score of 3.62, also demonstrating a

high degree of practice. The table shows that the difference between the two axes is 0.01, reflecting the alignment of the practical actions taken regarding gifted individuals. The overall mean score for the survey was 3.62, with a standard deviation of 0.62. Therefore, it can be said that, from the perspective of faculty members, the degree of practice of academic leadership in Omani higher education institutions in employing AI to enrich gifted and talented students is high. To understand the details of the survey axes, the means and standard deviations for the survey axes and items were calculated. Table 5 shows the degree of practice of academic leadership in Omani higher education institutions in using AI to enrich student talents from the perspective of faculty members in the axis of identifying gifted and talented students according to the items in the survey.

Table 5. The Degree of Practice of Academic Leadership in Employing Artificial Intelligence in the Axis of Identifying Gifted and Talented Students

N	Item	Mean	Standard deviation	Rank	Practice degree
29	The use of AI technologies in universities is an effective tool for integrating innovation and technology into education.	4.02	0.826	1	Large
24	AI-based strategies are a process to nurture students' talents at the university.	3.89	0.808	2	Large
1	University leaders adopt AI strategies and techniques to discover talent among students.	3.82	0.974	3	Large
2	University leaders make efforts to guide talented students using artificial intelligence techniques to develop their skills.	3.79	0.909	4	Large
27	The use of artificial intelligence allows universities to guide students towards educational and career paths appropriate to their talents.	3.77	0.895	5	Large
8	University leaders support innovative initiatives that use artificial intelligence technologies to discover and develop student talent.	3.68	0.898	6	Large
11	Universities have clear policies and frameworks in place to ensure the effective and ethical use of AI technologies in developing their student talent.	3.67	0.938	7	Large
3	Data is analyzed by the university administration for the purposes of talent needs assessment.	3.58	0.845	8	Large
7	University leaders have a clear vision of how to use AI applications to enrich student talent in universities.	3.52	0.929	9	Large
16	Universities provide AI-enhanced adaptive assessment tools allowing faculty to design teaching and enrichment activities to effectively further develop their talents.	3.29	0.956	10	Medium
18	Universities create intelligent AI-based guidance systems to help students make educational decisions that fit their talents and goals.	3.27	0.944	11	Medium
17	Universities design AI-powered assessment tests to accurately and effectively identify student talents.	3.25	0.993	12	Medium
total		3.63	0.662		Large

Table 5 shows that the degree of practice of academic leadership in Omani higher education institutions in employing AI is high (3.36) in the axis of identifying gifted and talented students. Most items in this axis were rated as a high degree of practice, except for three items (10, 11, 12), which

were rated as a medium degree of practice according to the faculty members in the study sample. Furthermore, the means and standard deviations for the survey axes and items were calculated. Table 6 illustrates the degree of academic leadership practice in Omani higher education institutions using AI to enrich gifted and talented students from the perspective of faculty members.

Table 6. The Degree of Practice of Academic Leadership in Omani Higher Education Institutions in Using AI to Enrich Gifted and Talented Students in the Axis of Enriching Gifted and Talent Students

N	Item	Mean	Standard deviation	Rank	Practice degree
31	The use of AI technologies in universities is an important step towards creating a learning environment that fosters the dynamic interaction between technology, academic learning, and comprehensive talent development.	4.15	0.854	1	Large
30	Artificial intelligence technologies provide the faculty member with an opportunity to allocate educational resources more accurately and effectively according to the needs of student talents.	4.07	0.844	2	Large
23	The faculty member at the university recognizes the importance of integrating artificial intelligence into talent enrichment programs to enhance student learning outcomes.	4.03	0.800	3	Large
25	The faculty member is motivated to integrate AI tools and techniques into his/her teaching practices to support the development of students' talents.	3.90	0.802	4	Large
10	University leaders motivate student participation in projects and programs that use AI applications to enhance skills and talents	3.80	0.825	5	Large
22	The faculty member at the university trusts the ability of artificial intelligence to personalize learning experiences for students based on their talents	3.73	0.901	6	Large
28	Universities are developing new and innovative methods to enhance student talent using artificial intelligence	3.73	0.825	7	Large
4	Analyzed data are used for the purposes of improving (developing) talent education programs.	3.66	0.862	8	Large
6	University leaders provide sufficient support to implement AI initiatives in enriching student talent.	3.65	0.871	9	Large
26	Universities offer educational programs that use artificial intelligence to motivate students and enhance their skills and talents.	3.51	0.897	10	Large
5	Employs interactive AI-based platforms at the university to stimulate collaboration between talented students.	3.47	0.972	11	Large
9	There is collaboration between university leaders and AI technology companies to ensure effective solutions are provided to motivate student talent.	3.47	0.883	12	Large

12	Universities offer customized AI-based educational programs to meet the needs and talents of each individual student.	3.44	0.946	13	Large
20	Universities employ experts and specialists in the fields of artificial intelligence to support research and development processes in enriching student talent.	3.42	0.999	14	Large
13	Universities use AI-powered intelligent guidance systems to guide students towards educational programs and resources that suit their talents.	3.40	0.872	15	Large
21	Universities collaborate with companies and industry to identify market needs and guide students towards areas with high demand for talent using artificial intelligence techniques.	3.40	0.979	16	Large
14	Universities provide collaborative AI platforms that connect students with peers who share the same interests and talents.	3.37	0.860	17	Large
15	Universities provide artificial intelligence technology that helps immerse students in interactive learning experiences, allowing them to try and hone their talents in a risk-free environment.	3.37	0.920	18	Large
19	Universities offer AI-based one-on-one mentoring and counseling services to help students identify and develop their educational and career paths.	3.36	0.998	19	Large
	Total	3.63	0.618		Large

Table 6 shows that all items in the second domain were rated as having a high degree of practice, ranging from 3.36 to 4.15, with the overall mean for the axis being 3.63. This result is surprising, as despite the novelty of AI, the degree of practice in enriching the learning of gifted and talent students was high.

Results Related to the Second Question:

Are there statistically significant differences in the degree of academic leadership practice in Omani higher education institutions in using artificial intelligence in nurturing gifted and talent students from the point of view of faculty members attributed to the variables of academic rank, academic specialization, and university?" To answer this question, a one-way ANOVA test was conducted for these variables, and Table 7 presents these results.

Table 7. One-Way ANOVA Test for Study Variables

Variables		Sum of Squares	df	Mean Square	F	Sig.
Sex	Between Groups	15.224	72	.211	.771	.877
	Within Groups	26.881	98	.274		
	Total	42.105	170			
College	Between Groups	16.314	72	.227	.917	.648
	Within Groups	24.212	98	.247		
	Total	40.526	170			
Academic rank	Between Groups	65.591	72	.911	1.000	.496
	Within Groups	89.298	98	.911		
	Total	154.889	170			
University	Between Groups	95.994	72	1.333	.801	.839
	Within Groups	163.164	98	1.665		
	Total	259.158	170			

Table 7 shows that there were no statistically significant differences at the alpha level of 0.05 in the responses of the sample regarding the degree of practice of academic leadership in Omani higher education institutions using AI to enrich student talents, attributed to the variable of gender (male or female). Additionally, Table 7 indicates that there were no statistically significant differences at the alpha level of 0.05 in the responses regarding the degree of practice of academic leadership in using AI to support student talents attributed to the academic specialization (scientific college versus humanities college). However, there were no statistically significant differences at the alpha level of 0.05 in the responses related to the degree of practice of academic leadership using AI to support gifted and talented students attributed to the academic rank.

Results Related to the Third Question:

What are the requirements for and challenges for employing AI in nurturing talented students from the perspective of faculty members?

To address this question, faculty members at universities were asked about the requirements for and challenges of employing AI to enrich student talents. The number of responses to the open-ended question was 76 out of 171 responses, representing 44% of the sample, as shown in Appendix 1. The main obstacle identified was the lack of a clear vision in areas of AI usage, as well as the absence of institutional policies on specific systems needed for AI applications. This includes the lack of a clear vision on the applicability of AI techniques and the absence of guidance on their use, and the lack of mandatory policies for using AI in dealing with talented students, which formed 21.1% of the obstacles. This is considered a strategic barrier and ranked first, highlighting the need for a clear policy and strategy given the modern nature of the subject.

The obstacle cited second-most frequently, at 17.1%, was the need for training workshops, since a large number of faculty members have not mastered AI applications. This includes the need to provide training for students and lecturers, as well as the absence of training courses for faculty and students in AI application methods based on their specialties. Training AI experts with academic degrees from universities also complement the first obstacle, as after establishing a clear vision and policy, training and developing competencies in AI are crucial.

The third-most frequent obstacle, at 15.8%, was the fear of misuse of these technologies, which might lead users to become overly dependent on them and not utilize their real skills and abilities. Concerns about technology from a security and hacking perspective, fear of negative aspects among faculty members, academic misconduct (cheating), and the need for ethical guidelines approved by the university for use with all sectors of learners, including talented students and students who do not qualify as gifted and talented, were also noted. This may be attributed to the novelty of the subject and unclear policies and governance.

The fourth obstacle, at 10.5%, was the lack of necessary resources, including insufficient facilities and weak infrastructure readiness to accommodate student skills and talents. The fifth and sixth obstacles included the need for scientific studies, the provision of resources and expertise in AI, and insufficient financial support for research projects and participation in financially allocated programs. Financial support is crucial for policy formation, infrastructure development, resource availability, and training, with these aspects representing 7.9% to 9.2% of the challenges.

Other obstacles included the university's educational system, lack of awareness among leadership about the importance of AI, insufficient awareness of purposeful use, lack of information and regulations, and the novelty of AI applications and unclear university strategies for handling AI. The lack of legal and ethical regulations related to AI use, poor organization and opportunities for talented individuals, lack of encouragement, and support from university management are all barriers that universities and educational institutions must address. However, after addressing these issues, the results can contribute to developing a model for employing AI effectively.

Based on the results of the study, the proposed vision for employing AI to nurturing student talents, according to faculty members, is illustrated in the model shown in Figure 1.

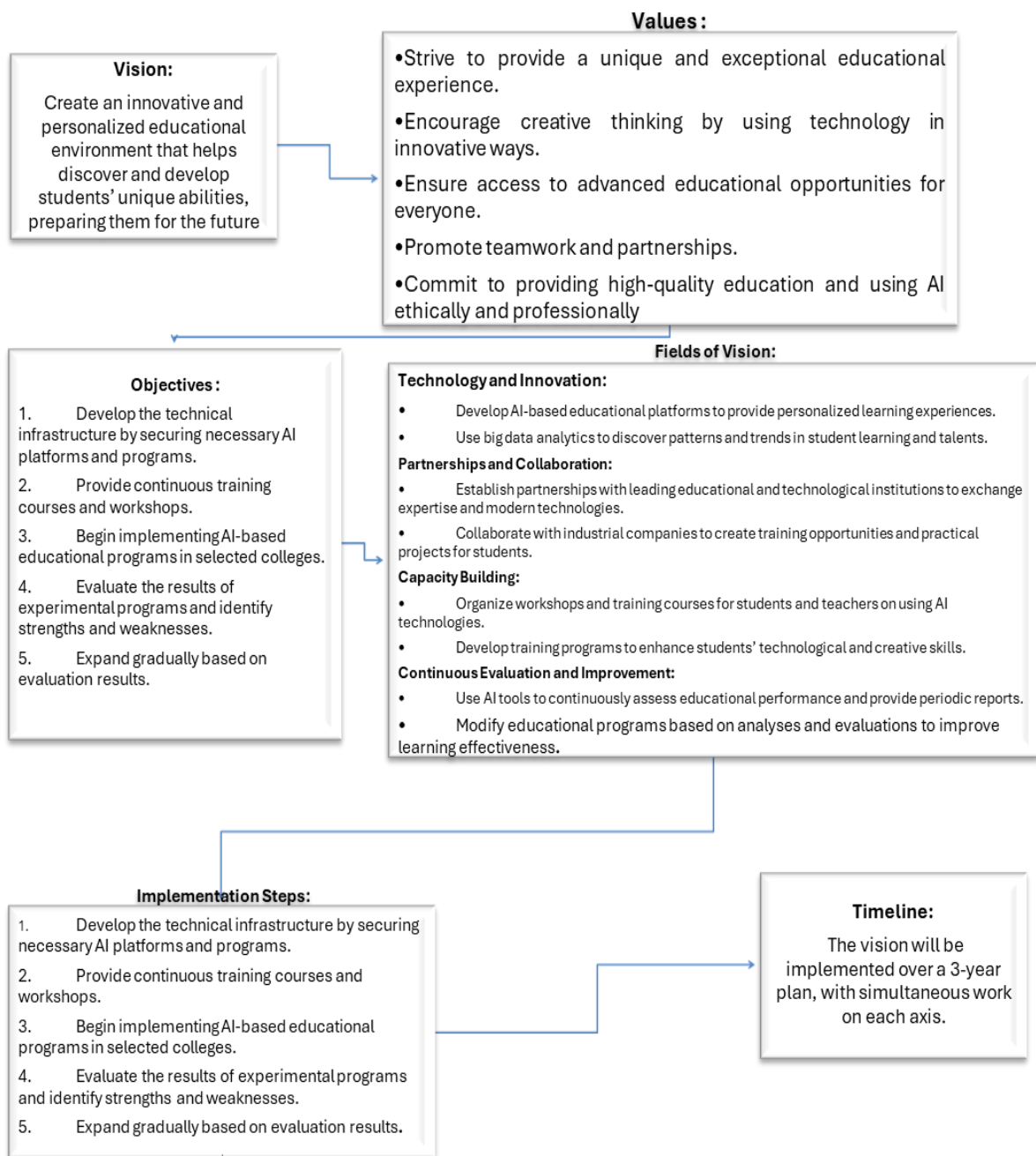


Figure 1. A Proposed Vision for Employing Artificial Intelligence to Nurture Gifted and Talented Students in Higher Education Institutions

5. Discussion

Omani universities consider the use of artificial intelligence technologies an important step towards creating an educational environment that enhances the interaction between technology and academic learning, contributing to the comprehensive development of gifted and talented students and programs.

The study's results showed that the aspect of identifying talented students and enriching their learning were rated as having a high level of practice according to the study sample of faculty members (Table 4). Employing academic leaders in universities to use AI for identifying and nurturing talented students is justified by several reasons. AI provides high accuracy and efficiency in analyzing

student data, aids in early and effective talent identification, customizes education according to each student's needs and offers continuous and precise evaluations of their progress. Furthermore, AI enhances inclusivity and fairness in education by identifying gifted and talented students from various backgrounds, supports data-driven decision-making, saves time and resources, improves the educational experience, and promotes innovation in teaching methods.

Additionally, Table 5 indicated high levels of practice among academic leaders in Omani higher education institutions in using AI to identify talented students. This highlights the academic leaders' orientation towards employing technological advancements for talent identification in these institutions, as a 2020 study by the Arab Center for Educational Research for the Gulf States showed. University leaders adopt AI technologies as an effective tool to integrate innovation and technology in education through practical strategies for nurturing and discovering gifted and talented students. Universities support innovative initiatives that leverage AI to identify and develop student talent, establish clear policies and frameworks to ensure the ethical and effective use of these technologies and analyze data to assess talent needs, reflecting the university leaders' clear vision of how to use AI applications to enrich student talent. This approach shows the academic leaders' desire to enhance educational quality and provide a unique and exceptional learning experience. AI enables the precise identification of gifted and talented individuals and offers tailored educational opportunities that match each student's needs and capabilities, fostering skill development in the best possible ways. Additionally, Abunasser and Abunasser AlAli (2022) noted that these technologies guide students toward the most suitable educational and career paths, increasing their future success prospects. These initiatives reflect the universities' commitment to innovation and sustainable development, enhancing their status as leading educational institutions that keep pace with modern technological advancements.

Table 6 further shows the significant use of AI by academic leaders to enrich the learning of talented students. The driving reasons for using AI in enriching students' learning include improving education quality by customizing learning to individual needs, discovering and nurturing gifted and talented students through precise data analysis, increasing engagement and interaction in educational environments, and responding to market needs by guiding students towards high-demand fields, thereby enhancing their employment prospects post-graduation. Additionally, Almukhambetova and Hernández-Torrano (2021) pointed out that adopting advanced technology enhances the universities' reputation as leading educational institutions, providing effective support for faculty to allocate educational resources efficiently. Analyzing data to improve educational programs ensures that changing student needs are met, and supporting research in AI fields contributes to developing new technologies to continuously improve the educational process. Through these strategies, Omani universities aim to enhance the educational process, discover and nurture gifted and talented students, and increase students' chances for success in their academic and professional lives.

Table 7 showed no differences in the responses of male and female study participants regarding the employment of AI by academic leaders in nurturing talented students in Omani higher education institutions in various ways. Both genders among academic leaders may have equal awareness and knowledge of the importance and role of AI in education, leading to similar responses. Additionally, academic policies and practices may be unified in dealing with all students, resulting in similar experiences related to AI applications. The academic environment in Omani universities may be free of gender discrimination in technology use, enhancing the lack of differences in their responses. Moreover, the needs and aspirations of talented students from both genders may be very similar, leading to a comparable evaluation of the academic leaders' efforts in this context.

The results also indicated no differences in responses between scientific and humanities college members regarding the employment of AI by academic leaders in nurturing talented students in

Omani higher education institutions. This could be due to a unified awareness across all colleges about the importance of AI in improving education and nurturing giftedness and talent, leading to similar responses. Additionally, academic policies and practices related to AI employment may be standardized across all colleges, enhancing response equality. The experience of using AI to nurture gifted and talented students may be similar between scientific and humanities colleges, where technology is applied similarly to support talented students. Moreover, the needs and aspirations related to skill and ability development among students from various disciplines may be alike, resulting in similar evaluations of academic leaders' efforts. Overall, this reflects a unification of strategies and academic policies, ensuring the effective use of AI technologies across all disciplines.

Differences between the professor and lecturer ranks regarding the employment of AI by academic leaders in nurturing talented students may favor lecturers due to several factors. Lecturers may have greater flexibility in adopting and using new technologies like AI, being more open to experimentation and innovation compared to professors, who might be more conservative due to their extensive experience. Lecturers often have direct interactions with students, allowing them to use AI more effectively to enhance the student experience and develop their skills. Conversely, professors may have significant administrative and academic responsibilities that consume their time, reducing their opportunities to focus on applying new technologies. Lecturers might also be more involved in new academic initiatives and experimental projects related to AI, appreciating the role of these technologies in nurturing gifted and talented students. The lack of differences between associate professors and assistant professors in the employment of AI by academic leaders in nurturing talented students might be due to several factors, such as all intermediate academic ranks, including associate and assistant professors, adopting similar approaches and tools in using AI, leading to similar responses on this subject. Additionally, all these academics, regardless of their rank, might be knowledgeable and interested in AI technologies, ensuring alignment in their evaluation of the importance of this technology in nurturing student giftedness. Moreover, the level of access to resources and institutional support available to both associate and assistant professors may be similar, promoting their comparable application of AI technologies in their teaching. Finally, there might be coordination and collaboration among academics from various ranks regarding adopting technological strategies, contributing to homogenizing their opinions on the effectiveness of AI in nurturing talented students.

The university variable had no effect on the responses of the study sample members. This result indicates that Omani universities may adopt unified policies and procedures regarding AI use, leading to similar responses among individuals from different institutions. Additionally, the available resources and technologies might be similar across universities, contributing to the uniformity of academic responses. Furthermore, a standard understanding and application of AI technologies may lead to converging evaluations regarding their use in nurturing talented students. If academic orientations and training related to AI are equal across universities, individuals' responses will also be similar, reflecting an equal level of adoption and application of these technologies in all institutions.

All previous outputs clearly indicate the possibility of formulating a vision for employing AI in the education of talented students (Figure 1), aiming to provide a unique and exceptional educational experience that encourages creative thinking by using technology innovatively, ensuring advanced educational opportunities for all students in various university colleges regardless of their backgrounds. This vision relies on enhancing teamwork and partnerships to achieve the common goals of the university and society, as well as committing to providing high-quality education and using AI ethically and professionally. To achieve these goals, developing the technical infrastructure, offering training courses and workshops for faculty and students, and implementing pilot educational programs based on AI in selected colleges, then expanding this experience after evaluating the results in the chosen colleges, are essential. After analyzing these programs' results to identify strengths and

weaknesses, successful programs will be widely disseminated with modifications based on feedback, contributing to creating an innovative and inclusive educational environment that discovers and nurtures gifted and talented students at the university, preparing them to face future challenges with advanced skills and knowledge.

The conceptualization of employing AI to identify gifted and talented students can include multiple strategies, such as analyzing educational data to discover patterns indicating giftedness and talent, designing AI-based standardized tests to identify unique abilities, organizing practical projects and competitions to encourage students to showcase their talent, and collecting feedback from faculty members using specialized platforms. Once these gifted and talented students are identified, customized enrichment programs can be offered, including tailored educational curricula that match each student's needs, guidance programs providing mentorship, advanced technical support through innovation labs, and partnerships with educational and technical institutions to provide training opportunities and practical projects. Additionally, Rinn and Plucker (2019) pointed out that AI tools can be used to evaluate the educational programs' impact and adjust the programs based on feedback to achieve the desired goals, contributing to developing talented students' abilities during their university stage and preparing them for a future filled with opportunities and appropriate challenges.

6. Conclusion

The results indicate a desire among academic leaders to employ AI to support talented students, whether in identification or nurturing processes. The environment in these institutions is conducive to development. The related policies and regulations are supportive, making this vision feasible if the conditions for its implementation are met, including adopting a clear national strategy focusing on academic excellence and innovation. Also, providing specialized training programs for academic leaders and faculty members to ensure optimal use of the technologies is essential. Enhancing and continually updating the technological infrastructure in these institutions to ensure the provision of necessary tools and platforms and updating policies and regulations to support flexibility in applying modern technologies while considering ethics and privacy is also crucial. Additionally, fostering partnerships with leading tech companies and research institutions, encouraging scientific research to support innovations in this field, and establishing mechanisms to evaluate the effectiveness of the provided applications are needed. Finally, providing the necessary support for talented students through AI platforms, such as personalized tutoring, academic guidance, and tailored educational resources, is required.

7. Recommendations

To effectively integrate AI in identifying and supporting gifted students, universities should implement specialized training programs for faculty and academic leaders, equipping them with the necessary skills. Strengthening technological infrastructure is essential for the seamless adoption and continuous updating of AI tools. Additionally, forging strategic partnerships with technology companies and research institutions will drive innovation and enhance AI applications in education. Personalized AI-driven support, including tailored resources and academic guidance, should be provided to optimize gifted students' learning experiences and outcomes.

8. Research Proposals

Further research in the following areas would significantly benefit gifted and talented education with regard to AI use:

- Examine how AI applications influence the identification and development of gifted students across educational stages, emphasizing effective integration at each level.

- Investigate AI's potential in crafting personalized learning experiences, focusing on its ability to adapt educational programs to individual needs and improve learning

9. Limitations

The generalization of the results of this study may be limited by the sample size and diversity, as it may be too small to be sufficiently representative of all academic disciplines. Additionally, the variation in levels of knowledge and technical expertise among faculty members may have influenced the outcomes. The technical infrastructure and access to technology supporting AI applications play a significant role, along with university policies and their orientations toward adopting modern technologies.

Declarations

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About the Contributor(s)

Houda Abdullah Mohammed Al-Housni, College of Education, Sultan Qaboos University, Oman

Email: alhousni@squ.edu.om

ORCID: <https://orcid.org/0009-0003-7854-5916>

Fathi M Abunaser, College of Education, Sultan Qaboos University, Oman

Email: f.abunaser@squ.edu.om

ORCID: <https://orcid.org/0000-0001-5288-4002>

Asma Mubarak Nasser Bani-Oraba, Omani Studies Center, Sultan Qaboos University, Oman

Email: baniorab@squ.edu.om

ORCID: <https://www.orcid.org/0000-0002-9549-7536>

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Appendix 1.

Percentage	Iteration	What hinders the use of AI in dealing with talented people in your organization from your point of view?	M
21.1%	16	A clear vision in the areas of using artificial intelligence, the policy of commitment of educational institutions to specific systems and the need to use artificial intelligence, the lack of a clear vision in the possibility of applying artificial intelligence techniques with no guidance for ways to use them, the lack of binding policies for the use of artificial intelligence in dealing with talented people	1
17.1%	13	The need for training workshops, the fact that a large number of faculty members do not master artificial intelligence applications, providing training for students and lecturers, lack of training courses for doctors and students in methods of using artificial intelligence applications according to disciplines, lack of specialists with degrees in artificial intelligence from universities	2
15.8%	12	Fear of misusing these technologies in a way that makes the user completely dependent on them, and therefore does not use his real abilities and skills, fear of dealing with technology in terms of security and breaches, fear of faculty members from the negative aspects of faculty members, controlling academic violations (cheating), the need for ethical controls approved by the university for use in dealing with all sectors of gifted learners and others	3
10.5%	8	Lack of necessary resources, lack of facilities, and poor readiness of the infrastructure to accommodate students' skills and talents	4
9.2%	7	Need for scientific study, and provide resources and expertise in the field of artificial intelligence	5
7.9%	6	Poor availability of financial support for research projects and participation in programs with financial allocations that require payment, lack of financial support and lack of logistical support, lack of availability of multiple types of artificial intelligence due to the budget	6
6.6%	5	The educational system of the university and the lack of awareness of the leadership of the importance of artificial intelligence, lack of awareness of meaningful use and lack of information and regulations that determine the use	7
5.3%	4	The novelty of artificial intelligence applications and the lack of clarity of the strategy of universities in dealing with artificial intelligence, the novelty of the subject of artificial intelligence, the lack of legal and ethical regulations approved in relation to the use of artificial intelligence	8
3.9%	3	Poor organization and opportunities for talented people	9
2.6%	2	Encouragement and opening the field, supporting the university administration	10
100%	76	Total duplicates	