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Developing the Core Competencies for the Future Adaptability of Gifted Students

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This study aimed to develop the core competencies that help gifted students adapt to future challenges and the rapid changes in the labor market, as well as enabling them to regain balance and ride the new waves in their future careers. Which should be developed through educational practices in gifted programs by integrating them into the curriculum and teaching methods. To achieve this, a preliminary core competency instrument was developed that incorporated the simultaneous collection of quantitative and qualitative data using a convergent mixed-methods design. The classical Delphi method was also used to develop the list of core competencies, and the sample consisted of 18 experts in the field to obtain their opinions through three rounds. The quantitative data were also analyzed using the SPSS program to extract means and standard deviations, while the qualitative data were analyzed using directed content analysis. The results yielded a list of 6 core competencies (analytical, creative, Investigative Research, Executive function, learning how to learn in technology, and interdisciplinarity). These results highlight the need to measure these core competencies in gifted programs and to adopt educational frameworks that promote their development.

Keywords: core competencies, adaptability, gifted students, education reform, skills for the future

INTRODUCTION

In light of the rapid and successive changes the world is witnessing today, it has become necessary to equip future generations with the skills and competencies that enable them to adapt and succeed in an uncertain future. At the beginning of the current century, the core competencies model was first introduced by the Organization for Economic Co-operation and Development (OECD) to enhance the skills required by the labor market (He & Huo, 2017). This concept has gained attention as a new model for promoting education reform (Park et al., 2021). According to the OECD, core competencies represent a set of abilities, knowledge, and skills that enable individuals to provide added value to their society (Bialecki, 2006).

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The emergence of the Fourth Industrial Revolution in the first decade of the 21st century is a new stage that integrates advanced technologies into all areas of life (Schwab, 2017). As a result, many future challenges have arisen, which can be expressed by the following acronym common in the United States (VUCA), which means that the world we live in today is fast-changing, unpredictable, complex, and ambiguous (Koden, 2020). These challenges can lead to radical transformations in organizations and institutions, posing a risk to students' professional future if they are not prepared to adapt successfully to them. Therefore, it is important to identify the core competencies that will be sought in the future.

Hence, adaptability has become essential in the era of rapid developments associated with the Fourth Industrial Revolution. The concept of adaptability refers to responding to continuous changes and managing them effectively (Collie & Martin, 2016); therefore, it has become difficult for decision-makers to stick to a detailed plan for a long time. For example, the life cycle of companies was previously estimated at 45 years and began to decrease to 15 years in the mid-20th century, and this decline may continue to five years or less (Koden, 2020), so it is important for institutions to have flexibility and adaptability.

Also, we find that the Kingdom of Saudi Arabia, within its Vision 2030, aims to invest in talent and prepare gifted individuals for the future. therefore, the Ministry of Education's directives are to expand the services provided to gifted students, for example, the focus on the gifted classes project, where the number of classes reached 998 in 2020 (Ministry of Education, 2021), which signifies the importance of optimal investment in these students and planning to equip them with competencies that help them adapt to the future. In this regard, we emphasize the importance of reviewing the goals of gifted education and modifying them to be responsive to the needs of society, as the educational field is the foundation where core competencies for future adaptability are built, and through these goals, core competencies that respond to challenges are adopted and integrated into gifted curricula and vocational training plans.

There is a shortage of skills related to the rapidly changing labor market (Kituu et al., 2022). For example, with the multiplicity of sources for acquiring knowledge, what an individual already knows is no longer the most important thing, but rather how to acquire knowledge directly relevant to a specific project or problem. This type of information is called just-in-time knowledge (Renzulli, 2020). Hence, the skill of acquiring just-in-time knowledge requires core competencies that are developed in an individual during their educational journey through interactions between a set of competencies in various educational and practical situations. Therefore, core competencies go beyond merely possessing skills to the ability to use them effectively in different situations and tasks (Park et al., 2021). This means that skills and abilities are essential components of core competencies, but core competencies represent a higher level of integration and practical application of these skills and abilities.

Likewise, talent development theories have provided a new perspective on talent, viewing it as the developmental outcome of a set of personal and socio-environmental factors that interact dynamically and grow in different contexts (Dai, 2017). In this context, Renzulli (2020) proposed the catch-a-wave theory of adaptability, in which he

proposed a set of core competencies that he believes are important to develop for the professional adaptability of gifted individuals, which are: (high-level analytical thinking skills, Creativity skills, Investigative research skills, Executive function skills, and skills for learning how to learn in technology), and he stipulated the importance of dynamic interactions between these competencies. However, Renzulli only proposed a model. This calls for rethinking how to develop practices for fostering core competencies, by developing these competencies, researching their inclusion in gifted programs, and investigating the challenges of developing these competencies in light of the interaction perspective, which forms a basis for developing strategies that align with these modern trends in talent development.

For gifted students to be able to adapt in the changing labor market, they must possess a set of core competencies that are developed dynamically and in a balanced manner through education, which qualify students to face a set of changes created by emerging technology in the form of wave-like challenges in the evolving professional future. An individual's knowledge base in a specific field can be considered necessary to contribute to it (Renzulli, 2020), but in today's evolving world, students will face a set of changes in their professional future that will pose challenges if they cannot adapt to them, therefore, it is important for them to have core competencies through which they can restore balance and ride the new waves.

Given the significant developments of the past five years, new skills have emerged that gifted students must acquire for their future. Therefore, it has become essential to update previous models in this context, such as Renzulli's (2020) proposal of core competencies. This research will update Renzulli's proposal using the Delphi technique. The most important aspect of this update lies in developing the sub-elements, rather than the main headings, of these core competencies. This research offers opportunities to improve the core competencies for future adaptability of gifted students, who are part of the future workforce, and helps the next generation adapt to jobs that do not yet exist and that may emerge in the future. Therefore, this research aims to explore the core competencies that help gifted individuals adapt to future challenges and rapid changes in the world, and this goal can be achieved by answering this question:

What are the core competencies that gifted students should possess for future adaptability?

Literature Review

Core Competencies

Many previous studies have worked on preparing models of core competencies with the aim of improving and enhancing educational practices in light of the literature related to gifted education, so there are now several models depending on the purpose for which they were created. There are studies focused on building core competencies for teachers of the gifted (Akar, 2020; Lee & Park, 2015; Park et al., 2014), while others focused on gifted students (Kim & Lee, 2012,2018; Kituu et al., 2022; Lee et al., 2016; Park et al., 2021; Roh et al., 2018). However, there is still a need to develop more core competency models to face the challenges and rapid changes associated with adaptability to future professions, so it is important to develop the core competencies of gifted students in a

way that is compatible with the labor market. Therefore, the focus of the current study is to contribute to developing a core competency model according to the variables brought about by the Fourth Industrial Revolution, as there will be a new perspective based on inputs that contribute to the adaptability of gifted individuals to professional challenges in the future.

Previous studies differ in the methodology they used to build core competencies, but in general, they follow several stages to build these competencies, with variations in how they proceed through those stages. Studies usually begin by reviewing the literature on core competencies for the gifted to form a foundational basis, which is then built upon with the help of experts, according to the method adopted by the study. Some of them adopted the Delphi method, which is good for solving difficult problems, as it relies on the opinions of experts in developing a specific topic without them knowing each other, and this method proceeds through several rounds to reach a consensus among the experts. Some studies were content with two rounds (Park et al., 2021), and others with three rounds (Akar, 2020) to settle on the core competencies. However, there are studies that followed methods other than Delphi to build core competencies, such as using the qualitative method that relies on data collection through interviews (Kim & Lee, 2012). As well as the quantitative method, which relies on surveys via questionnaires (Lee et al., 2016). As for the current study, it agrees with previous studies in reviewing the literature and following the Delphi method to confirm the core competencies, but it differs from previous studies in that it aims to develop a core competency model that expresses the adaptability of gifted individuals in facing challenges related to future professions, the basis of which will be the core competencies proposed by Renzulli (2020) within the catch-a-wave theory of adaptability.

Adaptability

In recent years, much research has emerged on adaptability as a result of the accelerating changes in the business world, and the emergence of more challenges that require reconsidering how to prepare to adapt to them, so some researchers have turned to developing measurement tools, by studying the business environment to identify the factors that help in adapting to it, so that students can be equipped with the necessary future skills to adapt to the wave of changes in the business environment. Due to the importance of the topic, a group of countries collaborated to define the dimensions that constitute career adaptability, leading to the emergence of the international Career Adapt-Abilities Scale (CASS) (Savickas & Porfeli, 2012). Its dimensions were (concern, control, curiosity, confidence). But the recent changes brought about by the Fourth Industrial Revolution necessitate a broader perspective on the abilities that aid career adaptability. Through the current research, the aim is to identify abilities that encompass future challenges, so that they are viewed as competencies related to interaction and executive situations, which will help develop scales that assist gifted students in adapting to future jobs.

Likewise, studies highlighting the importance of future adaptability for gifted students have varied in the wake of the changes brought by the Fourth Industrial Revolution, so researchers have employed research methodologies to highlight the important aspects that should be developed in educational and pedagogical practices. Some researchers

tried to focus on the dimensions that constitute adaptability, including (Murat & Ozdemir, 2020; Savickas & Porfeli, 2012), where four dimensions emerged: curiosity, concern, control, and confidence. Buyukgoze-Kavas (2016) proved three dimensions that predict career adaptability, which are flexibility, hope, and optimism. As for (Sternberg, 2021), he identified four elements that predict adaptive intelligence, which are: analytical, creative, practical intelligence, and wisdom. But there is still a need for a broader and more comprehensive perspective on the dimensions that constitute adaptability in the wake of the developments brought by the Fourth Industrial Revolution, which is what this research seeks to achieve.

METHOD

This study used a convergent mixed-methods design, where quantitative and qualitative data were collected simultaneously (Cresswell and Plano-Clark, 2018). This was done using the classic Delphi method, which relies on building a standardized questionnaire in an iterative process, and the experts' identities are not revealed to each other (Niederberger & Deckert, 2022). This method was used for a similar purpose to this research in Akar (2020), which relied on the classical Delphi method in its methodology.

The sample consisted of experts selected based on: (a) ≥5 years in gifted education, (b) ≥2 peer-reviewed publications, or (c) leadership in national gifted programs. All provided informed consent. The number of Delphi panel members who agreed to participate was 18. A study by Park et al. (2021) indicates that the appropriate number of people to gather different perspectives through a Delphi survey can range from 10 to 18 experts in the field. The study was conducted in the Eastern Province of Saudi Arabia.

Regarding the research instrument, a preliminary version of the list of core competencies, their definitions, and their elements was constructed, drawing from the core competencies proposed by Renzulli (2020), and it included five core competencies, which are:(analytical thinking skills, Creativity skills, Investigative research skills, Executive function skills, skills for learning how to learn in technology), and after preparing it via Google Forms. It was sent to the participating members via an electronic link on the WhatsApp application. Where they were asked for their degree of agreement with these competencies on a scale from 1 to 5, where 5 means strongly agree, and 1 means strongly disagree with the core competency, they were also asked to write positive, negative, and developmental comments.

As for data collection techniques, this was achieved through three Delphi rounds, during which Core Competencies were progressively developed. Mixed data was collected in each round, analyzed, and returned to the experts. As for data analysis, the collected data consists of two aspects: quantitative and qualitative. The quantitative data were analyzed using the SPSS program to extract means and standard deviations to determine the degree of agreement of the expert panel on the list of core competencies, and the Cronbach's alpha coefficient was also extracted to verify the reliability of the experts' responses.

As for the qualitative data, they were analyzed using the directed content analysis method (Hsieh & Shannon, 2005), which was proposed to test or expand an existing theory or classifications, and given the nature of the qualitative data collected from the open-ended questions in the questionnaire, which were pre-classified into three main categories (positives, negatives, and development proposals). The directed content analysis method was adopted as a suitable methodology for analyzing this data. This type of analysis relies on the researcher having initial classifications or concepts, which are used as a preliminary framework to guide the coding process and extract meanings. The analysis was carried out in four interconnected stages: first, organizing the data according to the questionnaire's elements and its three classifications; second, identifying important ideas from the comments; third, listing the most prominent positives, negatives, and developmental proposals that achieve the research objectives; and finally, presenting the developed list of core competencies.

FINDINGS

The research aims to develop the core competencies that help gifted students adapt to future challenges and the rapid changes in the labor market, as well as enabling them to regain balance and ride the new waves in their future careers, which should be developed through educational practices in gifted programs. The following will detail the gradual development of the result for the first question, through the analysis and results of the three Delphi rounds, until the final version of the list and tool of core competencies necessary for the adaptability of gifted students is reached:

- First: Analysis and results of the first Delphi round.
- Second: Analysis and results of the second Delphi round.
- Thirdly: Analysis and results of the third Delphi round.

First: Analysis and Results of the First Delphi Round

Analysis and results of expert consensus on the list of core competencies - First Round

A- Quantitative Data Analysis. It is clear from Table 1 that all averages for the five core competencies exceeded 3.5 out of 5, which is equivalent to over 70%, indicating a consensus among the experts in the Delphi rounds (Akar, 2020). This means that there is a high degree of agreement among the 18 expert members on the core competencies, and their acquisition is important for the future adaptability of gifted students. The reliability of the response to the list of core competencies was also verified through the Cronbach's alpha coefficient, which was 0.967, as reliability coefficients are considered very high if the Cronbach's alpha score is above 0.90 (Cortina, 1993).

B- Qualitative Data Analysis. Expert comments from multiple perspectives serve as an assurance of the core competency's importance. The clarity of its meaning and the comprehensiveness of its elements. Where their positive, negative, and developmental comments were collected as shown in Table 2 attached, each of these comments made by the experts contributes to strengthening those competencies according to the context being focused on. In this developmental stage of the list of core competencies, the focus

will be particularly on developing the concept and the element. According to the quantitative statistical analysis, there is a consensus among the experts on the list of the five core competencies. However, after the first round, the concept of core competencies and some of their elements were modified and added to, according to the developmental comments proposed by the experts. As shown in Table 7, which compares the development of competencies.

Second: Analysis and Results of the Second Delphi Round

Analysis and results of expert consensus on the list of core competencies - Second Round

A- Quantitative Data Analysis. It is clear from Table 3 that all averages for the five core competencies exceeded 3.5 out of 5, which is equivalent to over 70%, indicating a consensus among the experts in the Delphi rounds (Akar, 2020). This means that there is a high degree of agreement among the 18 experts on the core competencies, and that acquiring them is important for the future adaptation of gifted students. The reliability of the response to the list of core competencies was also verified through the Cronbach's alpha coefficient, which was 0.777, considered acceptable if it is above 0.70 (McNeish, 2018).

B- Qualitative Data Analysis. Expert comments from multiple perspectives serve as an assurance of the core competency's importance. The clarity of its meaning and the comprehensiveness of its elements. Where their positive, negative, and developmental comments were collected as shown in Table 4 attached, each of these comments made by the experts contributes to strengthening those competencies according to the context being focused on. In this developmental stage of the list of core competencies, the focus will be particularly on developing the concept and the elements. According to the quantitative statistical analysis, there is a consensus among the experts on the list of the five core competencies. However, after the second round, the concept of core competencies and some of their elements were modified and added to, according to the developmental comments proposed by the experts. As shown in Table 7, which compares the development of competencies.

Thirdly: Analysis and Results of the Third Delphi Round

Analysis and results of expert consensus on the list of core competencies - Third Round

A- Quantitative Data Analysis. It is clear from Table 5 that all means for the six core competencies exceeded 3.5 out of 5, which is equivalent to over 70%, expressing a state of consensus among experts in Delphi rounds (Akar, 2020). This means that there is a high degree of agreement among the 18 experts on the core competencies, and that acquiring them is important for the future adaptation of gifted students. The reliability of the response to the list of core competencies was also verified through Cronbach's alpha coefficient, which was 0.994, considered acceptable if it is above 0.70 (McNeish, 2018).

B- Qualitative Data Analysis. Expert comments from multiple perspectives serve as an assurance of the core competency's importance. The clarity of its meaning and the

comprehensiveness of its elements. Where their positive, negative, and developmental comments were collected as shown in Table 6 attached, each of these comments made by the experts contributes to strengthening those competencies according to the context being focused on. At this developmental stage of the list of core competencies, it is clear that the concept and elements are in their best form, and it is clear from the comments that there is support for what has been achieved. Also, the experts' comments in the final round tend towards recommendations that help ensure the success of these competencies when their application to gifted students is adopted, as some experts emphasized the importance of criteria to ensure the effective implementation of the elements of these competencies, and some comments have been identified in the previous tables that recommended and specified some criteria that help in the successful application process for gifted students**.** According to the quantitative statistical analysis, there is a consensus among the experts on the list of the six core competencies, their concept, and their elements; thus, the third stage is considered a stability stage, and no modifications or additions were made to the previous competencies from the second round. As shown in Table 7, which compares the development of competencies.

DISCUSSION

The research aimed to develop the core competencies that help gifted students adapt to future challenges and the rapid changes in the labor market, which help them restore balance and ride the new waves in their future careers, and which should be developed through educational practices in gifted programs. To achieve this goal, the classical Delphi method was used, which relies on building a standardized questionnaire in an iterative process where the experts' identities are not revealed to each other (Niederberger & Deckert, 2022). The result of these three rounds was a list of six core competencies, each including a concept and a set of elements through which these competencies are realized in the behavior of gifted students, as follows:

- Analytical Thinking Competency: They are processes and skills that enable an individual to understand and interpret information in-depth, through logical analysis, linking causes and effects, and evidence-based assessment, to make informed decisions in complex situations, and this includes Critical thinking, Systems thinking, Problem-solving, Decision-making, Analysis, Synthesis, Inference, and Evaluation.

- Creativity Competency: They are processes and skills that enable an individual to generate original and flexible ideas characterized by novelty and originality, and apply them in new educational or life situations, through divergent thinking, experimentation, and developing solutions in unconventional ways, and include Fluency, Flexibility, Originality, Perception of details, Sensitivity to problems.

- Investigative Research Competency: They are processes and skills that enable an individual to explore phenomena or problems in a systematic manner, It begins by posing questions or hypotheses, and ends with data analysis and extracting the results, to build new, evidence-based knowledge that includes: Developing a hypothesis or a research question, Review of related research, Planning and scheduling, Finding or developing data collection tools or techniques, Organizing and classifying information, Data analysis, Drawing conclusions, Report writing, Communicating the results.

- Executive Function Competency: They are processes and skills that enable an individual to plan their goals, regulate their behavior, make appropriate decisions, and engage in conscious social interaction, to accomplish tasks efficiently and independently. It includes Work orientation, social interaction, Ethical Leadership, Self-regulation, Planning, and Monitoring.

- Learning How to Learn in Technology Competency: They are processes and skills that enable an individual to use technology intelligently for continuous and self-directed learning, by organizing, evaluating, and employing digital knowledge sources in practical situations, which includes: Identifying trustworthy information, Selectively managing vast information, Organizing, classifying, and evaluating information, Using work-related information, Communicating information effectively, Planning the individual's learning purposefully and gradually, Implementing practical projects autonomously.

- Interdisciplinarity Competency: They are processes and skills that enable an individual to integrate knowledge from multiple disciplines to find innovative solutions to complex problems. They include: Basic understanding of concepts from diverse disciplines, connecting phenomena across different fields, using diverse tools from multiple disciplines, and providing innovative hybrid solutions.

There is a set of core competency lists highlighted by previous studies in the field of gifted education, such as (Akar, 2020; Lee & Park, 2015; Park et al., 2014), which targeted teachers of the gifted, as well as Kim & Lee (2018), which targeted gifted curricula. As for the current study, it targets gifted students; therefore, the focus of the following discussion will be on studies that have highlighted competency lists targeting gifted students, so that the level of development in the core competencies that they share in the same category becomes clear.

The core competencies reached in this study are considered essential for the uncertain future. One of the participants says about the positives of these competencies, "*Enabling students to adapt to modern challenges and rapid changes*", and it is important to work on developing them, especially in gifted programs, due to the students' high abilities to acquire these competencies, as one participant mentioned, "*The competency covers a high cognitive range consistent with the characteristics of gifted students*." When compared with the core competencies that emerged before the Fourth Industrial Revolution, for example, Kim & Lee (2012) which focused on three competencies in the areas of self-behavior, use of cognitive tools, and social interaction, which together constitute 16 skills, we find that they are not compatible with future trends, and the current competencies differ in that they are more comprehensive and broader.

One of the participants in the third round confirms "*All concepts and elements evolved significantly after the modification*" as they include 6 core competencies that collectively form 39 skills, and they are distinguished by three other competencies: Executive Function Competency, for which one participant expressed its purpose: "*The concept highlights the role of executive functions in regulating behavior and making effective, informed decisions*", and the Learning How to Learn in Technology

Competency, one of its main purposes as mentioned by a participant is that "*The concept enhances the learner's ability to use technology intelligently and effectively to achieve self-directed and continuous learning*", and the Interdisciplinarity Competency, about which one participant said, "*The concept encourages the integration of knowledge from multiple fields, which enriches the learner's understanding of complex problems*", which have become a necessity after the emergence of the Fourth Industrial Revolution.

The first five of the six competencies reached in this study agree in name with the competencies proposed by Renzulli (2020), but they differ in concept and many elements. The comparison is evident in Table 7 attached. In the first round, Renzulli's five competencies, their concept and elements before development are evident, and in the third round, the six competencies that were developed, their concept and elements are evident. One of the participants in the third Delphi round confirms, "*All concepts and elements evolved significantly after the modification*", and this difference is due to two reasons: First, Renzulli proposed them as a starting point for the theory of adaptability and riding new waves. Second, many changes have occurred in the skills required for the labor market, which experts have revealed with a new perspective that keeps pace with future developments; therefore, a sixth competency also emerged, which is interdisciplinarity. This competency is not new, but it holds future importance during its dynamic interaction with the other competencies. One participant described this competency as "*Focus on knowledge integration: It emphasized integrating knowledge from multiple fields rather than being limited to superficial multiplicity."*

The competencies reached help students in gifted programs adapt to the changing future and are considered the closest to the accelerating developments, as they include competencies that align with the trends of many studies (Lee et al., 2016; Park et al., 2021; Roh et al., 2018) that give importance to analytical, creative, research, and executive competencies, despite variations in their wording of these competencies, and it adds other competencies and elements to them; it is distinguished and differs from them by the Learning How to Learn in Technology Competency and the Interdisciplinarity Competency, including their detailed skills, in total, they are six competencies that interact to shape the behavior of gifted students so that they are better able to adapt to future changes.

Among the more advanced research on core competencies is Kituu et al. (2022),which added the digital literacy competency, which corresponds in the current research to the Learning How to Learn in Technology Competency, characterized by a set of elements that are appropriate for the advancements in technology and artificial intelligence, One participant emphasizes its importance, "*This competency represents the cornerstone of future skills, especially in the age of artificial intelligence*". However, the current research differs by adding the Interdisciplinarity Competency, which provides a broader horizon for how to think about solutions to future problems.

It is important to view these competencies from a dynamic, interactive perspective and to take them all into account when adopting them in the reforms of gifted student programs, as this perspective equips gifted students with adaptive behavior for the uncertain future, and this aligns with the vision stated by Renzulli (2020). Also, modern theories in the field of gifted education emphasize the dynamic interactions between the

factors that shape the skills of gifted students, for example (Dai, 2017; Subotnik et al., 2021).

CONCLUSIONS

This study set out to identify core competencies for future adaptability of gifted students. Through a three-round Delphi process with 18 experts, we validated six competencies: Analytical Thinking, Creativity, Investigative Research, Executive Function, Learning How to Learn in Technology, and Interdisciplinarity. Together, these comprise 39 behavioral elements that enable gifted students to restore balance and "ride new waves" of change in an uncertain professional future. The key theoretical contribution is the addition of Interdisciplinarity as a standalone competency, reflecting the reality that complex future problems rarely respect disciplinary boundaries. Practically, gifted programs should move beyond isolated skill training toward integrated, project-based experiences where all six competencies are exercised simultaneously. However, this model remains expert-derived, not empirically validated. Future research must test whether gifted students trained under this model demonstrate higher career adaptability scores (e.g., on the CASS) compared to traditional curricula. Until such evidence exists, educators should use this model as a flexible framework rather than a prescriptive checklist.

RECOMMENDATIONS

1. It is important to continuously evaluate the suitability of the core competencies targeted in gifted programs for the skills required in the future.
2. Researchers should develop the core competencies for the other pillars of the educational process in gifted programs, such as the teacher and the curriculum.
3. Build modern strategies that help in acquiring the core competencies and increasing the interactions between them.

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APPENDIX

Table 1

Descriptive statistics for the degree of agreement of the Delphi expert panel on the list of core competencies

Descriptive Statistics					
Core Competencies	Sample	Minimum	Top	Mean	Standard deviation
Analytical Thinking Skills	18	1	5	4.6667	0.97014
Creativity skills	18	1	5	4.3889	1.0369
Investigative Research Skills	18	1	5	4.5556	0.98352
Executive Function Skills	18	1	5	4.6111	0.97853
Learning How to Learn in Technology Skills	18	1	5	4.4444	1.04162

Table 2

Important ideas from the experts' comments

Analytical Thinking Competency		
Positive comments	Negative comments	Developmental Comments
-The concept's wording is clear, and it combines higher-order thinking skills such as analysis, synthesis, and evaluation. Competency is fundamental to any educational or research situation, and it covers deep cognitive skills.	-It may not cover the element of speed with the requirements of artificial intelligence and technology. -The skill of synthesis has recently been classified as part of creativity. This can be seen in the revised Bloom's taxonomy.	-The current definition is a good starting point, but it needs to be expanded to include modern skills and applied contexts. -Add the element of inference. -They are the higher mental skills that enable an individual to understand and interpret information in depth, through logical analysis, and linking causes and effects, and evidence-based assessment, to make informed decisions in complex situations.
Creativity Competency		
Positive comments	Negative comments	Developmental Comments
-Diversity of elements: The concept includes a wide range of techniques (such as imagination ,brainstorming, adaptation) that cover different aspects of creative thinking, providing multiple tools for generating ideas. -Focus on creative processes such as reformulation and substitution, which enhance flexibility in dealing with problems. -Inclusiveness of some well-known methods such as curiosity (as a driver of creativity) and alternative use (repurposing things), which are established concepts in the literature on creativity. -It contributes to developing flexible thinking and opens broad horizons for innovation in learning and work. -It also increases internal motivation and supports personal and professional excellence in various fields. -Its elements are comprehensive and consistent with thinking skills. -The concept clearly reflects the skills that promote divergent thinking and innovation. -The multiplicity of elements, such as brainstorming, other use, and adaptation, gives a practical dimension to the competency.	-The competency lacks reference to the ethical aspect of employing creativity.	-Add the element of invention. -It is the ability to generate original and flexible ideas characterized by novelty and relevance, and applying them in new educational or life situations, through divergent thinking, and experimentation, and to develop solutions in unconventional ways.
Investigative Research Competency		
Positive comments	Negative comments	Developmental Comments
-It enables the individual to acquire deep knowledge based on evidence and scientific research. -The competency is comprehensive and interconnected, and it reflects the steps of real scientific research from the		-They are the skills that enable an individual to explore phenomena or problems in an organized manner, it begins by posing questions or hypotheses, and

question to the report. -The wording of the elements is precise and supports the development of an organized scientific mindset in the learner.		ends with data analysis and extracting the results, with the aim of building new knowledge based on evidence.
Executive Function Competency		
Positive comments	Negative comments	Developmental Comments
-Comprehensiveness of the concept: It includes multiple aspects such as creativity, research, and social interaction, reflecting an integrated vision that links cognitive and social skills. -The focus on altruistic leadership highlights leadership that serves others, which promotes ethical and cooperative values. -Attention to the social dimension includes awareness of the needs of others, which enhances emotional intelligence and effective interaction in group environments. -The concept expresses the skills that enable the learner to transform knowledge into disciplined practice. The wording of competency shows a balance between personal and social skills.	-Some terms may be unfamiliar or ambiguous (such as "altruistic leadership" or "awareness of others' needs"). Also, the concept of "executive function" itself may need a clearer educational definition.	-Add the elements of strategic planning and effective time management as they are executive function skills. -It is a set of personal and organizational skills that help an individual plan their goals, regulate his behavior, make appropriate decisions, and conscious social interaction, enabling them to complete their tasks efficiently and independently.
Learning How to Learn in Technology Competency		
Positive comments	Negative comments	Developmental Comments
-The definition highlights the importance of keeping up with rapid technological developments, making it suitable for the digital age characterized by continuous transformations. -Comprehensiveness of elements: The mentioned elements (such as identifying reliable information, information management, evaluation, and communication) covered multiple aspects of the learning process, from research to practical application. -Compatibility with technological development.		-It is preferable to rephrase. -They are the skills that enable an individual to use technology intelligently to plan their learning, organizing and evaluating digital knowledge sources, and applying them in practical situations, which enhances their ability for continuous and self-directed learning in changing environments.
Comments suggesting additional competencies		
It is preferable to add systems thinking skills.		

Table 3
Descriptive statistics for the degree of agreement of the Delphi expert panel on the list of core competencies - Second Round

Descriptive Statistics					
Core Competencies	Sample	Minimum	Top	Mean	Standard deviation
Analytical thinking skills	18	4	5	4.8889	0.32338
Creativity skills	18	3	5	4.7778	0.54832
Investigative Research Skills	18	4	5	4.7222	0.46089
Executive Function Skills	18	3	5	4.6111	0.6978
Learning How to Learn in Technology Skills	18	3	5	4.7778	0.54832

Table 4
Important ideas from the experts' comments

Analytical Thinking Competency		
Positive feedback	Negative comments	Developmental Comments
-Comprehensiveness of elements: It covers elements such as critical and systems thinking and problem-solving, providing integrated tools to face challenges. -Necessary according to modern theories. -The competency covers a high cognitive range consistent with the		-They are processes and skills that enable an individual to understand and interpret information in depth, Through logical analysis, and linking causes and effects, and evidence-based assessment, to make informed decisions in complex situations and include (critical thinking, Systems thinking, Problem-solving, Decision-

characteristics of gifted students. -The inclusion of systems thinking is an important development in facing future complex challenges.		making, Analysis, Synthesis, Inference, evaluation).

Creativity Competency		
Positive feedback	Negative comments	Developmental Comments
-Enabling students to adapt to modern challenges and rapid changes. -Its conceptual richness and multiplicity of strategies reflect the breadth of the concept of creativity. -It helps in dealing with changing challenges with flexibility and innovation.	-The large number of included elements may reduce focus in practical assessment.	-They are processes and skills that enable an individual to generate original and flexible ideas characterized by novelty and originality, and applying them in new educational or life situations, Through divergent thinking, and experimentation, and to develop solutions in unconventional ways, and they include (fluency, flexibility, originality, and elaboration, and sensitivity to problems).
Investigative Research Competency		
Positive feedback	Negative comments	Developmental Comments
-Linking theoretical knowledge with practical application. -Preparing learners for scientific research at the university level. - Competency aligns with STEM trends and inquiry-based learning. -It fosters curiosity and the continuous search for knowledge. -It is an important tool for preparing students for scientific research at higher levels.	-Order: Questions then hypotheses	-Include research ethics as a fundamental element (such as obtaining ethical approvals, protecting data privacy).
Executive Function Competency		
Positive feedback	Negative comments	Developmental Comments
-Developing self-regulation and self-discipline skills. -Comprehensiveness of the concept: The skills cover multiple aspects (planning, self-control, social interaction)، making it suitable for promoting independence and efficiency. -The competency is comprehensive, and it touches on life skills and independent learning.	-Omission of basic components: Absence of key elements related to traditional executive functions such as: cognitive flexibility, emotional control, working memory.	-Clarify terms: Replace "altruistic leadership" with cooperative or ethical to be more comprehensive. -Reorder the elements according to the cognitive neuroscience framework (e.g.: self-control – planning – monitoring). -They are the cognitive and behavioral skills that enable an individual to plan their goals, and regulate his behavior, and making appropriate decisions, and conscious social interaction, to accomplish tasks efficiently and independently, and they include: Work orientation, self-assessment, social interaction, leadership, planning, time management.
Learning How to Learn in Technology Competency		
Positive feedback	Negative comments	Developmental Comments
-The presence of important terms such as: "organize“ ”,evaluate,” “employ,” changing environments” gives the wording a modern academic character. -This competency represents the cornerstone of future skills, especially in the age of artificial intelligence. -It develops the ability to select and filter important information from the		-The order of elements can be improved to reflect the logic of digital learning:(identify → organize → use → communicate → plan → execute). -Modify to: They are processes and skills that enable the individual. -Modify the beginning: They are the skills that enable an individual to use technology intelligently for continuous and self-

vast amount available. -It supports continuous learning and staying up-to-date with the latest developments in the field of specialization.	directed learning, by organizing, evaluating, and employing digital knowledge sources in practical situations.
Comments suggesting additional competencies	
- Interdisciplinary Thinking Competency. Concept: The ability to integrate knowledge from multiple fields to find innovative solutions to complex problems. Elements: •Basic understanding of concepts from diverse disciplines. •Connecting phenomena in different fields. •Using various tools from multiple disciplines. •Providing innovative hybrid solutions.	

Table 5
Descriptive statistics for the degree of agreement of the Delphi expert panel on the list of core competencies - Third Round

Descriptive Statistics					
Core Competencies	Sample	Minimum	Top	Mean	Standard deviation
Analytical thinking skills	18	1	5	4.7222	0.95828
Creativity skills	18	1	5	4.7222	0.95828
Investigative Research Skills	18	1	5	4.6667	0.97014
Executive Function Skills	18	1	5	4.7222	0.95828
Learning How to Learn in Technology Skills	18	1	5	4.7222	0.95828
Interdisciplinarity skills	18	1	5	4.5556	0.98352

Table 6
Important ideas from the experts' comments

Analytical Thinking Competency		
Positive feedback	Negative comments	Developmental Comments
-Comprehensiveness of elements: It covers all stages of analytical thinking (from analysis to evaluation). -Linking theory to practice: It focused on decision-making in complex situations, which enhances the practical aspect. -The concept of analytical thinking was clarified precisely after the modification.	-It requires significant time and effort from the teacher to train students on it correctly. -It may not suit some traditional teaching methods that focus on memorization and rote learning.	-The current definition is excellent but needs: -Clarification of application mechanisms (how to implement the elements). -Linking skills to the digital transformation (e.g., big data analysis). -Reference to balancing speed and accuracy in decision-making. -Continuous training on problem-solving.
Creativity Competency		
Positive feedback	Negative comments	Developmental Comments
-Modern terms such as “fluency,” “flexibility,” originality” were included. -The new concept is more precise and comprehensive". -The concept focuses on important elements such as originality, fluency, flexibility, and sensitivity to problems, which are essential skills in contemporary work and educational environments.	-Lack of distinction between creativity and innovation: Creativity (generating ideas) ≠ Innovation (applying them practically)، and the concept merges them without clarification. -The concept may seem more theoretical than practical for young learners or in the early stages.	-Measurement criteria: Add: "Measuring creativity through indicators (number of ideas produced, their diversity, the percentage of their successful application).
Investigative Research Competency		
Positive feedback	Negative comments	Developmental Comments

-Comprehensiveness of research stages: It covered all basic steps (from planning to communicating results). -Detailing of practical elements: such as developing hypotheses, data collection, and analysis. -The rephrasing clarifies the research steps logically.	-Lack of distinction between research types: Clarification of the differences between quantitative/qualitative/mixed research was missing. -It requires advanced skills. -The concept is broad and may be complex for learners unfamiliar with the steps of scientific research.	-Managing challenges: Dealing with difficulties during implementation (such as loss of samples, bias). Enhance the "communicating results" stage.
Executive Function Competency		
Positive feedback	Negative comments	Developmental Comments
-Linking skills to independence: It focused on enabling the individual to "complete their tasks efficiently and independently". -Integrating the ethical dimension: Inclusion of "ethical leadership" as a key element. -The concept highlights the role of executive functions in regulating behavior and making effective, informed decisions.	-Lack of implementation mechanisms: How to turn planning into action? (e.g., task division, time management).	-Detailing practical application: Examples: -Self-control: Avoid digital distractions while working. -Monitoring: Evaluate project progress weekly and correct the course. -Add performance indicator measurement criteria: goal achievement rate, accuracy of risk prediction, speed of adaptation to challenges.
Learning How to Learn in Technology Competency		
Positive feedback	Negative comments	Developmental Comments
-Focus on self-directed learning: It linked skills to continuous and self-directed learning as a primary goal. -Addressing digital challenges: It addressed critical points such as evaluating the credibility of information and managing it. -Linking knowledge to application: It included employing information in practical situations and implementing projects. -Providing flexible learning. -Focus on self-directed learning and the smart use of technology. -The concept enhances the learner's ability to use technology intelligently and effectively to achieve self-directed and continuous learning.		-Technological adaptation., periodic review of modern learning tools. -Measurement criteria: It is possible to add competency measurement via: quality of digital outputs, speed of updating skills with new tools, effectiveness of sharing knowledge with others. -Designing projects that rely on artificial intelligence tools to support personalized learning.
Interdisciplinarity Competency		
Positive feedback	Negative comments	Developmental Comments
-Clarity of strategic goal: It linked the skill to finding innovative solutions for complex problems as a primary goal. -Focus on knowledge integration: It emphasized integrating knowledge from multiple fields rather than being limited to superficial multiplicity. -Comprehensiveness of practical elements: It covered the stages of the process (understanding, connecting, employing, creating). -The concept encourages the integration of knowledge from multiple fields, which enriches the learner's	-Lack of defining innovation criteria (novelty, feasibility, impact).	-Competency measurement criteria: -Quality of solutions. -Balance between technical novelty and practical relevance. -Integration effectiveness: The degree of harmony of specialized components in the final solution. -Scalability or generalizability: The possibility of generalizing the model to similar contexts.

understanding of complex problems.

Comments suggesting additional competencies
All concepts and elements evolved significantly “after modification, "but future improvement could focus on: •Practical and pedagogical application in classroom environments. •Simplifying scientific language without losing depth. •Including realistic scenarios and applied projects. •Linking concepts to the assessment of gifted students and the diagnosis of their needs.

Table7
Comparison of the development of core competencies in the three Delphi rounds

First Round		Second Round		Third Round	
Core competence	Concept and Elements	Core competence	Concept and Elements	Core competence	Concept and Elements
Analytic Thinking Skills	It enables an individual to gain a deeper understanding of a topic and includes Critical thinking, Problem-solving, decision-making, analysis, synthesis, Evaluation.	Analytic Thinking Skills	It enables an individual to understand and interpret information in depth,Through logical analysis,and linking causes and effects,and evidence-based assessment,To make informed decisions in complex situations, and this includes:Critical thinking,Systems thinking,Problem-solving,Decision-making, Analysis, Synthesis, .Inference,Evaluation	Analytic Thinking Skills	They are processes and skills that enable an individual to understand and interpret information in-depth,Through logical analysis,and linking causes and effects,and evidence-based assessment,To make informed decisions in complex situations, and this includes:Critical thinking,Systems thinking,Problem-solving,Decision-making, Analysis, Synthesis, .Inference,Evaluation
Creativity Skills	It enables an individual to come up with new ideas and includes Curiosity, Brainstorming, Substitution, Questioning, Rephrasing, Imagining, Modifying, Combining, Adapting, Eliminating, Reflecting, Magnifying, Minifying, alternative use.	Creativity Skills	It enables an individual to generate original and flexible ideas characterized by novelty and relevance,and applying them in new educational or life situations,Through divergent thinking, and experimentation,and developing solutions in unconventional ways, and includes:Curiosity,Brainstorming, Substitution, Questioning,Rephrasing, Imagining, Modifying, Combining, Adapting, Eliminating, Reflecting, Magnifying, Minifying,Other use,invention.	Creativity Skills	They are processes and skills that enable an individual to generate original and flexible ideas characterized by novelty and originality,and applying them in new educational or life situations,Through divergent thinking, and experimentation,and developing solutions in unconventional ways, and includes:Fluency, Flexibility, Originality,Perception of details,Sensitivity to problems.
Basic Investigative Research Skills	It helps an individual develop new knowledge and includes Developing a hypothesis or a research question, Review of related research, Planning and scheduling, Finding or developing data collection tools or techniques, Organizing and classifying information, Data	Basic Investigative Research Skills	It enables an individual to explore phenomena or problems in an organized manner,It begins by posing questions or hypotheses,and ends with data analysis and extracting the results,To build new, evidence-based knowledge that includes:Developing a hypothesis or a research question,Review of related research,Planning and scheduling,Finding or developing data collection tools or techniques,Organizing and classifying information,Data analysis,Drawing conclusions,Report .writing,Communicating the results	Basic Investigative Research Skills	They are processes and skills that enable an individual to explore phenomena or problems in a systematic manner,It begins by posing questions or hypotheses,and ends with data analysis and extracting the results,To build new, evidence-based knowledge that includes:Developing a hypothesis or a research question,Review of related research,Planning and scheduling,Finding or developing data collection tools or techniques,Organizing and classifying information,Data analysis,Drawing

	analysis, drawing conclusions, Report writing, Communicating the results.				conclusions,Report writing,Communicating the .results
Executive Function Skills	It enables an individual to execute higher levels of thinking, creativity, and research and includes Work orientation, Realistic self-assessment, social interaction, Awareness of others' needs, altruistic leadership.	Executive Function Skills	It helps an individual plan their goals,and regulate his behavior,and making appropriate decisions,and conscious social interaction,enabling them to complete their tasks efficiently and independently, and it includes:Work orientation,Realistic self-assessment,Social interaction,Awareness of others' needs,altruistic leadership,strategic planning,effective time .management	Executive Function Skills	They are processes and skills that enable an individual to plan their goals,and regulate his behavior,and making appropriate decisions,and conscious social interaction,to accomplish tasks efficiently and independently,It includes:Work orientation,Social interaction,Ethical Leadership,Self-regulation, .Planning,Monitoring
			It enables an individual to use technology intelligently to plan their learning,organizing and evaluating digital knowledge sources,and applying them in practical situations,enhancing their ability for continuous and self-directed learning in changing environments, and it includes:Identifying trustworthy information,Selectively managing vast information,Organizing, classifying, and evaluating information,Using work-related information,Communicating information effectively,Planning the individual's learning purposefully and gradually,Implementing practical .projects autonomously	Learning-How-To-Learn Skills in Technology	They are processes and skills that enable an individual to use technology intelligently for continuous and self-directed learning,By organizing, evaluating, and employing digital knowledge sources in practical situations, which :includes Identifying trustworthy information,Selectively managing vast information,Organizing, classifying, and evaluating information,Using work-related information,Communicating information effectively,Planning the individual's learning purposefully and gradually,Implementing practical .projects autonomously
				Interdisciplinary Thinking skills	They are processes and skills that enable an individual to integrate knowledge from multiple disciplines to find innovative solutions to complex problems,It includes:Basic understanding of concepts from diverse disciplines,Connecting phenomena across different fields,Using diverse tools from multiple disciplines,Providing innovative hybrid solutions.