

Standardized scales for identifying behavioral characteristics of gifted students in the field of technology: a Structured analytical review

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Abstract

Gifted students represent an important human resource for educational innovation and national development, particularly in technology-related fields. However, identifying students whose giftedness is expressed through technological performance remains challenging because few tools focus specifically on behavioral characteristics in technology. This study used a structured analytical review approach to examine selected literature and measurement tools related to identifying gifted and high-achieving students in technology. Two tools were analyzed: Renzulli's Technology Characteristics Scale within the Scales for Rating the Behavioral Characteristics of Superior Students and Ontario's Student Technology Skills Rating Scale: Junior Division. The analysis showed that Renzulli's scale is more directly connected to gifted-identification procedures, whereas the Ontario scale measures general technology competence rather than giftedness. The findings also indicate a clear gap in Arab and Jordanian contexts, where no locally developed or adapted Arabic scale was identified for assessing technology-related gifted behaviors. The study recommends translating, culturally adapting, and validating relevant tools for Jordanian schools, considering technology-related giftedness as a complementary domain in identification systems, and training teachers to recognize advanced technological behaviors

Keywords: Behavioral Characteristics; Gifted Students; Standardized Scale; Technology Skills

Introduction

In the modern era, gifted students are recognized as one of the most critical resources for advancing a nation's global standing. A nation committed to societal progress understands that optimal investment extends beyond natural or industrial resources. The most valuable and enduring investment lies in human capital—specifically, in nurturing the potential of gifted individuals.

Investing in human potential is a long-term endeavor, yielding results over time rather than overnight. Such strategic initiatives require meticulous, flexible, and scientifically grounded planning. Prioritizing the identification and support of gifted students is therefore one of the most effective ways to foster innovation and societal advancement. In this regard, accurate identification is not a secondary procedure, but a foundational step that determines whether students with advanced potential are recognized and provided with appropriate educational opportunities.

Over the past two decades, rapid advancements in fields such as communications, industry, biological sciences, and digital technologies have transformed societies. Technological progress, in particular, has been a driving force behind this acceleration, reshaping social norms and human behaviors. At the heart of this progress lies knowledge production, which is fundamentally driven by human creativity and intelligence. Consequently, nations must invest in intelligent, innovative individuals from an early age, providing them with financial, material, and psychological support. Schools, as key institutions, play a vital role in identifying and nurturing gifted students.

To remain relevant in an era of rapid scientific and technological advancement, schools must adopt structured plans and strategies for identifying and developing gifted students' talents. This underscores the increasing relevance of technology as a domain in which gifted behaviors may be expressed. By leveraging technology, gifted students can generate knowledge more efficiently, precisely, and with less effort, making them indispensable contributors to societal progress.

This need is especially important in technology-related domains, where giftedness may appear through creative digital production, advanced problem solving, computational thinking, independent learning of technological tools, and the ability to support peers in solving technical problems (Hebda, 2023; Pereira et al., 2025; Siegle, 2004). Therefore, the relationship between gifted education and technology should not be treated only as a matter of using technology in instruction, but also as a matter of identifying students whose gifted behaviors are expressed through technology itself.

Gifted and Talented Students

The definitions, characteristics, and needs of gifted students have been widely studied, attracting the attention of researchers, educators, and psychologists, particularly after World War II. Understanding these characteristics is essential for designing effective educational programs for gifted students (Alyasra & Al-Azizi, 2012). These characteristics span cognitive, intellectual, emotional, social, and ethical dimensions, and gifted students often exhibit advanced learning styles and unique modes of expression.

Scholars have approached the study of giftedness from various perspectives. Francis Galton emphasized that gifted individuals possess exceptional working capacity, including physical strength and heightened sensory abilities. Similarly, James Cattell identified intellectual ability as the defining feature of giftedness. Over time, numerous theories and measurement approaches emerged, but Lewis Terman's 1929 longitudinal study had a major impact. Terman's work is widely regarded as one of the earliest scientific attempts to study the behavioral characteristics of gifted students (Jarwan, 2012 b).

Terman and Hollingworth defined behavioral characteristics as patterns of behavior that distinguish gifted students from their peers. These characteristics include heightened curiosity, diverse and deep interests, rapid learning and comprehension, independence, risk-taking, leadership, initiative, and perseverance (Alyasra & Al-Azizi, 2012).

Building on this foundation, Tuttle and Becker characterized gifted students as highly curious, persistent in exploring questions and interests, and acutely aware of their surroundings. They possess the ability to critically evaluate themselves and others, exhibit a sophisticated sense of humor, and demonstrate heightened sensitivity to injustice. Additionally, they often reject superficial answers, respond to their environment in unconventional ways, and recognize connections between seemingly unrelated ideas (Jarwan, 2012 a).

Joseph Renzulli further refined the understanding of giftedness by identifying three key attributes: above-average ability, creativity, and high task commitment. According to Renzulli (2010), these attributes can be applied across any domain of human performance, including technology-related domains, making them a versatile framework for identifying gifted students.

The Importance of Behavioral Characteristics

Behavioral characteristics are critical indicators of giftedness, particularly during early childhood. These characteristics represent psychological attributes that distinguish gifted students and often become integral aspects of their personalities. Recognizing these character-

istics is essential in gifted education, as behavioral rating scales are among the primary tools used to identify students for specialized programs.

The strong connection between behavioral characteristics and the needs they generate underscores the importance of tailored educational and counseling programs. Supporting gifted students effectively requires aligning their strengths and weaknesses with programs that address their diverse needs. It is important to note that not all characteristics must be present in every gifted student. Some characteristics may be more pronounced in certain individuals, while others may vary depending on context. Educators, mentors, and families must remain attuned to these variations and address them through awareness programs, counseling, and guidance (Al-Masdar, 2008).

Today's gifted students are growing up in an era of unprecedented technological advancement, which presents both opportunities and challenges. The complexity of the modern world, driven by information and communication technologies, demands more than just traditional education. Success in overcoming these challenges depends not only on the volume of knowledge acquired but also on the development of essential skills and competencies. As a result, the education of gifted students has become more urgent than ever, posing significant challenges for families, schools, and communities (Al-Zaidi, 2012). This also suggests the need to identify gifted behaviors that may appear specifically through technological performance, such as creative digital production, independent problem solving, and advanced use of technological tools (Hebda, 2023; Siegle, 2004).

Educational Technology

Educational technology encompasses a wide range of tools, including computers, the internet, mobile devices, interactive whiteboards, and software programs designed to enhance learning. These tools serve as valuable resources for teachers, enabling them to perform their tasks more efficiently by providing insights into students' academic performance, successes, and struggles.

To appreciate the role of modern educational technology, it is helpful to first consider the traditional teacher-student relationship. Maintaining a personalized instructional strategy is easier when teachers have a direct and personal connection with their students. Educational technology enhances this relationship by empowering teachers to transition from traditional instructors to mentors and facilitators of learning. Tools such as game-based assessments and adaptive educational technology allow teachers to tailor their methods, curricula, and classroom programs to meet the diverse needs of their students.

When used effectively, educational technology can help teachers maximize their time, evaluate student performance, and enhance their own teaching practices. However, achieving these outcomes depends on how technology is integrated into the classroom. Equally important is the identification of students with exceptional technological skills, as these individuals represent a unique opportunity to fully invest in human potential. Therefore, educational technology should be viewed not only as a teaching tool but also as a domain in which giftedness may be observed, rated, and developed.

Research Problem and Objectives

The field of gifted education is rich with standardized tools for identifying gifted students across various domains. While these tools are not the only means of identifying giftedness, they represent scientifically rigorous and accredited methods. These assessments are grounded in well-established educational theories and have been developed through extensive research in the fields of giftedness and creativity.

Examples of such assessments include the Watson-Glaser Critical Thinking Appraisal, the Stanford-Binet Intelligence Scale, the Wechsler Intelligence Scale, the Torrance Tests of Creative Thinking, and the Rimm and Davis Scale. These tools have been adapted for use in various cultural contexts, including Jordan. Among the most significant tools are Renzulli and colleagues' (2010) fourteen behavioral rating scales, which assess characteristics such as learning ability, creativity, motivation, leadership, and technological skills. The original SRBCSS scales have been adapted in some Arab contexts; however, the technology scale itself has received far less attention in Arab and Jordanian research.

Despite the abundance of tools for identifying giftedness, there is a notable gap in the assessment of technological skills. Many existing tools focus on well-established domains such as thinking, motivation, and learning, but few prioritize technological abilities. This oversight may stem from the relatively recent emergence of technology as a field compared to the extensive literature on giftedness. Additionally, the rapid pace of technological advancement requires continuous adaptation, making it challenging to develop and maintain relevant assessment tools.

Recent literature confirms growing attention to technology talent, computer science talent development, and technological giftedness; however, this attention has not been matched by the development of many standardized tools designed specifically to identify gifted students in technology (Hebda, 2023; Pereira et al., 2025; Renzulli et al., 2009; Siegle, 2004).

Study Objectives:

Identify the original versions of the scales used to detect gifted students in the field of technology.

Examine whether Jordanian adaptations of these scales exist.

Analyze the structure, rating procedures, and psychometric evidence of the identified technology-related scales.

Compare the identified scales in terms of purpose, domains, applicability, and limitations.

Clarify the need for developing or adapting a Jordanian version of a scale for identifying gifted students in technology.

Previous Studies

Upon reviewing the educational literature and previous studies related to identifying the behavioral characteristics of gifted students in technology using standardized scales, the researcher found that studies in this field are limited. This limitation is not restricted to the Arab context; rather, the international literature also shows that technological giftedness has received less attention than traditional domains of giftedness, such as academic achievement, creativity, leadership, and general cognitive ability. The following are the most relevant studies identified:

Studies that examined the relationship between giftedness and technology indicate that technology may function as a distinct domain through which gifted behaviors become visible. Siegle (2004) conducted a study aimed at understanding how to identify gifted and high-achieving students in the field of technology. The study highlighted several methods, including observation, noting that gifted students tend to use technology deliberately to create complex and intricate school projects. These students also frequently assist their peers with technological issues, demonstrating a high level of knowledge. The study suggested that rating scales may be one useful method for identifying students with gifts and talents in technology, particularly when combined with observation of students' technological products, technology-related questions, and peer support behaviors. Siegle recommended the Behavioral Characteristics Scale for Gifted and High-Achieving Students in Technology by Renzulli and colleagues as a relevant teacher-rating tool for documenting technology-related gifted behaviors.

Renzulli, Siegle, Reis, Gavin, and Sytsma Reed (2009) provided stronger empirical support for this direction by examining the reliability and factor structure of four new scales for rating the behavioral characteristics of superior students, including reading, mathematics, science,

and technology. Their study is highly relevant because it treats technology as a distinct performance area within gifted education rather than as a general classroom skill. The technology scale focuses on teacher-observable behaviors related to students' technological expertise, initiative, problem solving, support for others, and creative use of technology. This makes it one of the few standardized teacher-rating tools directly connected to the identification of technologically gifted students. However, because the scale was developed and validated in a non-Arab context, its use in Jordan or other Arab countries requires linguistic adaptation, cultural validation, and local psychometric examination.

Recent studies have also strengthened the theoretical relationship between giftedness and technology, although they do not necessarily provide identification scales. Hebda (2023) discussed technology talent development among gifted students and argued that computer programming can provide opportunities for creative productivity, complex problem solving, perseverance, feedback processing, and self-directed learning. This study supports the idea that technological giftedness should not be reduced to ordinary computer use; rather, it may appear through advanced engagement with coding, digital production, and creative technological problem-solving. However, the study is mainly developmental and practical, not a psychometric validation of an identification tool.

Similarly, Pereira et al. (2025) proposed a computer science talent development model for K-12 education. Their model emphasizes early access to computer science opportunities, mentoring, psychosocial support, and advanced learning pathways. This study is useful because it confirms the growing importance of computer science as a field of talent development. Nevertheless, it does not provide a standardized scale for identifying gifted students in technology. Instead, it reinforces the need for clear identification procedures that can recognize students with advanced technological potential before talent-development programs are implemented.

Su (2020) reviewed the concept of information and communication technology talents and argued that ICT talent has emerged as a new form of talent in response to rapid technological development. This review is important because it shows that technology-related talent is still conceptually developing and requires clearer definitions, indicators, and measurement approaches. However, the study addresses ICT talent broadly and does not focus specifically on gifted students in school settings or on teacher-rated identification scales.

Several empirical studies have examined technological competencies among already-identified gifted students. Avcu and Ayverdi (2020), for example, investigated the relationship between computer programming self-efficacy and computational thinking skills among gifted and talented students. The study used the Computational Thinking Skills Scale and the Com-

puter Programming Self-Efficacy Scale and found a positive relationship between the two variables. This study confirms the relevance of programming and computational thinking to gifted students, but it does not offer a tool for initially identifying students as technologically gifted. Rather, it measures technology-related competencies among students who had already been identified as gifted.

Şen, Ay, and Kırac (2021) examined computational thinking skills among gifted and talented students through integrated STEM activities involving robotics and 3D robot modeling. Their findings showed that gifted students used critical thinking, problem solving, creativity, generalization, and explanation skills during technology-rich STEM tasks. This study supports the behavioral link between giftedness and technology-based performance. However, like Avcu and Ayverdi (2020), it does not provide a standardized gifted-identification scale; instead, it demonstrates how gifted students' abilities may appear in technological and STEM-based learning environments.

Olpak and Karamete (2024) also examined gifted students' self-efficacy perceptions related to computational thinking skills and information technologies. Their study contributes to the recent literature by showing that computational thinking and information technology self-efficacy are relevant variables in understanding gifted students' technological competencies. However, the study relies on self-efficacy measures rather than teacher-rated behavioral indicators, and therefore it cannot replace the need for standardized identification tools designed specifically for technological giftedness.

Abboud and Al-Masmoudi (2014) developed and standardized a behavioral characteristics scale for identifying gifted students at King Faisal University in Saudi Arabia. The study sample consisted of 264 students from various disciplines. The scale demonstrated high validity and reliability and included 22 dimensions, one of which focused on technology and information technology. The behavioral indicators for this dimension included:

Enjoying games that require concentration and strategic thinking, such as chess.

Enjoying reading technology magazines and following programs that present the latest developments in information technology.

This scale incorporates some behavioral characteristics related to technology as a characteristic of giftedness, highlighting the importance of technological skills in identifying gifted students. However, its limitation is that technology appears as one dimension within a broader giftedness scale, not as a specialized and independent tool for identifying gifted students in technology. Therefore, although the study is valuable because it comes from an Arab context,

it does not fully address the need for a technology-specific giftedness scale.

The Ontario Student Technology Skills Rating Scale is also relevant because it provides practical indicators for assessing students' technology skills, including routine use, information retrieval, information processing, and communication skills. Its strength lies in its classroom applicability and its focus on observable technological performance. However, it appears to assess general technology competence rather than giftedness. Therefore, it may help identify students who are advanced users of technology, but it does not necessarily distinguish between ordinary technological proficiency and exceptional technological giftedness.

Review of Previous Studies and Identification of the Research Gap

Taken together, previous studies reveal three important points. First, recent literature confirms a growing relationship between giftedness, technology, computer science, computational thinking, and creative digital production, particularly through coding, technology-based projects, and computer science talent-development pathways (Hebda, 2023; Pereira et al., 2025). Second, most recent studies examine technological competencies among students who have already been identified as gifted, rather than providing tools for identifying students as technologically gifted.

Third, within the reviewed literature, standardized teacher-rated tools designed specifically to identify gifted students in technology appear to remain limited. Siegle (2004) noted that students with gifts and talents in technology may not be identified through traditional gifted-identification methods and suggested rating scales as one possible method for identifying them. Renzulli et al. (2009) provided one of the most directly relevant teacher-rating tools by examining the reliability and factor structure of new SRBCSS scales, including the technology scale. The Renzulli technology scale, therefore, appears to be the most directly relevant gifted-identification tool, whereas the Ontario scale provides useful indicators of technology skills but is not specifically designed as a giftedness-identification scale.

These findings confirm the need for further Arab and Jordanian efforts to adapt or develop a valid and reliable teacher-rated scale for identifying the behavioral characteristics of gifted students in technology.

Methodology and Procedures

To achieve the objectives of this study, the researcher conducted a structured analytical review of selected literature and measurement tools related to scales designed for identifying the behavioral characteristics of gifted and high-achieving students, specifically in the field of

technology. Relevant literature and tools were identified through searches of Google Scholar, ERIC, publisher databases, and manual searches of references related to giftedness, technology talent, computational thinking, and behavioral rating scales. The review focused on tools that met the following criteria: direct relevance to technology-related behaviors or skills, use of observable rating indicators, applicability in educational settings, availability of scoring procedures, and potential relevance to identifying advanced or gifted technological performance. The study aimed to locate precise measurement tools for this purpose and to analyze them in terms of purpose, structure, rating procedure, scoring method, psychometric evidence, and relevance to Arab and Jordanian educational contexts.

Based on these criteria, two tools were identified as the most relevant to the purpose of this study: Renzulli's Technology Characteristics scale, which is directly connected to gifted-identification procedures, and the Ontario Student Technology Skills Rating Scale, which assesses students' technology skills but is not specifically designed as a gifted-identification tool.

First Scale: Scale for Rating the Behavioral Characteristics of Superior Students in Technology

Renzulli, Smith, White, Callahan, and Hartman (2010) identified behavioral characteristics of gifted students, beginning their work in 1970. Initially, three primary scales were developed to assess behavioral characteristics related to learning, motivation, and creativity. Later, Robert Hartman added a scale to measure leadership-

related behavioral characteristics. By 1976, ten internationally recognized scales had been published to evaluate behavioral characteristics.

In 1990, Karen Westberg refined the first four scales, and the validity and reliability of the ten scales were subsequently established. In 2003, Renzulli and his colleagues introduced four additional scales focusing on behavioral characteristics associated with reading, science, mathematics, and technology. The validity and reliability of these four scales were confirmed in a separate study conducted in 2009 by Renzulli, Siegle, Reis, Gavin, and Sytsma Reed. Ultimately, the final version of the fourteen scales was compiled in a handbook in 2010 (Masoud, 2014).

The Technology Characteristics scale was examined by Renzulli, Siegle, Reis, Gavin, and Sytsma Reed (2009) as one of four new SRBCSS content-area scales: reading, mathematics, science, and technology. The technology scale focuses on four characteristics: expertise in using technology, interest and initiative in using technology, mentoring others in technology, and creative integration of technology. The final technology model included seven items and demonstrated strong internal consistency, with Cronbach's alpha of .959. Confirmatory factor

analysis also supported the seven-item model, with acceptable fit indices. However, Renzulli et al. described technological giftedness as an emerging construct and considered the scale an early attempt to operationally define it. Therefore, although the scale is directly relevant to identifying technology-related gifted behaviors, its use in Jordan requires translation, cultural adaptation, and local validation.

The scale can be described as follows:

The scale consists of seven individual statements, each measuring a single characteristic or trait, formulated as action-oriented statements.

The rating scale comprises six descriptive levels: "Never," "Very Rarely," "Rarely," "Occasionally," "Frequently," and "Always."

Each descriptive level is assigned a specific weight, ranging from 1 (Never) to 6 (Always).

The scale is completed by the teacher most familiar with the student's technological abilities or by a computer science instructor. Alternatively, a committee of teachers closely working with the students on technology projects may also complete the scale.

Renzulli et al. (2009) reported evidence of content validation through expert review and strong internal consistency for the technology scale, with a Cronbach's alpha coefficient of .959.

The scale is directly relevant to the present study because it focuses on observable technology-related behaviors, including independent learning of software, assisting others with technology-related problems, creative use of technology in products or assignments, and advanced technological performance compared with age peers.

Second Scale: Student Technology Skills Rating Scale (Junior Division)

The Ministry of Education in Ontario, Canada, adopted this scale to assess students' computer and technological skills at various educational levels. Designed in 2006, the scale was made publicly available online to provide teachers with essential tools and resources for effective e-learning, ensuring accessibility to all. Unlike the Renzulli scale, this tool is not presented as a gifted-identification scale. Rather, it is a technology-skills rating scale that classifies users according to levels of technological competence. The scale is structured as follows:

It comprises four domains, each containing specific behavioral indicators:

Domain 1: Routine and Proper Usage - Includes ten statements describing behavioral indicators of performance.

Domain 2: Information Retrieval Skills - Includes ten statements describing behavioral indicators of skill acquisition.

Domain 3: Information Processing Skills - Includes twenty-seven statements describing behavioral indicators of skill execution.

Domain 4: Communication Skills - Includes four statements describing behavioral indicators of skill application.

The rating scale consists of three descriptive levels: "Novice User," "Intermediate User," and "Expert User."

Each descriptive level is assigned a specific weight: 1 for Novice User, 2 for Intermediate User, and 3 for Expert User.

The scale is completed by the rater according to the user's demonstrated level of comfort or competence with each technological task. The available form does not clearly establish it as a gifted-identification instrument. Scores are interpreted according to the student's demonstrated level of competence across the scale indicators. However, classification as an expert user should not be interpreted by itself as evidence of giftedness without additional indicators such as creativity, originality, problem solving, and advanced performance compared with age peers.

This scale is relevant to the present study because it provides detailed behavioral indicators of technology use, including routine use, accessing information, processing information, and communication skills. However, its major limitation is that it measures technological competence rather than technological giftedness. Therefore, it may serve as a supportive framework for observing advanced technology skills, but it cannot replace a validated gifted-identification scale.

Analytical Procedure

The analysis was conducted through a comparative document-analysis procedure. Each identified scale was reviewed according to six criteria: purpose of the scale, target construct, number and type of items, rating levels, scoring method, and relevance to identifying gifted students in technology. The two scales were then compared to determine whether each tool measured technological giftedness directly or assessed general technology competence. Attention was given to the distinction between advanced technology use and gifted technological behavior, because gifted identification requires evidence of creativity, originality, independent problem solving, and advanced performance compared with age peers.

Findings and discussion

The structured analytical review of the selected literature and measurement tools produced four main findings related to the availability, nature, and applicability of tools relevant to identifying gifted students in the field of technology.

Finding 1: Technology-related giftedness is increasingly recognized, but identification tools remain limited

The reviewed literature indicates growing attention to the relationship between giftedness and technology. Recent studies have discussed technological talent, computer science talent development, computational thinking, programming self-efficacy, and creative digital production among gifted students (Avcu & Ayverdi, 2020; Hebda, 2023; Pereira et al., 2025; Şen et al., 2021; Su, 2020). However, most of these studies focus on understanding or developing technological competencies among students who have already been identified as gifted. Most of these studies do not provide standardized tools for the initial identification of students whose giftedness is expressed specifically through technology.

This finding suggests that technology and computer science are gaining importance as domains of gifted and talent development, while the literature still points to a limited number of standardized tools for identifying gifted students specifically in technology (Hebda, 2023; Pereira et al., 2025; Renzulli et al., 2009; Siegle, 2004).

Finding 2: The Renzulli Technology Characteristics scale appears to be the most directly relevant tool for identifying technological giftedness

The Renzulli Technology Characteristics scale appears to be the most directly relevant tool among the tools analyzed in this review because it was developed within the Scales for Rating the Behavioral Characteristics of Superior Students. Unlike general technology-skills instruments, this scale focuses on observable behaviors that may indicate superior technological performance. These behaviors include independent learning of software, advanced use of technology compared with age peers, assisting others with technology-related problems, pursuing opportunities to use technology, and using technology creatively in assignments or products (Renzulli et al., 2009; Siegle, 2004). Siegle specifically noted that students gifted in technology may not be identified through traditional gifted-identification methods and that one possible method of identifying them is through a rating scale.

The strength of this scale lies in its connection to gifted-identification procedures and its

focus on behavioral indicators rather than general technological exposure. Its six-level rating format also allows teachers or qualified raters to distinguish between occasional and consistent technology-related behaviors. Therefore, the scale provides a useful foundation for identifying students whose giftedness may appear through technological performance.

However, the scale was developed and validated in a non-Arab context. Therefore, its use in Jordan or other Arab educational systems requires translation, cultural adaptation, and local validation before it can be adopted as an official identification tool. Its relevance is strong, but its direct applicability remains conditional.

Finding 3: The Ontario Student Technology Skills Rating Scale assesses technological competence rather than giftedness

The Ontario Student Technology Skills Rating Scale: Junior Division provides detailed indicators of students' technology skills across four domains: routines and good practice, accessing skills, processing skills, and communication skills. The scale classifies students according to three levels: novice user, intermediate user, and expert user. This structure makes it useful for observing students' functional competence in using technology in educational settings.

However, the Ontario scale is not designed specifically to identify gifted students. It measures students' ability to use technology effectively, but giftedness in technology requires more than competent use. A student may be an expert technology user without necessarily demonstrating giftedness. Technological giftedness requires additional indicators such as originality, creative production, independent problem solving, rapid learning, advanced performance compared with age peers, and the ability to use technology in complex or innovative ways. This distinction is consistent with the literature that treats technological talent as more than routine digital competence (Hebda, 2023; Pereira et al., 2025; Siegle, 2004). The Ontario scale may serve as a supportive tool for observing advanced technology-related skills, but it cannot replace a validated gifted-identification scale.

To clarify the analytical distinction between the two identified tools, Table 1 compares them according to purpose, relation to giftedness, construct, rating structure, strengths, limitations, and relevance to Jordanian educational contexts.

Table 1: Comparative Analysis of the Two Technology-Related Scales

Criterion	Renzulli Technology Characteristics Scale	Ontario Student Technology Skills Rating Scale
Main purpose	Identifying behavioral characteristics of superior students in technology	Assessing students' technology skills

Relation to giftedness	Directly related to gifted-identification procedures	Indirect; focuses on technology competence
Main construct	Technological giftedness / superior technology-related behavior	General technological competence
Type of indicators	Advanced, observable technology-related behaviors	Functional technology-use skills
Rating levels	".Six levels, from "Never" to "Always	Three levels: novice, intermediate, expert
Main strength	Most directly relevant tool among the reviewed tools for identifying technology-related gifted behaviors	Provides detailed indicators of technology skills
Main limitation	Requires translation, cultural adaptation, and local validation in Arab contexts	Not designed as a giftedness-identification scale
Relevance to Jordan	Potentially useful after validation	Useful as a supporting framework only

As shown in Table 1, the Renzulli scale is more directly aligned with gifted-identification purposes, whereas the Ontario scale is more closely aligned with general technology-skills assessment. This comparison supports the need to distinguish between technological competence and technological giftedness when developing or adapting identification tools for Arab and Jordanian contexts.

Finding 4: There is a clear gap in the Arab and Jordanian contexts

Within the reviewed literature and selected tools, no locally developed or adapted Arabic scale was designed to identify the behavioral characteristics of gifted students in technology. Although some Arab studies have included technology or information technology as one dimension within broader giftedness scales, such inclusion remains limited. For example, Aboud and Al-Masmoudi's scale included technology-related indicators, but technology was not treated as a specialized and independent domain of gifted identification.

This finding reveals a practical and research gap in Arab and Jordanian contexts. In Jordan, gifted-identification procedures have commonly relied on academic achievement, cognitive ability, creativity, task commitment, behavioral characteristics, and achievement in specific academic subjects. Moreover, intellectual aptitude and academic performance continue to play a predominant role in the definition and selection of gifted students, which may contribute to the underrepresentation of students with unique talents (Al-Hroub, 2023). Therefore, the absence of a technology-specific giftedness scale supports the need to adapt or develop a valid and reliable Arabic tool for identifying technology-related gifted behaviors in a culturally appropriate way.

Conclusion

This structured analytical review highlights the need to distinguish clearly between technological competence and technological giftedness. The analysis showed that the Renzulli Technology Characteristics scale is more closely aligned with gifted-identification purposes because it focuses on observable behaviors associated with superior technological performance (Renzulli et al., 2009; Siegle, 2004). In contrast, the Ontario Student Technology Skills Rating Scale provides useful indicators of technology skills but does not, by itself, identify giftedness in technology.

The main contribution of this study lies in clarifying the limited availability of specialized tools for identifying gifted students in technology, particularly in Arab and Jordanian contexts. The findings indicate that technology-related giftedness should not be treated merely as a general digital skill, but as a domain that may involve creativity, originality, independent problem solving, rapid learning, and advanced performance compared with age peers. Therefore, adapting or developing culturally appropriate tools for identifying gifted students in technology is necessary to support more inclusive and contemporary gifted-identification practices.

Recommendations

Translate, culturally adapt, and validate the Renzulli Technology Characteristics scale for use in Jordanian educational settings before adopting it as part of gifted-identification procedures.

Consider technology-related giftedness as a complementary domain in gifted-identification systems, alongside existing criteria such as academic achievement, cognitive ability, creativity, motivation, and behavioral characteristics.

Use the Ontario Student Technology Skills Rating Scale only as a supporting framework for observing students' technology skills, not as an independent gifted-identification tool.

Encourage further Arab and Jordanian research to develop valid and reliable scales for identifying behavioral characteristics of gifted students in technology.

Train teachers, especially computer science and technology teachers, to recognize technology-related gifted behaviors such as creative digital production, independent problem solving, rapid learning of software, and advanced technological performance compared with age peers.

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Appendix 1: A Sample of Scale for Rating the Behavioral Characteristics of Superior Students in Technology

STUDENT'S NAME (OR ASSIGNED CODE NO.): _____

TECHNOLOGY CHARACTERISTICS

The student . . .	Never	Very Rarely	Rarely	Occasionally	Frequently	Always
1. demonstrates a wide range of technology skills.						
2. learns new software without formal training.						
3. spends free time developing technology skills.						
4. assists others with technology-related problems.						
5. incorporates technology in developing creative products/assignments/presentations.						
6. eagerly pursues opportunities to use technology.						
7. demonstrates more advanced technology skills than other students his or her age.						
Add Column Total:						
Multiply by Weight:	1	2	3	4	5	6
Add Weighted Column Totals:						
Scale Total:						

Scoring:

- Add the total number of x's in each column to obtain the "Column Total."
- Multiply the "Column Total" by the "Weight" for each column to obtain the "Weighted Column Total."
- Sum the "Weighted Column Totals" across to obtain the Score for each dimension of the scale.
- Enter the Scores for each dimension on the cover sheet.

Appendix 2: A Sample of Student Technology Skills Rating Scale



ONLINE
TEACHING
RESOURCE



Student Technology Skills Rating Scale Junior Division



Instructions: Indicate your comfort level with each task by checking off the appropriate number on the Rating Scale to the right.

Rating Scale	<u>1</u> novice user	<u>2</u> intermediate user	<u>3</u> expert user
Routines and Good Practice			
Follow classroom routines and instructions for using and handling hardware.			
Act in a responsible manner when using hardware and software.			
Use logins, passwords, and log off.			
Save work in own workspace.			
Load and save files to a drive.			
Save back-ups on a hard drive, disk or portable drive, or server.			
Understand school's guidelines for using the Internet.			
Evaluate websites critically.			
Understand about copyright, plagiarism.			
Document sources of information obtained electronically.			
Accessing Skills			
Use an electronic thesaurus.			
Access information from an electronic encyclopaedia.			
Use CD-ROMs.			
Use an electronic book.			
Use index and keyword searches in databases (e.g., in library software).			
Access Internet sites using URLs.			
Use keywords to do Internet searches.			
Conduct subject-related Webquests.			
Use website menus to locate information.			
Bookmark a website.			
Processing Skills			
Use correct fingering while typing.			
Use both hands on the keyboard.			
Maintain a steady keyboarding pace.			
Use all alphanumeric keys and some non-alphanumeric keys (e.g., SHIFT, DELETE, BACKSPACE, CAPS LOCK, CONTROL, OPTION).			
Use arrow keys to move the text cursor.			
Use tabs to indent text.			
Use common screen elements (e.g., maximize, minimize, scrollbar).			
Move objects on screen to sort and count them.			
Create a text file using a word processing program.			