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Competency development of the gifted schools in Vietnam – A tracer study

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Abstract The gifted schools and thier students have been more interested by people than ever it is because, apart from what they have contributed to education sector, they seem superquality but not-comprehensive, which causes concer about what should be learned, taught, and built up in terms of student development. This tracer study reviews gifted schools through the eyes of their alumni, who are university students, concerning the outcomes on competency progression, which is now considered as the top priority in education of Vietnam. It assesses key competencies such as creativity, critical thinking, self-study, problem solving, communication, information technology, foreign languages and identifies strengths and weaknesses. Feedback from 388 graduates illustrates that the most self-helped competencies are self-study and self-sufficiency, suggesting that these schools successfully nurtured independence and resilience. However, critical thinking level, IT skills and foreign language proficiency were perceived more differently indicating gaps in resource availability, teaching, or focus in a variety of more complex areas. The differences along this issue, persuaded by an independent samples test, are focused on questions of effectiveness and equity of gifted education programs in Vietnam. This research will provide the fact of competency development, which can be used to compare the competency development of students who have not graduated from this kind of school and help better policies and practices for eliminating the severity of imbalances in attaining the competencies that all students will enable them to be successful in a dynamic global environment, and the findings should be regarded as a concrete evidence to reform this kind school model in the new educational context.

Keywords: competency development, gifted school, former student, tracer study, Vietnam education

1. Introduction

Gifted students and their education have been researched by many authors with manifold research themes. Research has explored how academic competency teasing (ACT) influences the academic and psychological well-being of gifted students. Using data from approximately 200 gifted students, Lee et al. (2017) reported that academic self-concept (ASC) mediates the negative impact of ACT on GPA and psychological engagement. Academically gifted students show a stronger link between ACT and GPA, whereas artistically gifted students exhibit a stronger connection between ACT and psychological engagement. These findings emphasize the importance of academic self-concept and reveal the distinct academic experiences of gifted students across different domains (Lee et al., 2017).

Jen & Hoogeveen (2022) evaluate the effectiveness of a blended learning model for teacher professional development in gifted education, specifically the RITHA program. Using a design-based research approach, the study assesses a model that combines 20% face-to-face instruction with 80% online learning. The results indicate that teachers highly value the flexibility of the blended approach, the opportunity for asynchronous discussions, and meaningful interactions with instructors. The study concludes that blended learning is an effective way to provide professional development for teachers working with gifted students, offering scalability and accessibility while maintaining high engagement levels (Jen & Hoogeveen, 2022).

Aparicio et al. (2021) used a randomized controlled trial (RCT) to assess the impact of a mathematics camp on gifted high school students in Italy. The findings indicate that participation in the camp significantly enhances problem-solving skills, particularly logic-based reasoning. Additionally, the camp experience positively influences personality traits by reducing neuroticism and increasing extroversion. Moreover, students who attended the camp were more likely to express intentions to pursue higher education. The study suggests that mathematics enrichment programs can be particularly beneficial for gifted students, especially those with lower academic performance in traditional school math settings (Aparicio et al., 2021).

Using meta-analysis, Ogurlu (2021) investigated the relationship between emotional intelligence (EI) and giftedness. An analysis of 81 effect sizes from 17 published studies revealed that gifted individuals exhibit significantly greater EI than their nongifted peers do, although with a small but meaningful effect size (g = 0.120). The differences in EI are more pronounced

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when they are measured via ability models than when they are measured via trait models. The study also examines moderators such as gender, age, and cultural background, revealing mixed results. The findings highlight the relevance of emotional intelligence in gifted education and suggest further research on how EI contributes to the well-being and success of gifted individuals (Ogurlu, 2021).

Durak & Citil (2022) investigated the risk factors influencing online game addiction among both gifted and nongifted students. An analysis of data from 245 students (113 gifted, 132 nongifted), revealed that different factors contribute to addiction in these groups. Gifted students' addiction is influenced by appearance, competition, and virtue, whereas nongifted students are more affected by appearance, competition, and academic competency. The preference for multiuser and social media games increases the likelihood of moderate addiction, and competitive gaming increases addiction risk, whereas academic competency decreases it. The findings underscore the necessity for school-based interventions to mitigate online gaming addiction in both groups (Durak & Citil, 2022).

Sen et al. (2021) examine how gifted students develop computational thinking skills through STEM activities that follow the Engineering Design Process (EDP). Using a qualitative case study approach, the study highlights that gifted students actively engage in problem solving, algorithmic thinking, and creativity when working on robotics and 3D modeling projects. Research underscores the importance of structured STEM education for gifted learners and recommends incorporating more engineering-based problem-solving activities into their curriculum to foster computational thinking and creativity (Sen et al., 2021).

Investigating how the flipped classroom model (FCM) affects gifted students' academic performance and self-regulation skills. In a 6-week intervention with 70 gifted students (35 experimental, 35 control), the experimental group followed FCM, whereas the control group adhered to a traditional curriculum. Bektas (2023) indicated that FCM significantly enhances both academic achievement and self-regulation skills. Students report that the model is flexible, engaging, and effective for self-directed learning, whereas teachers highlight its role in fostering independence and deeper learning. The study advocates for FCM as an effective pedagogical strategy for gifted education (Bektas, 2023).

Exploring the impact of interdisciplinary teaching on the development of creative and critical thinking skills in gifted students, Kaynar & Kurnaz (2024) studied 62 gifted fifth graders in a 45-hour program and reported that integrating multiple disciplines significantly improved their cognitive ability. Students describe the interdisciplinary approach as engaging, thought-provoking, and enjoyable, whereas teachers view it positively and recommend broader implementation. Research suggests that interdisciplinary teaching is a powerful method for fostering higher-order thinking skills among gifted students (Kaynar & Kurnaz, 2024).

These studies collectively highlight the diverse factors influencing the academic, psychological, and cognitive development of gifted students, emphasizing the importance of tailored educational approaches. Research on academic competency teasing, emotional intelligence, and online gaming addiction underscores the unique challenges gifted students face, whereas studies on flipped classrooms, interdisciplinary teaching, and STEM-based learning demonstrate the effectiveness of innovative instructional models in enhancing their learning experiences. Additionally, professional development for teachers through blended learning and enrichment programs such as mathematics can further contribute to fostering an environment that supports gifted learners. Overall, these findings underscore the need for specialized, research-backed educational strategies to nurture the intellectual, emotional, and social growth of gifted students, ensuring that they reach their full potential.

In terms of tracer studies, several studies have focused on creativity, career transitions, the employability of graduates, the relationship between IEQ and students' mathematics achievement, the social determinants influencing adolescents' expectations of pursuing higher education, and how high school inventors perceive and learn from failure.

Creativity emerges as a key driver of innovation across disciplines, particularly in the medical field, as Dr. Patricia A. Thistlethwaite highlights in her presidential address. By drawing parallels between historical architectural marvels and advancements in cardiothoracic surgery, she underscores the importance of creative thinking in solving complex challenges. Groundbreaking developments such as pacemakers and video-assisted thoracoscopic surgeries exemplify how creativity leads to significant improvements in patient care and sets the stage for future innovations. Her reflections highlight the enduring role of mentors and pioneers in nurturing creativity, a vital skill in medicine and other fields requiring precision and ingenuity. Creativity is a cornerstone of innovation in various fields, as explored in Dr. Patricia A. Thistlethwaite's address on the role of creativity in cardiothoracic surgery. Drawing parallels between historical architectural achievements such as Hagia Sophia and medical breakthroughs, she emphasized how creative thinking has driven advancements such as pacemakers and video-assisted thoracoscopic surgeries. These innovations demonstrate how fostering creativity in medicine can lead to improved patient outcomes and enduring progress in the field (Thistlethwaite, 2020).

The transition from education to employment is critical, as shown in studies from Lebanon and the Philippines. In Lebanon, most upper secondary school students aspire to careers in science and technology, but systemic rigidity and inadequate career counseling hinder their pathways to success. Aligning education with labor market demands and enhancing career guidance are essential to improving outcomes (Vlaardingerbroek et al., 2020). Similarly, in the Philippines (Albina & Sumagaysay, 2020), an employability tracer study of IT graduates revealed that while nearly 79% find relevant jobs, delays in

employment highlight the need for regular curriculum updates. Collaborating with industry ensures that students acquire skills that meet evolving market demands, enhancing employability and reducing job search delays. Education systems face challenges in aligning with the demands of modern economies, as seen in Lebanon and the Philippines. In Lebanon, high school students often aspire to careers in science and technology, reflecting their ambition for upward mobility. However, systemic rigidity and inadequate career counseling hinder their transition to higher education and employment. Similarly, in the Philippines, IT graduates report high employability rates, yet many experience significant delays in securing their first job. These findings highlight the need for continuous curriculum updates and collaboration between educational institutions and industries. Addressing these gaps ensures that students are equipped with relevant skills, facilitating smoother transitions into the workforce and reducing unemployment rates.

The physical and social environment also plays a pivotal role in shaping educational and career outcomes. A study on Finnish elementary schools (Toyinbo et al., 2016) revealed that proper indoor environmental quality (IEQ), such as improved ventilation and temperature control, significantly enhances students' mathematics achievement. The regular maintenance of HVAC systems is vital to ensure a conducive learning environment. In Guinea-Bissau (Edmund & Bald, 2023), adolescents' expectations for higher education are influenced by gender, socioeconomic status, and private schooling, with supportive parental relationships fostering aspirations. However, systemic barriers such as teacher–student conflicts and educational disenfranchisement perpetuate inequality, underscoring the need for structural reforms to create equitable opportunities. The physical and social environments in which education occurs significantly impact student performance and aspirations. Research from Finnish elementary schools has demonstrated that proper indoor environmental quality (IEQ), including optimal ventilation and thermal comfort, enhances students' learning outcomes in mathematics (Toyinbo et al., 2016). This underscores the importance of maintaining conducive learning spaces to maximize academic potential. Moreover, in Guinea-Bissau, social determinants such as gender, socioeconomic status, and parental support influence adolescents' expectations for higher education. Despite the ambitions of many students, systemic inequalities such as teacher–student conflicts and inadequate educational infrastructure continue to restrict opportunities, highlighting the pressing need for structural reforms to ensure equitable access to education.

Failure, often perceived negatively, is reimagined as a catalyst for growth and innovation in a study of high school inventors (Estabrooks & Couch, 2018). The participants in the InvenTeams program learned to view failure as a necessary and productive step in the creative process, fostering resilience, critical thinking, and problem-solving skills. By integrating failure into the learning process, students develop inventive mindsets that extend beyond the classroom. This approach aligns with social constructionism and dialogic theories, emphasizing the collaborative and iterative nature of learning. These findings suggest that embracing failure as a learning tool in educational programs can nurture creativity and prepare students to address complex real-world challenges. Finally, the value of learning from failure is highlighted in a study on high school inventors participating in the InvenTeams program. Students redefine failure as an integral part of the creative and iterative process, fostering critical thinking and problem-solving skills. Social constructionism and dialogic theories reveal how these experiences shape innovative mindsets, suggesting that embedding failure as a learning opportunity in educational programs can cultivate creativity and resilience in students.

According to these studies, a unifying theme emerges: fostering creativity, adaptability, and inclusivity within educational and professional systems is essential for societal advancement. Whether through rethinking failure, improving learning environments, or aligning curricula with market demands, these insights underscore the importance of preparing individuals to thrive in a rapidly evolving world. Each study contributes a unique perspective to the conversation on how to create systems that empower individuals and communities to reach their full potential.

In the context of Vietnam, gifted education is a unique domain that combines traditional academic rigor with contemporary competency-based learning frameworks. Since its inception, the system of specialized schools for gifted students has been an integral part of Vietnam's educational landscape, aimed at fostering exceptional talent in science, mathematics, arts, and humanities (Dao, 2001). These schools prioritize holistic development by integrating life skills, creativity, and critical thinking into their curricula, providing students with the tools to excel in global contexts (Nguyen, 2019).

Competency-based education has emerged as a key focus in Vietnam's education reform, particularly in gifted schools. Dao (2001) outlines Vietnam's efforts to integrate literacy, numeracy, and life skills into the curricula of gifted programs, emphasizing the alignment of education with national development goals. Similarly, Nguyen (2019) highlights the adoption of integrated teaching methods, which foster the development of critical thinking and practical problem-solving skills among students. Vietnamese gifted schools are lauded for their success in promoting self-study and resilience among students. Research by Ho (2016) shows that an emphasis on independent learning and adaptability prepares students for higher education and professional environments. These findings align with international studies that underline the importance of fostering autonomy in learners to meet global educational standards (London & Duong, 2023).

Competency development, which emphasizes practical knowledge application, has increasingly become the cornerstone of educational reforms in Vietnam, aligning with global shifts in teaching methodologies (Ho, 2016). Tracer studies—focused on understanding the long-term outcomes for graduates—serve as valuable tools for assessing the efficacy of these educational models. These studies provide insights into the impact of gifted education on students' career trajectories,

personal growth, and contributions to society (London & Duong, 2023). Gifted schools have played a pivotal role in shaping Vietnam's educational landscape. Research by Nguyen and Le (2021) highlights their contributions to developing academic excellence and social competence while also addressing broader societal needs through specialized programs. Additionally, studies emphasize the role of gifted schools in nurturing innovation and leadership qualities, which are essential for national progress.

Despite their successes, Vietnam's gifted schools face challenges such as maintaining equitable access, adapting to technological advancements, and balancing national identity with international standards (Vuong et al., 2021; Le et al., 2024). As such, research efforts in this field continue to shed light on innovative teaching practices and policies that address these challenges while maximizing the potential of Vietnam's gifted youth. There are challenges in fostering critical thinking and digital competencies. Studies suggest that while critical thinking is incorporated into teaching, there is a gap in its consistent application across gifted schools. Nguyen et al. (2023) reported that digital literacy among students remains uneven, with significant disparities between urban and rural institutions due to differences in resource availability. Gifted schools in Vietnam place a strong emphasis on foreign language proficiency, particularly English proficiency. According to Vuong et al. (2021), this focus reflects Vietnam's drive to integrate into the global economy. However, there are disparities in outcomes, attributed to variations in teacher expertise and access to learning resources.

Overall, these studies illustrate both the achievements and challenges of Vietnam's gifted schools in terms of competency development. While successes in promoting self-study and resilience are evident, areas such as critical thinking, digital skills, and equitable access to resources require further attention. By addressing these gaps, Vietnam can enhance the effectiveness of its gifted education programs and better prepare students for the demands of a globalized world. The competency development in Vietnam's gifted schools, particularly through tracer studies, provides insights into the evolving educational framework and its effectiveness in preparing students for future challenges.

The main purpose of this study is to apply the traceability method to (i) determine how competencies are assessed by alumni of specialized schools, (ii) the contributions from these competencies to the further education and work of alumni after graduation, and (iii) the findings provide implications for policy on the management of this kind of school model.

2. Materials and methods

A tracer study is a methodical approach that is commonly used in educational research to evaluate the results and effects of specific educational programs on graduates. The method includes career trajectory, skill use and monitoring and analyzing the personal growth of alumni to assess the effectiveness of educational interventions (HO, 2016). This approach typically combines quantitative and qualitative data collection techniques, including structured surveys, interviews and focus group discussions, to gather wide insights from alumni, employers and other stakeholders (Nice, 2019). A major feature of tracer studies is their ability to measure long-term efficiency, such as alignment between graduates' skills and alignment between demands of labor markets and identifying areas for program improvement (London and Duong, 2023). In addition, tracer studies often include statistical equipment to analyze employment rates, income levels and professional achievements, providing strong evidence for policy-making and course design (Wuong et al., 2021). Given the difference between education and real-world applications, tracer studies play an important role in running educational reforms and increasing the relevance of the program.

To evaluate the merit development of students in talented schools in Vietnam, this tracer study uses a mixed-method approach that integrates quantitative and qualitative research techniques. The functioning ensures broader data collection and analysis, allowing strong conclusions about the effectiveness of these institutions in promoting the necessary skills. The tracer study is primarily descriptive and analytical in nature, aiming to discover the long-term outcomes of competency development among gifted school alumni. This perspective significantly contributes to understanding students' views concerning their learning experiences and how they find it pertinent to use competencies such as critical thinking, problem-solving, communication, and digital literacy. In this study, alumni who graduated from gifted schools throughout Vietnam composed the target population, and a stratified random sampling method was used to ensure that there was diversity in the groups on the basis of age, gender, region, and field of study. A total of 388 former students participated in the study, which allows for an adequate sample size for reliable statistical analysis on the basis of the recommendations of Krejcie and Morgan (1970) for determining representative sample sizes in educational research.

2.1. Data collection tools

A duo of primary tools took this stage: survey questionnaires and interviews. The survey questionnaires came in the form of a well-structured questionnaire tailored to grasp how alumni perceived their growth in competencies while attending gifted schools. It delved into nine domains, such as self-study, critical thinking, communication, and foreign language skills, using a 5-point Likert scale ranging from strongly disagree to strongly agree. On the other hand, the interviews were semistructured conversations held with a select group of participants to delve deeper into the hurdles and triumphs faced

during competency development. These interviews served as a companion to quantitative data by offering insights specific to the context.

2.2. Data analysis

Descriptive statistics were obtained by calculating the mean, standard deviation, and standard error to gauge response central tendency and variability. Inferential statistics flexed its muscles through independent samples t tests and Levene's tests for equality of variances aimed at comparing perceptions across different demographic groups. These tried-and-tested methods from prior educational studies proved effective in unearthing significant differences in perspective. Qualitative data had its moment under thematic analysis, as it hunted down recurring patterns and themes linked to competency development.

Ethical clearance was sought from the relevant institutional review board before embarking on this journey. Informed consent was obtained from all the participants, who guaranteed anonymity and confidentiality while also briefing them on the study's objectives, with an emphasis on their right to withdraw at any given stage along the way. A pilot test involving a smaller sample size was conducted on the questionnaire, ensuring that clarity and reliability standards were met with flying colors because the Cronbach's alpha calculation yielded an impressive value of 0.85, indicating that high reliability levels were achieved. Triangulation became key in weaving together both quantitative and qualitative data, further enhancing the study's validity.

Acknowledging potential pitfalls is part of any thorough study; hence, self-reported biases in survey responses or regional disparities that could impact the generalizability of the results are not overlooked here. Future research horizons might be broadened by embracing longitudinal data studies alongside larger sample sizes, increasing insights even further up for grabs! Through this robust methodology lens, this tracer study highlights how gifted schools within Vietnam nurture key competencies, shedding invaluable insights for educators and policymakers seeking refinement within the realms of educational strategies.

2.3. Characteristics of the participants

In the realm of tracer studies, these discoveries focus on the diverse attributes of past students who were part of a program for gifted individuals (Table 1). They shed light on their academic concentrations, choices of universities, gender ratios, and academic accomplishments. Concerning specialized fields of study, a noteworthy percentage of students delved into mathematics (18.6%), biology (18%), and chemistry (17.5%). Conversely, subjects such as English (4.4%) and informatics (6.2%) had fewer takers, indicating a strong preference for STEM subjects. The incorporation of various disciplines showcases the program's holistic approach, catering to a wide array of student passions and talents.

The trends in university preferences revealed that most students (50.5%) pursued further education at VNU University of Science, with 31.2% opting for Hanoi National University of Education. Smaller cohorts chose institutions such as Hanoi University of Civil Engineering (3.4%) and University of Social Sciences and Humanities (10.3%). This distribution hints at a penchant for specialized schools aligning with students' strengths and career aspirations.

With respect to gender representation, females constituted a greater percentage (62.4%) than males did (37.6%). This hints at a possible surge in female involvement in gifted programs and mirrors the evolving dynamics in educational achievements. Evaluating academic performance on the basis of cumulative point averages (CPAs) has even spread across different achievement levels. Notably, 19.1% achieved the highest bracket (3/60–4/00 or A+), whereas most fell within intermediate ranges, with 33% scoring A (3/20–3/59) and 28/4% securing B+ (2/50–3/19). These results underscore the program's success in fostering academic excellence while also pinpointing areas that need enhancement to bolster students falling behind—only 3/9% scored below 2/0 or C.

In essence, these revelations offer profound insights into the outcomes stemming from programs tailored for gifted individuals by highlighting their role in nurturing talent across diverse domains while championing scholastic brilliance and inclusivity.

3. Results

Table 2 shows the viewpoints of former students regarding their skill development in gifted schools located in Vietnam. The table covers assessments of various important skills, such as creativity, critical thinking, self-study, communication, and foreign languages. A total of 388 participants' feedback was scrutinized via mean scores, standard deviations, and error margins to reveal how effective these schools are in honing specific abilities. Among the skills evaluated, self-study and self-reliance received the highest ratings, with mean scores of 4.05 and 4.04, respectively. These results show that gifted schools excel in fostering independent learning and resilience. The low standard deviations linked to these competencies indicate a consistent positive response from students, suggesting strong harmony in their educational experiences within these areas.

On the other hand, problem-solving skills score 3.91, and cooperation score 3.88 also indicate significant strengths within the school curriculum. These abilities are crucial for real-life challenges and professional requirements, revealing that graduates from these schools are well equipped in such aspects. Additionally, communication and foreign language skills, both

rated at 3.84, demonstrate moderate success in providing students with essential interpersonal and language capabilities; however, a slightly greater variability suggests room for improvement. Critical thinking garnered a mean score of 3.73, highlighting an area with potential for further growth since it is among the lower scores indicating that students may not feel as proficiently prepared compared with other areas of study. Similarly, information technology and communication skills scoring at 3.80 could benefit from increased attention to align with the rising demand for digital literacy across modern educational settings.

Table 1 Characteristics of the alumni.

Characteristics	Frequency	Percent	Valid Percent	Cumulative Percent
Specialized subjects				
Maths	72	18.6	18.6	18.6
Literature	52	13.4	13.4	32.0
English	17	4.4	4.4	36.3
Other languages	15	3.9	3.9	40.2
Physics	18	4.6	4.6	44.8
Chemistry	68	17.5	17.5	62.4
Biology	70	18.0	18.0	80.4
History	24	6.2	6.2	86.6
Geography	12	3.1	3.1	89.7
Informatics	24	6.2	6.2	95.9
Other subjects	12	3.1	3.1	99.0
Nonspecialized subjects	4	1.0	1.0	100.0
Total	388	100.0	100.0	
Universities				
VNU University of Science	196	50.5	50.5	50.5
Hanoi University of Civil Engineering	13	3.4	3.4	53.9
Hanoi University of Science and Technology	3	.8	.8	54.6
University of Social Science and Humanity, Hanoi.	40	10.3	10.3	64.9
VNU University of Education	15	3.9	3.9	68.8
Hanoi National University of Education	121	31.2	31.2	100.0
Total	388	100.0	100.0	
Years in university				
1st	199	51.3	51.3	51.3
2nd	44	11.3	11.3	62.6
3rd	48	12.4	12.4	75.0
4th	97	25.0	25.0	100.0
Total	388	100.0	100.0	
Gender				
Male	146	37.6	37.6	37.6
Female	242	62.4	62.4	100.0
Cumulative Point Average CPA)				
(3.60-4.00 or 9-10 or A+)	74	19.1	19.1	19.1
(3.20 – 3.59 or 8- <9 or A)	128	33.0	33.0	52.1
(2.50-3.19 or 7- < 8 or B+)	110	28.4	28.4	80.4
(2.00-2.49 or 6-<7 or B)	61	15.7	15.7	96.1
(1.0- <2.00 or 5-<6 or C)	15	3.9	3.9	100.0

Table 2 Perspectives of alumni of competency development in gifted schools in Vietnam.

Competencies	N	Mean	Std. Deviation	Std. Error Mean
Creation	388	3.86	.902	.046
Critical thinking	388	3.73	.948	.048
Self study	388	4.05	.867	.044
Self help	388	4.04	.865	.044
problem solving	388	3.91	.889	.045
Communication	388	3.84	.983	.050
Cooperation	388	3.88	.898	.046
Information Technology and communication	388	3.80	.932	.047
Foreign languages	388	3.84	.920	.047

While gifted Vietnamese schools promote self-directed learning and resilience, there is clearly room for improvement to focus more on critical thinking skills as well as digital literacy to better equip students with future global challenges. These

findings offer valuable insights, allowing policymakers and educators opportunities to refine strategies ensuring a balanced development of competencies among future graduates.

In Table 3, the data shed light on the analysis of competencies among past gifted students in Vietnam, comparing viewpoints across various skill areas. The test outcomes, which utilize the t test for mean equality and Levene's test for variance equality, offer valuable insights into the diversity and significance of specific skills.

Table 3 Independent samples test of the perspectives of alumni of competency development in gifted schools in Vietnam.

Independent Samples Test									
Competencies	Levene's Test for Equality of Variances		t test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Creation	11.395	.001	6.123	1573	.000	.337	.055	.229	.445
Critical thinking	7.538	.006	6.200	1573	.000	.363	.059	.248	.478
Self study	28.887	.000	7.401	1573	.000	.399	.054	.293	.504
Self help	26.327	.000	7.017	1573	.000	.383	.055	.276	.490
problem solving	16.898	.000	5.567	1573	.000	.300	.054	.194	.405
Communication	1.664	.197	5.357	1573	.000	.306	.057	.194	.418
Cooperation	16.715	.000	5.075	1573	.000	.277	.055	.170	.384
Information Technology and communication	11.322	.001	7.026	1573	.000	.410	.058	.295	.524
Foreign languages	8.038	.005	7.965	1573	.000	.450	.057	.339	.561

All the competencies examined show statistically significant differences, with p values (sig. 2-tailed) less than 0.05. For instance, creativity competency displays a notable mean difference of 0.337 (p = 0.000), with a confidence interval ranging from 0.229--0.445. This implies that perspectives on creativity development vary and may be influenced by factors such as gender, the school environment, or other demographic aspects. Critical thinking reveals a mean difference of 0.363 and a confidence interval from 0.248--0.478 (p = 0.000), highlighting the variability in students' experiences with increasing analytical and evaluative skills. Similarly, self-study (mean difference: 0.399) and self-help (mean difference: 0.383) exhibit strong statistical significance, emphasizing their unique perceptions and importance within gifted schools.

Furthermore, problem-solving, communication, and cooperation also present noteworthy differences, with mean variances of 0.300, 0.306, and 0.277, respectively; however, these values are slightly lower than self-study or self-help values but still significant, with p values of 0.0000 for all the cases, which effectively validates that communication stands out because it has the lowest F value (1.664, p=)0.197). The most pronounced contrasts emerge in information technology & communication (mean difference: 1.410) & foreign languages (mean difference: 0.450). These skills display considerable divergence among former students, as indicated by consistently low p values (0.000). This finding indicates that technology integration and language learning in gifted school curricula could yield varying results on the basis of implementation quality resources or individual capabilities.

In summary, the independent samples test data underscore substantial variations across competencies, reflecting diverse experiences among alumni from gifted Vietnamese schools. Self-study and self-help are prominent strengths, whereas foreign language and IT skills show larger discrepancies, indicating opportunities for more inclusive educational strategies. These discoveries form a strong basis for customizing interventions aimed at enhancing student achievements in gifted schools.

4. Discussion

Gifted students' competency development involves nurturing a variety of essential skills and capabilities to help them thrive in diverse educational and professional environments. These key competencies include creativity, critical thinking, self-directed learning, problem solving, communication, teamwork, information technology (IT), and proficiency in foreign languages. Through project-based and inquiry-driven learning approaches, students are encouraged to think innovatively and devise creative solutions to real-world problems (Muvid et al., 2022; Tymkiv et al., 2022), often integrating multiple disciplines for a holistic learning experience. Critical thinking and self-directed study form the foundation of gifted education by enabling

students to independently analyze complex issues and synthesize knowledge. Self-study promotes autonomy and lifelong learning habits crucial for continual intellectual growth. Communication and collaboration skills are honed through interactive group activities that foster teamwork, dialog exchange, and peer feedback. These interactions enhance the interpersonal understanding and leadership qualities necessary for cooperative settings (Wulan & Antika, 2021).

Information technology literacy is vital, as it equips students with digital tools essential for innovation and problem solving. The incorporation of ICT into education enhances access to global knowledge while increasing proficiency in the use of advanced technologies (Hebda, 2023). Furthermore, the ability to acquire foreign language skills broadens students' global perspectives, enabling effective engagement in international collaborations and cross-cultural interactions (Zhubanova, 2017). The comprehensive development of these competencies ensures that gifted individuals not only are academically proficient but also possess the critical skills required to navigate effectively in an ever-evolving world. Insights from former students regarding competency development in gifted schools in Vietnam highlight strengths as well as areas for improvement. The feedback sheds light on how these institutions foster essential skills among graduates while indicating potential enhancements in educational practices.

Notably, high ratings were observed for self-study (mean: 4.05) and self-help (mean: 4.04), emphasizing the schools' success in cultivating independent learning abilities crucial for personal growth. Consistent responses with low standard deviations underscore the schools' effectiveness at promoting the autonomy necessary for lifelong learning. Similarly, strong foundations were evident in problem solving (mean: 3.91) and collaboration (mean: 3.88), showcasing that analytical thinking, alongside teamwork abilities, is vital in today's collaborative environment-driven world. Communication skills (mean: 3.84) along with foreign language proficiency received moderately high ratings, reflecting efforts toward equipping students with interpersonal communication capabilities. However, critical thinking (mean: 3.73) alongside information technology proficiency (mean: 3.80) emerged as areas needing further attention, suggesting opportunities to enhance deeper cognitive abilities such as evaluation and synthesis through inquiry-based approaches or integrating advanced tech training to bolster IT competencies that align better with contemporary needs.

Briefly, Vietnam's gifted schools excel at fostering independence, problem-solving and collaboration yet can further increase their focus on critical thinking and IT competencies, ensuring a balanced skill set that prepares students holistically not only academically but also professionally for our increasingly intricate tech-driven global landscape. By addressing these aspects effectively, gifted institutions can better equip their students to thrive as well-rounded individuals poised for future success amidst evolving demands.

Once, in the realm of educational exploration, remarkable progress in diverse skills was illuminated by the independent samples test. These discoveries highlighted notable enhancements across all the assessed abilities, solidifying the triumph of the gifted education system in nurturing well-rounded skill sets.

Let us delve into the realms of creativity and critical thinking: the outcomes reveal a significant positive disparity in creativity ($t = 6.123$, $p < .001$) and critical thinking ($t = 6.200$, $p < .001$). These revelations harmonize with studies accentuating problem-centered and inquiry-based learning methods that foster innovation and critical evaluation (Muvid et al., 2022). The focus on interdisciplinary endeavors within gifted institutions empowers students to blend ideas and craft innovative solutions to intricate dilemmas.

Venturing into self-study and self-help skills: Both self-study ($t = 7.401$, $p < .001$) and self-help ($t = 7.017$, $p < .001$) exhibit substantial enhancements, echoing the triumph of autonomy-driven educational approaches. The cultivation of these proficiencies allows students to learn continuously—a pivotal quality in swiftly evolving domains. Learners should be equipped with metacognitive tools to nurture autonomy and resilience during the educational journey.

Let us explore problem solving and cooperation: the results showcase noteworthy improvements in problem solving ($t = 5.567$, $p < .001$) and collaboration ($t = 5.075$, $p < .001$). These competencies are indispensable for collaborative work and addressing real-world predicaments—especially in professional or academic milieus (Wulan & Antika, 2021). Collaborative ventures within gifted schools cultivate both critical thinking abilities and interpersonal aptitudes that empower students to function efficiently within diverse teams.

Journey through Communication Skills & ICT Proficiency: Proficiency in communication skills ($t=5.357$, $p<0$), along with information technology & communication (ICT) ($t=7.026$, $p<0$), mirrors the escalating integration of digital resources into academic frameworks (Hebda, 2023). As Hebda acknowledges, ICT literacy offers learners vital tools for navigating virtual territories while promoting global connections that enhance their learning ability.

Exploring Foreign Language Proficiency: Mastery over foreign languages boasts the most prominent mean variance ($t=7.965$, $p<0$), underscoring multilingualism's mounting significance within our interconnected world (Zhubanova, 2017). Zhubanova emphasized that acquiring foreign language skills broadens students' global outlooks while empowering them to partake in international collaboration.

Evidently, Vietnam's gifted education system is effective at fostering an array of competencies indispensable for scholastic as well as personal growth alongside professional triumphs. The statistically significant headways across all scrutinized fields reinforce the essence of a curriculum blending theoretical knowledge with hands-on skill honing. While strengths such as self-study prevail, critical thinking, IT proficiency, and foreign language flair reveal variances warranting

tailored interventions. Policymakers as well as educators can leverage these insights to refine pedagogical approaches to ensure inclusive, effective learning environments for every student.

5. Conclusions

Delving into the realm of competency development within Vietnam's gifted schools, this tracer study offers valuable insights into the strengths and areas ripe for growth in these educational institutions. These schools shine in cultivating self-directed learning and independence, evident through their commendable ratings of self-study and self-help skills. This underscores their triumph in arming students with crucial lifelong learning abilities pivotal for both academic excellence and professional triumphs.

Nonetheless, the study also highlights notable gaps in the enhancement of other competencies, such as critical thinking, information technology, and foreign languages. While competencies such as problem solving, collaboration, and communication exhibit some success, the varying viewpoints among students suggest uneven execution or disparities in resource accessibility. These disparities highlight the need for more inclusive and standardized approaches to competency development, especially those focused on areas aligned with global educational trends such as digital literacy and proficiency in multiple languages.

On a broader scale, this tracer study affirms that Vietnam's gifted schools play a significant role in nurturing gifted individuals and priming them for forthcoming challenges. To amplify their influence, educators and policymakers should prioritize tactics that target identified discrepancies to ensure that all students have fair chances to cultivate a well-rounded set of competencies. This strategy not only bolsters individual achievements but also contributes to the overarching objective of enhancing Vietnam's education system to meet the evolving demands of our swiftly changing world.

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Ethical considerations

This research project addresses how research activities are approved by the Ministry of Education and Training and other authorities in the education sector.

Conflict of interest

The authors declare that they have no conflicts of interest.

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