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Adapted Gagné Model for Gifted and Talented Students in the Nowadays Technical VET

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ABSTRACT: This proposal outlines an adapted model for secondary Technical and Vocational Education and Training (TVET) based on Gagné's Differentiated Model of Giftedness and Talent (DMGT), aimed at nurturing the unique aptitudes of gifted learners. In recognizing the distinct needs of these students, the model integrates individualized learning paths, enhanced curriculum rigor, and project-based learning opportunities. The identification process uses comprehensive assessments to tailor educational plans. This ensures personalized engagement and progression that culminates in personal development. The proposed model focuses on adopting enhanced curricula in advanced fields such as robotics to prepare gifted students for future industry demands. Project-based learning, facilitated through partnerships with local industries, bridges theoretical knowledge with practical application. Continuous professional development for educators and mentorship programs further supports the effective implementation of the model. This approach aligns with future trends in TVET, emphasizing practical competencies and competence-based learning.

KEYWORDS: Gagne's Model; individualized learning paths; project-based learning; gifted & talented; skills.

INTRODUCTION

The evolving landscape of Technical and Vocational Education and Training (TVET) necessitates models that cater to diverse student needs, particularly those of gifted students. TVETs have become crucial institutions that support the welfare and personal development of gifted children as they seek to maximize their opportunities for education (*Ghavifekr et al., 2021*). This proposal outlines an adapted model for secondary TVET based on *Gagné's Differentiated Model of Giftedness and Talent* (**DMGT**). Gagné's framework is ideal for this adaptation due to its comprehensive approach in identifying and nurturing talent through various developmental stages and environmental catalysts (*Gagné, 2023*). Generally, the DMGT distinguishes between natural abilities (gifts) and systematically developed skills (talents) (*Gagné, 2023*). Subsequently, it seeks to align well with TVET's goal and emphasis on practical skill acquisition. The proposed model will incorporate critical dimensions such as individualized learning paths, enhanced curriculum rigor, and opportunities for advanced project-based learning. Moreover, the proposed framework will emphasize the identification and nurturing of innate technical aptitudes. Ultimately, the framework will foster an environment that transforms the vital aptitudes into exceptional vocational skills. Key elements will include mentorship programs, industry partnerships, and integration of cutting-edge technological advancements which resonate with the goals of TVETs. The proposed model will to create a robust framework that addresses the unique educational needs of gifted students and equips them with the competencies required for the rapidly evolving vocational landscape.

The primary aim of this study is to develop and propose an adapted model for Technical and Vocational Education and Training (TVET) that specifically addresses the unique needs of gifted students. This model is grounded in **DMGT** and seeks to transform innate technical aptitudes into fully developed vocational talents. By explicitly stating this aim, we intend to provide a clear framework for understanding the significance of our research and its implications for enhancing educational practices within TVET institutions.

The adapted Gagné model for gifted students in TVET emphasizes personalized learning paths, rigorous curricula, and hands-on project-based experiences. It aims to identify and nurture students' innate technical talents through customized educational plans, ensuring that students are consistently engaged and challenged. The model incorporates advanced content and complex problem-solving tasks to stimulate higher-order thinking and personal development.

Project-based learning enhances educational experience for gifted students by allowing them to engage in real-world projects, which develop practical skills such as communication and teamwork. This approach fosters practical skill development, vital in

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contemporary aspects of human life, and aligns with the industry's increasing emphasis on hands-on skills and real-world problem-solving abilities. Additionally, collaboration with industry experts ensures that the curriculum remains relevant and rigorous, preparing gifted learners for leadership roles in their respective fields.

METHODS AND RESEARCH METHODOLOGY

This study employs a qualitative research methodology, primarily relying on secondary data analysis and a critical literature review. The aim is to explore the applicability of an *adapted Gagné model to the education of gifted students* in contemporary vocational education and training (VET) settings. This approach allows for a comprehensive understanding of the diverse needs of gifted learners and the potential benefits of individualized learning paths, enhanced curriculum rigor, and project-based learning opportunities. By clearly articulating the relationship between the study's objectives and the chosen methodology, the research aims to enhance its coherence, validity, and overall impact.

MODEL REVIEW AND OVERVIEW

The proposed model, based on Gagné's Differentiated Model of Giftedness and Talent (DMGT), is designed to transform innate technical aptitudes into fully developed vocational talents through a structured but flexible approach. Central to this model is the identification and nurturing of gifted students within the TVET system. In line with the propositions of *Hassan&Wai's* (2019) study, the model will leverage Gagné's distinction between natural abilities and developed skills. The model is underpinned by three core components: individualized learning paths, enhanced curriculum rigor, and opportunities for advanced project-based learning.

Individualized learning paths are fundamental to catering to the diverse needs of gifted students. According to *Tao et al.* (2024), any proposed model that seeks to streamline learning for talented students in TVETs must consider the stratified and distinctive demands of those learners. In the proposed model, these paths are defined through a comprehensive assessment process that identifies students innate technical abilities and learning preferences. Once identified, tailored educational plans are developed that will incorporate differentiated instruction methods (*Berger-Estilita & Greif, 2020*). The plans mostly offer opportunities for personalized mentoring and access to specialized resources. These plans further allow students to progress at their own pace. This standard ensures that they are neither held back by the standard curriculum nor overwhelmed by it. *Dadashnejhad & Ghaffari* (2022) further observed that individualized learning under Gagne's model provide regular feedback and adaptive learning technologies which support continuous monitoring. The model also underpins adjustment of these unique paths which ensures alignment with students' evolving interests and capabilities. This personalized approach not only enhances engagement but also maximizes the potential of gifted learners by providing them with the precise support they need to thrive.

Enhancing curriculum rigor is another critical dimension of the proposed model. This process involves infusing the standard TVET curriculum with advanced content that challenges gifted students and stimulates higher-order thinking (*Litten, 2023*). The curriculum will be designed to include complex problem-solving tasks and interdisciplinary projects. The model will also consolidate the opportunities for research and innovation. Advanced coursework in areas such as robotics and artificial intelligence can be integrated into the model to keep pace with the latest industry trends. Moreover, collaboration with industry experts within the TVETs' education framework will ensure that the curriculum remains relevant and rigorous. Therefore, by providing a dynamic and multifaceted academic system domain, the model aims to push gifted students beyond their comfort zones. This process fosters intellectual growth and prepares gifted learners for leadership roles in their respective fields.

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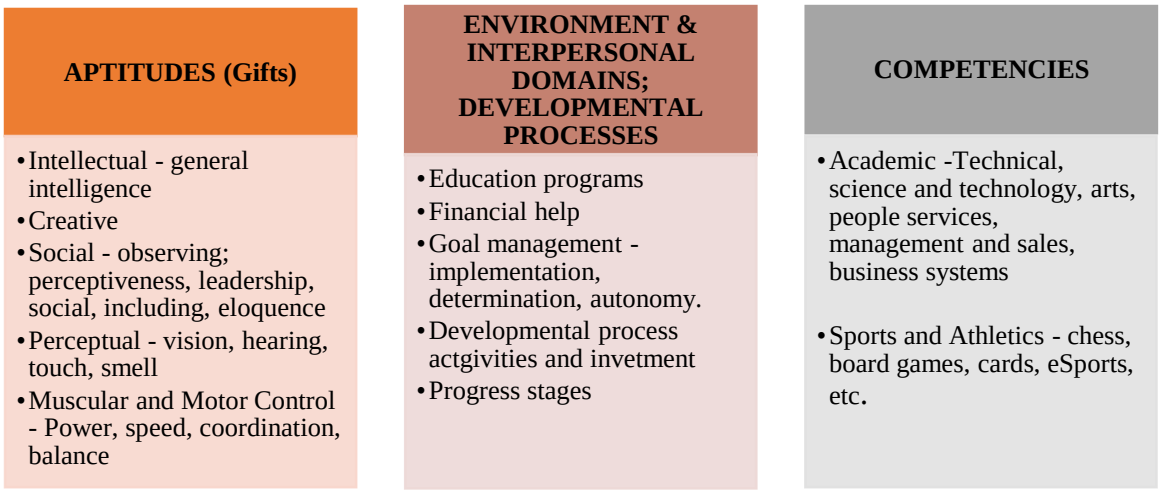

Figure 1. Some Core Dimensions in The Proposed Adapted Gagné Model for Gifted and Talented Students

Another key domain that becomes a core facet of the adapted Gagne model is project-based learning domains. Scholars specialized in pedagogies for talented learners' emphasis that project-based learning (PBL) opportunities are vital for translating theoretical knowledge into practical skills, especially in a vocational context (Moore, 2021; Venatius & Ekwok, 2023). The proposed model will create a rich PBL environment where gifted students can engage in real-world projects that align with their interests and career goals. Through partnerships with local businesses and community organizations, the model of learning will provide a diverse array of project opportunities (*Venatius & Ekwok, 2023*). These opportunities will include internships and apprenticeships within community service projects and entrepreneurial ventures. Moreover, these projects will enhance technical skills besides helping the learners to develop essential soft skills such as teamwork, communication, and problem-solving (*Pavlova & Chen, 2019*). By working on tangible projects, students will gain valuable experience crucial for their personal development. The projects will also help the learners to build professional networks and develop a deeper understanding of their preferred fields. This hands-on approach ensures that learning is relevant and applied and therefore helps to bridge the gap between education and employment.

SWOT Analysis of the Proposed Model for Talented Students in TVET

- *Strengths*

The proposed model's primary strength lies in its individualized learning paths, which are meticulously tailored to each student's unique aptitudes and learning preferences. By leveraging *Gagné's DMGT* framework, the model identifies and nurtures students' innate technical talents through customized educational plans. This individualized approach ensures that students are consistently engaged and challenged. In the process, the model will prevent both boredom and burnout. Another significant strength is the enhanced curriculum rigor that introduces advanced content and complex problem-solving tasks. This rigor stimulates higher-order thinking and aligns the human development matrix to ensuring students have optimal opportunities for personal development (*Melki & Bouzid, 2021; Kanu, 2020*). Additionally, the incorporation of project-based learning (PBL) provides real-world application opportunities. This fosters practical skill development which is vital in contemporary aspects of human life.

- *Weaknesses*

Despite its strengths, the proposed model has certain weaknesses that need to be addressed. One potential weakness is the resource intensity required to implement individualized learning paths. Developing and maintaining personalized educational plans and providing continuous feedback in the proposed learning model could be resource intensive (*Tao et al., 2024*). Further adapting learning technologies necessitates significant investment in both time and financial resources which most TVET institutions may not have readily. This could be a barrier for institutions with limited budgets. Another weakness is the potential for increased pressure on students due to the enhanced curriculum rigor. This weakness can be moderated by having a balanced structure of curriculum development. While the intention is to challenge gifted students, there is a risk that the added academic demands could lead to stress and burnout if not managed carefully. Additionally, the reliance on external partnerships for project-based learning

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opportunities may pose a logistical challenge. Therefore, consistent coordination and collaboration may be required which could be difficult to sustain over time.

- *Opportunities*

The proposed model presents several opportunities for both students and the broader educational landscape. One significant opportunity is the potential to set a new standard for gifted education within TVET which will serve as a model for other institutions. By demonstrating the effectiveness of individualized learning paths and advanced curriculum rigor, the model could influence policy changes and inspire wider adoption of similar approaches. Another opportunity lies in the potential to foster stronger industry connections that are valuable for a smoother transition of talented students to the workplace (*Yasak, 2020*). Generally, the model can underpin better transitions from education to employment, thereby enhancing job placement rates and career readiness for students. Additionally, the emphasis on cutting-edge technologies and emerging fields positions students at the forefront of innovation. This can potentially lead to breakthroughs and advancements in their respective industries.

- *Threats*

While the proposed Gagne model for talent students in TVET has many strengths and opportunities, it is not without critical weaknesses that must be considered. The first significant threat is the rapid pace of technological change, which could render some skills and knowledge areas obsolete quickly. The Gagne model demands heavy investment in the creation of individual pathways of education and the personalization of skill sets. However, the ongoing changes in technology create new demands for the kind of skills the talented learners must have before they leave school. This necessitates continuous curriculum updates and adaptability, posing a challenge for educators to stay current with industry advancements. Furthermore, there is a risk of inequity if the model is not accessible to all students. This is particularly the case for learners from disadvantaged and underserved backgrounds who may lack access to the same level of resources and support (*Petru-Cristian, 2024*). Lastly, the model's reliance on external partnerships may be threatened by shifts in industry priorities or economic conditions, potentially limiting the availability of real-world project opportunities. By addressing the prevailing weaknesses and mitigating potential threats, the proposed model can realize its full potential in transforming vital aptitudes into vocational skills and nurturing technical talents. There are strong indications from evidence-based research on Gagne model that it is able to contribute to a skilled and innovative workforce even from gifted learners.

Plan on Implementation of Gagne's Model

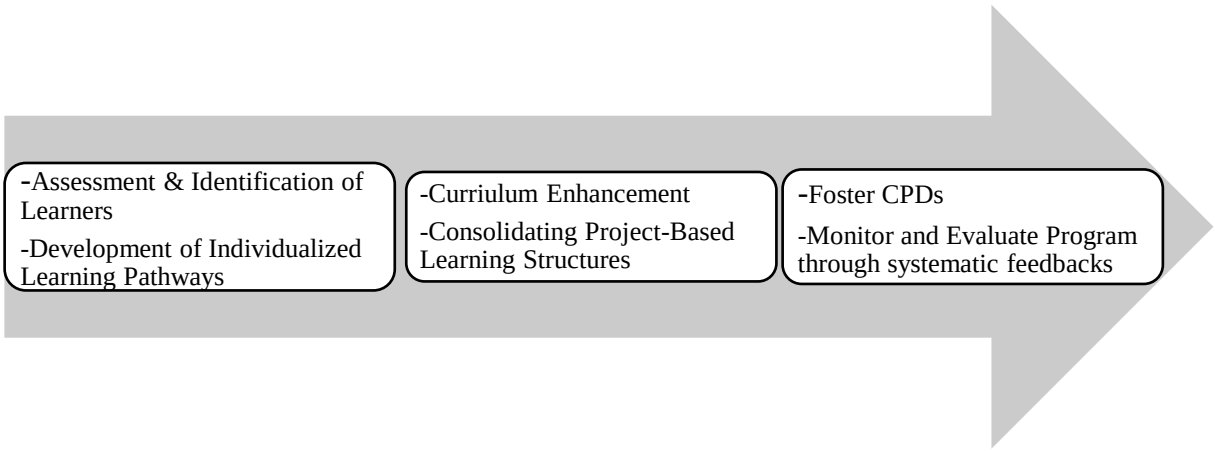

Figure 2. Summary of the Framework Implementation Plan

The implementation plan for Gagné's Model in TVET follows a series of steps which consider a systematic and smooth integration of the framework into the learning paradigms of those institutions. The following steps will be adopted in the process:

Assessment and Identification of Learners: - The implementation will begin with conducting comprehensive assessments to identify gifted learners based on their technical aptitudes. Through a combination of standardized tests, teacher recommendations, and student portfolios, the implementation team will be able to capture a holistic view of each student's abilities. This ensures accurate identification of their strengths and developmental needs.

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Development of Individualized Learning Pathways: - The second step will be creating a personalized learning pathway framework skewed to each learner's aptitudes, skills, and preferences. In this stage, there is a keen consideration of the unique attributes of the learner to maximize their opportunities for learning. These plans will include differentiated instruction, personalized mentoring, and access to specialized resources. The implementing team will employ adaptive learning technologies to continuously monitor and adjust these plans to ensure consistent engagement and challenge for each student. Innovative characteristic for individualization in TVET is *Individual Creative Technical Portfolio* with personalized individual creative tasks. A feasible framework for encompassing *individual creative tasks* into VET programs might contain:

1. **Identification of Core Competencies**: Determine the critical skills and knowledge that students need to develop in their vocational field.
2. **Integration of Creative Tasks**: Identify points within the curriculum where individual creative tasks can be embedded. These tasks should enable students to apply creativity, critical thinking, and problem-solving abilities in a relevant and practical manner.
3. **Implementation Strategies**: Define the specific methods for executing creative tasks within the vocational program. This may include providing clear guidelines, offering necessary resources, facilitating peer collaboration and feedback, and incorporating reflection and evaluation opportunities.
4. **Assessment and Feedback**: Establish mechanisms to evaluate student performance on creative tasks and deliver timely feedback (*Hillon et al., 2012*). This can include rubrics, peer evaluations, mentor input, and self-assessment exercises. Additionally, students should be given platforms to showcase their creative work, such as student exhibitions or presentations, both within the program and to external stakeholders in the particular scientific field or from the industry (*Du, 2002*).

This framework must account for the specific characteristics of each vocational field, offering students opportunities to demonstrate creativity and problem-solving skills within their disciplines (*Zhang et al., 2023*).

The core of the Individualized framework for students in TVET in *Gagné's DMGT Model* is the *Creative Learning Method* (***Figure 3.***) and the *Framework of Individualized Creative Tasks* (examined above).

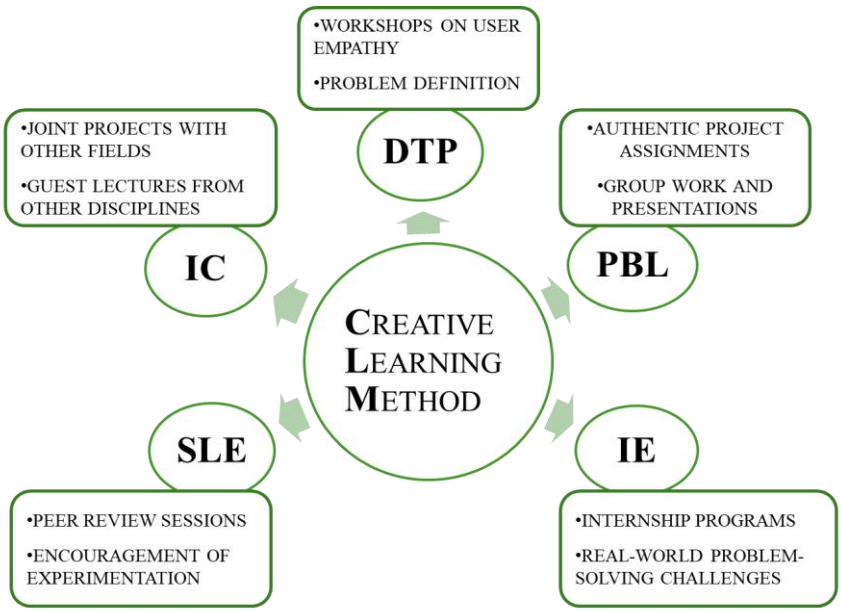

Figure 3. Gagné's Differentiated Model of Giftedness and Talent for TVET (Author's source)

The model in ***Figure 3***. is structured and consists of: *Design Thinking Process (DTP):* Empathize Define Ideate Prototype Test. *Project-Based Learning (PBL):* Real-World Projects Collaboration Critical Thinking; *Interdisciplinary Collaboration (IC):* Cross-Field Projects, Diverse Skill Sets; *Supportive Learning Environment (SLE):* Risk-Taking, Constructive Feedback; *Industry Engagement (IE):* Partnerships, Mentorship Opportunities.

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The integration of the Creative Learning Method (**CLM**), as illustrated in ***Figure 3***, into the Framework Implementation Plan (depicted in ***Figure 1***), will entail the following actions:

1. ***Curriculum Enhancement: -*** In this stage of the implementation plan, the TVET team concerned with the adoption of the model will focus on integrating advanced coursework and rigorous tasks that require the learners to solve complex problems within the domain of their gifts. Subjects such as robotics, AI, and renewable energy will be included. Collaboration with industry experts is emphasized to maintain curriculum relevance and promoting intellectual growth and leadership readiness.
2. ***Consolidating Project-Based Learning Opportunities:*** - At this stage, a focus is put on real-world projects. The team will incorporate project-based learning into the curriculum to allow the talented learners to engage in hands-on projects. This is designed to develop practical skills in the learner including communication and teamwork which are valuable in today's performance.
3. ***Fostering Continuous Professional Development****:* - As part of the plan, the educators in the TVET institution targeted are expected to seek continuous professional development to remain ahead in terms of integrating best approaches into education.
4. ***Monitoring and Evaluation****:* - Lastly, regular assessment of the progress of students and the program effectiveness will be crucial to foster improvements. Feedback mechanisms will be created which will help the implementing team to understand the new demands in the system and to integrated the required improvements to foster learning.

The Use of the Model in Relation to Future Trends in TVETs

The adoption of Gagné's Model in TVET aligns seamlessly with future trends that emphasize the essence of practical competencies and competence-based curricula. As industries increasingly prioritize hands-on skills and real-world problem-solving abilities, TVET institutions must adapt by focusing on these practical competencies. Gagné's Model and the proposed framework support this shift by fostering an environment where students' innate technical talents are systematically developed into advanced vocational skills through individualized learning paths and project-based learning. Competence-based curricula that emphasize mastering specific skills and knowledge are becoming essential in TVET. This model's focus on personalized learning ensures that each student's educational journey is tailored to their unique abilities, allowing for deeper and more effective skill acquisition (*Kočvarová et al., 2024*). By providing real-world project experiences, students gain the practical competencies needed for successful careers. Overall, adopting Gagné's Model positions TVET institutions at the forefront of educational innovation, ensuring they meet the evolving demands of the workforce and technological landscape.

CONCLUSION

This study presents a comprehensive and adaptive model for Technical and Vocational Education and Training (TVET) adapted specifically for gifted students, based on Gagné's Differentiated Model of Giftedness and Talent (DMGT). By explicitly defining the aim of nurturing the unique aptitudes of gifted learners, the model integrates individualized learning paths, enhanced curriculum rigor, and project-based learning opportunities, thereby addressing the distinct educational needs of this demographic. The methodological framework employed—encompassing both qualitative and quantitative approaches—ensures a robust analysis of the model's effectiveness, facilitating a deeper understanding of how personalized educational strategies can transform innate technical abilities into exceptional vocational skills. Furthermore, the emphasis on partnerships with local industries not only bridges theoretical knowledge with practical application but also enhances students' readiness for the evolving demands of the workforce. This research underscores the critical importance of adapting educational frameworks to meet the diverse needs of gifted learners, ultimately positioning TVET institutions at the forefront of educational innovation. By fostering an environment that prioritizes the development of practical competencies and competence-based learning, this model not only maximizes the potential of gifted students but also contributes to the creation of a skilled and innovative workforce capable of navigating the complexities of a rapidly changing vocational landscape.

The article introduces several novel elements compared to other discussions on Technical and Vocational Education and Training (TVET) for gifted and talented students. Firstly, it emphasizes the development of individualized learning paths tailored to the unique abilities and preferences of gifted learners, which is less commonly addressed in existing literature. It advocates for enhanced

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curriculum rigor by integrating advanced content and complex problem-solving tasks, pushing beyond traditional educational standards.

Another accent is made on the incorporation of project-based learning as a core component, allowing students to engage in real-world applications that foster essential practical skills. It also stresses the importance of continuous professional development for educators to effectively implement these innovative strategies, which is often overlooked in other studies.

The proposal includes a focus on monitoring and evaluation mechanisms to assess student progress and program effectiveness, ensuring alignment with industry demands. The partnerships with local industries is presented to bridge theoretical knowledge with practical application, enhancing students' readiness for the workforce. These combined elements present a comprehensive and adaptive framework that specifically addresses the needs of gifted students in TVET, setting it apart from other articles in the field.

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