JOURNAL OF TECHNICAL EDUCATION AND TRAINING
ISSN: 2229-8932 e-ISSN: 2600-7932

JTET

Vol. 17 No. 2 (2025) 38-52
https://publisher.uthm.edu.my/ojs/index.php/jtet

Exploring the Relationship Between Personality Types and Learning Styles Among Special Education Students in TVET: A Case Study

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DOI: https://doi.org/10.30880/jtet.2025.17.02.003

Article Info

Received: 4th December 2025
Accepted: 24th February 2025
Available online: 30th June 2025

Keywords

Student personality types, learning styles, special education students, vocational special education

Abstract

This study investigated how student personality types (introvert, extrovert, and ambivert) and learning styles, based on the five stimuli in the Dunn & Dunn Model, impacted special education students' interest in Technical and Vocational Education and Training (TVET) skills related to refrigeration and air conditioning. A quantitative research method was employed, focusing on students enrolled in refrigeration and air conditioning programmes at Vocational Special Education Secondary Schools in Malaysia. A total of 37 special education students participated in this study, which utilized a questionnaire as a research tool. The study examined how introverted, extroverted, and ambivert personalities influenced students' interest in the field. Additionally, it explored how various components of learning styles, including environment, emotions, sociology, physical aspects, and psychology, affected student interest. The findings indicated that most respondents had a moderately high level of individual personality classifications (introvert, extrovert, and ambivert) and a high-level learning style. The results revealed no significant link between different personality types and students' interest in TVET skills related to refrigeration and air conditioning, with a correlation coefficient of 0.296. Various personality types did not notably affect special education students' interest in the profession. This study enhanced comprehension of the interests of special education students, which could contribute to developing a more suitable and comprehensive learning approach to support student achievement in TVET skills.

1. Introduction

The educational system in Malaysia provides valuable insights into the evolution and modifications within the education sector, particularly in special education (Musa, 2021). Malaysia has implemented laws and initiatives to promote inclusive education for all students, including those with special needs. Special education students are

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increasingly recognized as having the right to appropriate education, leading to the development of specialized programs and institutions designed to meet their unique learning needs (Hussin, 2021). Therefore, understanding the relationship between personality and learning styles among special education students in TVET is key to improving educational effectiveness and helping them achieve their full potential.

Pazim (2021) discusses the progress made in understanding and meeting the diverse needs of special education students in Malaysia. Among the most notable issues are the lack of adapted learning materials, specialized equipment, trained instructors, and support systems such as accommodations and special education programs. Policies and guidelines have played a crucial role in shaping the provision of appropriate educational services. Examining the history of special education in Malaysia can provide educators and policymakers with valuable insights into the challenges, accomplishments, and best practices that have influenced the educational landscape for these students.

Furthermore, understanding the unique characteristics and needs of special education students in Malaysia is essential for creating effective educational programs and support systems (Mosbiran et al., 2021). Special education students encompass a variety of disabilities, abilities, and learning styles, which require tailored teaching strategies to support their academic and vocational development. Students may face challenges in communication, cognitive development, sensory processing, or physical mobility (Francisco, Hartman & Wang, 2020). Reliance on appropriate learning materials is crucial, especially for students with visual or auditory learning styles. For example, students with analytical or systematic personalities may need more structured, text-based learning materials. However, if these materials are not provided in a more interactive format such as graphics or illustrations, they may have difficulty understanding TVET concepts in greater depth.

In this context, Carl Jung's personality classification theory and the Dunn & Dunn learning style model serve as crucial frameworks for understanding how special education students engage with Technical and Vocational Education and Training (TVET). Jung's personality theory categorizes individuals into introverts, extroverts, and ambiverts, which can influence how they process information, interact with their environment, and develop interest in vocational skills. Students with extroverted personalities may be more flexible in adapting to different learning environments, but for those who are more introverted or tend towards individualistic learning, they may have difficulty in systems that demand high levels of social interaction. Additionally, for students who rely on verbal or auditory learning, language barriers can be a major challenge that prevents them from understanding the concepts taught in TVET.

Similarly, the Dunn & Dunn learning style model identifies five key stimuli that affect learning: environmental, emotional, sociological, physiological, and psychological (Dunn & Dunn, 1992). This model highlights the importance of personalizing instruction to match students' preferred learning conditions, particularly for those in special education who may require specific accommodations. The purpose of testing learning styles is to identify the most effective learning style for an individual, identify intangible learning styles, accurately identify learning styles through specific instruments, avoid misinterpretation of behavior and recognize signs of certain behaviors. There are various learning style models as explained in the next section. Applying the Dunn & Dunn model to TVET training in refrigeration and air conditioning helps in understanding how different learning conditions impact student interest and engagement in vocational skills.

The primary difficulty in the relationship between special education student personality types and learning styles in TVET is a lack of personalized instructional strategies that cater to various cognitive and behavioral needs. Many TVET programs use standardized teaching approaches that do not account for the diverse personality features and learning preferences of special education students, resulting in disengagement and poor academic achievement. Relying on appropriate learning materials is especially important for students with visual or auditory learning styles. For example, students with analytical or systematic personalities may need more structured and text-based learning materials. However, if these materials are not provided in a more interactive format such as graphics or illustrations, they may have difficulty understanding TVET concepts in depth.

According to Puteri Zarina et al. (2021), TVET programs customized for special education students are essential for providing vocational training and preparing them for employment opportunities. TVET for special education students in Malaysia continues to grow with various initiatives to ensure they have the same learning opportunities as mainstream students. However, initial research through observations and interviews with special education teachers and students found that the effectiveness of learning in TVET is still influenced by the mismatch between teaching approaches and students' personality types and learning styles. TVET institutes have evolved to meet the unique needs of special education students by offering specialized programs in technical and vocational fields. Refrigeration and air conditioning training equip students with practical experience and industry-specific skills necessary for their professional growth.

En et al. (2023) emphasize the significance of special education students demonstrating interest in TVET industries like refrigeration and air conditioning for their personal development, career aspirations, and integration into the workforce. Just like their peers, special education students have unique abilities and preferences that influence their career choices. Selecting a TVET field that aligns with their personality type and preferred learning style enables them to develop their potential, improve practical skills, and gain a sense of

purpose. Without a deep understanding of the relationship between personality types and learning styles of special education students in the TVET field, it is possible that students will experience difficulties in the learning process, thereby affecting their performance and reducing interest in the TVET field. Ultimately, such an approach facilitates a smoother transition into the workforce and promotes lifelong success for special education students.

1.1 Study Background

Special education students have many challenges in developing an interest in technical and vocational education and training (TVET) skills specifically in refrigeration and air conditioning. Salim (2019) mentioned that these students face difficulties in accessing inclusive educational opportunities and appropriate occupational programmed tailored to their need. The development of special education in Malaysia also involves the establishment of special schools, resource centres, and inclusive classrooms that provide opportunities for special education students to develop in an environment that supports their learning. In addition, the policies and guidelines that have been introduced help ensure that education is delivered more systematically and in line with their needs. Understanding the personality and learning styles of special education students is an important element in planning more effective and inclusive teaching strategies.

Special education students in European countries face unique challenges when trying to gain TVET skills in refrigeration and air conditioning. Efforts to improve inclusive education have not eliminated existing gaps. The students may face challenges such as limited access to appropriate TVET programmed and inadequate support structures, as mentioned by Paseka & Schwab (2020). Language barriers, cultural disparities, and prejudiced attitudes could affect students' educational journey and discourage their pursuit of vocational skills. Tackling these challenges is essential to create equal opportunity and foster the enthusiasm of special education students in this topic. In the context of TVET, a practical and skills-oriented learning approach is very much in line with the needs of kinesthetic learners.

Besides, special education students in Southeast Asia face challenges in developing an interest in TVET skills related to refrigeration and air conditioning. Robson et al. (2018) discovered that insufficient resources and facilities can impede access to comprehensive vocational training. Support systems for special education children, such as counselling services, tailored education plans, and adjustments, may be insufficient in certain countries. Social stigma and discrimination might affect individuals' confidence and motivation to engage in vocational education. The selection of TVET skill areas among special education students depends not only on their interests but also on the suitability of individual personality and learning style.

Additionally, special education students in Malaysia face distinct challenges while developing an interest in TVET skills associated with refrigeration and air conditioning. Hee et al. (2023) found that the absence of customized programmed can impede individuals, restricting their training options and opportunities. Inadequate support services, such as counselling, personalized education plans, and appropriate accommodations, can hinder their learning experience. It is essential to address cultural attitudes, eliminate stigma, and promote inclusion to ensure that special education students in Malaysia have equal opportunities to develop and improve their occupational skills.

Special education students in Malaysian public school's face challenges in developing an interest in TVET skills associated with refrigeration and air conditioning. Limited resources and financing can impact their access to high-quality vocational programmed (Hashim et al., 2021). Institutions may lack the specialized equipment, customized learning materials, and skilled teachers needed to meet the unique requirements described by Delubom, Marongwe & Buka (2020). Lack of support services such as counselling, tailored education programmed, and accommodations can hinder their progress and limit opportunities to develop and improve their vocational skills. It is essential to address these issues and offer adequate resources and support systems to nurture the passion of special education students at public institutions in Malaysia.

Special education students in private schools in Malaysia struggle to develop interest in TVET skills associated with refrigeration and air conditioning. Tohara's 2021 study revealed that the absence of inclusive vocational programmed in private universities can provide a significant obstacle for students. Additionally, the costs of private school and the availability of certain resources and support services may pose challenges for children in special education and their families. Private universities must offer inclusive programmed, affordable options, and adequate support services to improve the involvement and success of special education students in the field.

1.2 Problem Statement

Challenges at both national and international levels impact the interest of special education students in Technical and Vocational Education and Training (TVET) skills, particularly in the field of refrigeration and air conditioning. These students often face barriers to accessing inclusive education programs and appropriate vocational training opportunities due to limited resources, such as adapted learning materials, specialized equipment, and qualified instructors. In Europe, special education students encounter challenges stemming from linguistic barriers, cultural conflicts, and discriminatory attitudes, whereas students in Southeast Asia face social stigma, restricted

vocational training opportunities, inadequate equipment, and insufficient support networks. In Malaysia, similar issues persist, with inadequate resources, funding, and support services in both public and private institutions, particularly schools. To improve access to high-quality vocational programs, adequate resource allocation, funding, and comprehensive support services are necessary. Ensuring that special education students can effectively develop occupational skills requires targeted interventions and thorough measures.

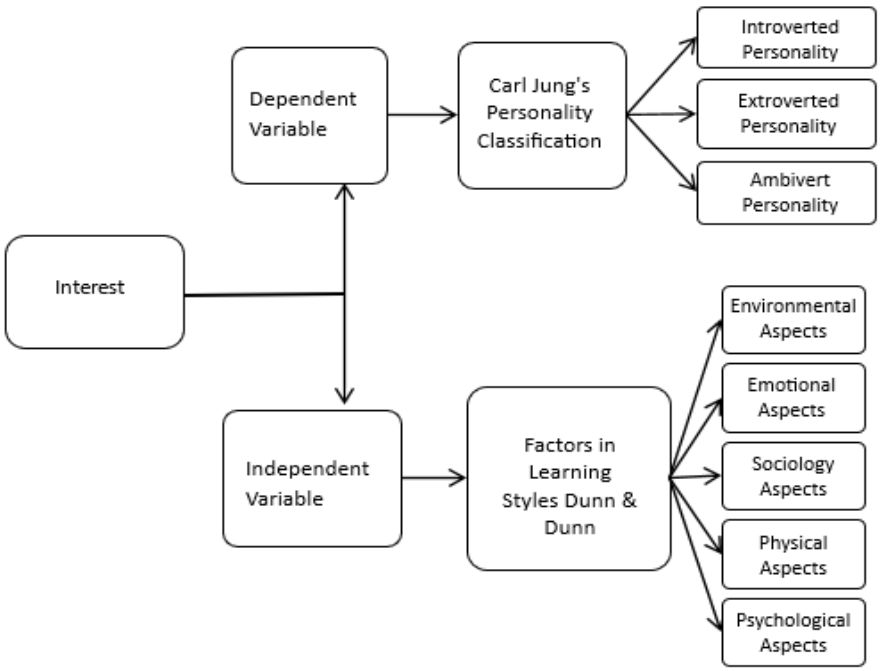

Fig. 1 *Study concept framework*

Figure 1 presents the conceptual framework developed for this study to examine the factors influencing special education students' interest in TVET skills related to refrigeration and air conditioning. The study focuses on two key independent variables: learning styles and personality types. The learning style variable is based on the Dunn & Dunn Model (Price et al., 1981), which categorizes learning preferences into five factors: psychological, physical, emotional, social, and environmental. These factors influence how students process information and engage with learning materials, which can impact their interest in TVET skills.

The second independent variable, personality type, is based on Carl Jung's Personality Classification (Andrews, 2014), which identifies individuals as introverts, extroverts, or ambiverts. Personality traits affect students' engagement levels, learning preferences, and interest in vocational training. For example, extroverted students may thrive in collaborative, hands-on activities, while introverted students may prefer structured, self-paced learning environments.

The Dunn & Dunn Learning Style Model stresses particular learning preferences, such as environmental, emotional, social, and physiological aspects, which can assist customize TVET instruction to special education students' specific requirements. Carl Jung's Personality Classification provides a psychological framework that, when combined with Dunn & Dunn's model, allows for more personalized teaching methods, ensuring that vocational training aligns with both students' cognitive processing styles and personality traits, ultimately improving engagement and skill acquisition. The dependent variable in this study is student interest in TVET skills related to refrigeration and air conditioning. By analyzing the relationship between learning styles, personality types, and student interest, this study seeks to determine whether these factors significantly influence the motivation and engagement of special education students in vocational training. A deeper understanding of these relationships can contribute to the development of more inclusive and effective TVET programs tailored to the unique needs of special education students.

1.3 Research Objectives

To fulfill the purpose of this study, the following objectives have been formed:

i. Identify individual personality classifications that appeal to special education students in the TVET field of refrigeration and air conditioning.

ii. Identify factors in learning styles that appeal to special education students in the TVET field of refrigeration and air conditioning.
iii. Identifying the relationship between individual personality classification and factors in learning styles that appeal to special education students in the TVET field of refrigeration and air conditioning.

2. Methodology

Research methodology refers to the structured methods and strategies employed to conduct a study and address specific research inquiries or issues. It establishes a systematic framework for organizing, executing, and evaluating the research process to ensure accuracy, reliability, and rigor. This study adopted a quantitative research method, incorporating elements such as research design, data collection methods, sampling strategies, and data analysis procedures. A well-defined methodology is essential to ensure that the study produces reliable and meaningful findings that contribute to knowledge advancement and support evidence-based decision-making.

2.1 Research Design

A well-structured research design is crucial for ensuring that data collection and analysis align with the study's objectives (Huntington-Klein, 2021). This study employed a quantitative research approach, focusing on special education students enrolled in refrigeration and air conditioning programs at Vocational Special Education Secondary Schools in Malaysia. The study aimed to identify specific factors influencing these students' interest in TVET skills related to refrigeration and air conditioning.

Data were collected through a standardized questionnaire, which included three main sections:

- Section A: Respondents' demographic information.
- Section B: Individual personality traits, including introversion, extroversion, and ambiversion, based on Carl Jung's Personality Classification.
- Section C: Learning style factors, including the five stimuli from the Dunn & Dunn Model (environmental, emotional, sociological, physical, and psychological stimuli).

The questionnaire was developed based on validated instruments from previous research related to learning styles and personality classification. To ensure content validity, experts in special education and vocational training reviewed the questionnaire. A pilot study was conducted with a small group of special education students (not included in the final sample) to assess the clarity, readability, and reliability of the instrument. The questionnaire's internal consistency was measured using Cronbach's alpha, where a value above 0.70 was considered.

Descriptive statistics (mean and standard deviation) were used to determine the average interest level and variability among responses. Additionally, correlation analysis was conducted to examine the relationship between personality traits and learning style factors in influencing student interest in TVET skills.

2.2 Sampling Of the Study

This study focused on special education students enrolled in refrigeration and air conditioning programs at Vocational Special Education Secondary Schools in Johor, Selangor, and Kedah. The study employed a purposive sampling technique, selecting students specifically enrolled in these programs to ensure relevance to the research objectives.

A total of 37 special education students participated in the study. One of the main challenges was the limited number of special education students enrolled in refrigeration and air conditioning courses, which restricted the sample size. However, the study ensured a representative sample by selecting students across multiple vocational schools in different states. Approval was obtained from school authorities, parents, and guardians before conducting the study. Participants were informed about the study's objectives, their rights to withdraw at any time, and the confidentiality of their responses.

By identifying the factors that attract special education students to TVET programs, particularly in refrigeration and air conditioning, this study contributes to existing research on career interests and educational pathways for special education students. The findings provide valuable insights for educators and policymakers in designing more inclusive and effective vocational training programs that enhance student participation and success in technical fields (Hashim, Ismail & Masek, 2017).

2.3 Research Instrument

A questionnaire has been used as a research instrument in a study to identify the specific traits that attract special education students to TVET skills in refrigeration and air conditioning. The tool in this study intends to have adequate validity in measuring the factors that attract special education students at Special Vocational Secondary

Schools in Malaysia to TVET skills in refrigeration and air conditioning. Table 1 shows how the questions are distributed in the questionnaire.

Table 1 *Distribution of the questionnaire's items*

Section	Items	Number of questions	Elements
A	Student demographics	5 questions	School Age Levels Gender Race
B	Personality Classification	15 questions	Introverted Personality Extroverted Personality Ambivert Personality
C	Factor In Learning Style	25 questions	Environmental Aspects Emotional Aspects Sociological Aspects Physical Aspects Psychological Aspects

The data collected using a 5-point Likert scale in table 2 is analyzed based on the mean score, standard deviation, and interpretation of the mean.

Table 2 *Likert scale value*

Scale	Level
1	Strongly disagree
2	Disagree
3	Moderately agree
4	Agree
5	Strongly agree

The average calculated from data analysis indicated the overall positive or negative response to a studied element. Pandey & Pandey (2021) classified the mean into three categories: low, medium, and high. Pandey & Pandey (2021) asserts that academics possess the authority to interpret facts, even if data are accessible to everyone. The researcher has classified the gathered data in a certain environment into three tiers: low, medium, and high, as illustrated in table 3.

Table 3 *Mean score interpretation on a 5-point Likert scale*

Mean score	Level
1.00 – 2.39	Low
2.40 – 3.70	Medium
3.71 – 5.00	High

3. Results and Discussion

Personality classification analysis of individual students who have three personality elements, namely introverted, extroverted and ambivert students. Table 4 displays the average value and standard deviation for each personality trait of introverted students related to TVET skills in refrigeration and air conditioning. Examination of participants' responses to each statement in the study reveals a specific trend.

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Table 4 *Personality analysis of introverted students*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I like sitting alone in class.	Introverted student	3.02	1.394	Medium high
2. I am a quiet person.		3.06	1.392	Medium high
3. I don't like making friends.		2.92	1.371	Medium high
4. I don't have many friends.		3.00	1.359	Medium high
5. I like to study alone.		3.19	1.360	Medium high
Overall value		3.02	1.312	Medium high

Respondents' replies to each statement in the research questionnaire reveal certain inclinations. Respondents in question 1 generally prefer to sit alone in class, with a mean score of 3.02 and a standard deviation of 1.394, indicating considerable variability in their responses. Question 3 demonstrates that respondents perceive themselves as quiet individuals, with a mean score of 3.06 and a standard deviation of 1.392, showing consistency in their responses to this assertion. Question 3 reveals a propensity towards disliking social interactions, with a mean score of 2.92 and a standard deviation of 1.371, indicating variations in respondents' opinions on social matters. Question 4 reveals that some participants perceive having few friends, with a minimum score of 3.00 and a standard deviation of 1.359, suggesting relatively noticeable variations in social perception. Question 5 indicates a preference for solitary study with a mean score of 3.19 and a standard deviation of 1.360, demonstrating uniformity in respondents' opinions towards independent learning methods. Introverted students' personality scores towards TVET skills in refrigeration and air conditioning have a moderately high overall minimum score of 3.03, with a standard deviation of 1.312. The data indicates that special education students studying refrigeration and air conditioning exhibit somewhat high levels of introverted personalities. Next, table 5 displays the minimum scores and standard deviations for each aspect of extroverted students' personality related to TVET skills in refrigeration and air conditioning.

Table 5 *Personality analysis of extroverted students*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I like to be in a noisy atmosphere.	Extroverted student	3.06	1.183	Medium high
2. I like to talk in class.		3.13	1.110	Medium high
3. I have many friends at school.		3.25	1.072	Medium high
4. I get along well with everyone.		3.17	1.172	Medium high
5. I like to help friends and teachers.		3.66	1.018	Medium high
Overall value		3.25	1.021	Medium high

Question 6 has the greatest minimum score of 3.66 and a standard deviation of 1.018, suggesting that respondents typically exhibit positive characteristics by finding satisfaction in assisting peers and teachers. Question 3 follows with a minimal score of 3.25 and a standard deviation of 1.072, indicating a strong inclination towards promoting teamwork as a result of having several friends at school. Question 4 has a minimum score of 3.17 and a standard deviation of 1.172, indicating a strong preference for socializing with others. Question 2 has a minimum score of 3.13 and a standard deviation of 1.110, suggesting a favorable inclination towards liking speaking in class. Question 1 indicates a minimum score of 3.06 and a standard deviation of 1.183, implying a preference for noisy environments. The extroverted students' personality score for TVET skills in refrigeration and air conditioning is 3.25, with a standard deviation of 1.021, indicating a medium-high level. The data shows that special education students studying refrigeration and air conditioning exhibit somewhat high levels of extroversion. Table 6 outlines the minimal scores and standard deviations for each aspect of extroverted students' personalities related to TVET skills in refrigeration and air conditioning.

Table 6 *Personality analysis of ambivert students*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I like the quiet and noisy class.	Ambivert student	3.58	1.232	Medium high
2. I like to talk in class and I can also be a quiet person.		3.57	1.248	Medium high
3. I like to study alone and also like to study in groups with my classmates.		3.72	1.199	Medium high
4. I have many friends and I also like to be alone.		3.68	1.252	Medium high
5. I like to help friends and sometimes I feel shy to help friends.		3.72	1.262	Medium high
Overall value		3.65	1.218	Medium high

Questions 13 and 15, which are the top-ranked, suggest ambivert characteristics that involve appreciating both solitary and group learning, and showing a good attitude towards assisting others, despite occasional shyness. A somewhat high interpretation indicates a well-rounded combination of several ambivert characteristics, offering a glimpse into their flexibility in social and educational settings. Question 4 explores the ambivert's inclination to balance social interactions with a need for solitude, focusing on both social activities and independence. Both sides are equally emphasized, highlighting the distinctive characteristics of ambivert personalities in their interactions with their environment. Questions 11 and 12 focus on individuals' preferences for quiet or noisy classroom environments and their willingness to participate in class discussions while displaying introverted characteristics. Ambiverts exhibit sensitivity to learning situations by displaying both energetic and reserved behaviors. The minimum scores and standard deviations offer insight into the variability and distinctiveness of ambivert students' personality traits in relation to refrigeration and air conditioning skills. A moderately high interpretation suggests their ability to adjust to various learning environments and social engagements.

The study's findings indicate that there is no notable correlation between individual personality types (introvert, extrovert, and ambivert) and students' interest in TVET skills related to refrigeration and air conditioning. Different personality types do not have a significant impact on special education students' interest in the field (Tefaha & Koriche, 2021). Past studies focusing on individual personality traits that appeal to special education students in the field of refrigeration and air conditioning within TVET skills offer valuable insights. Previous studies have concentrated on specific relevant facets. Prior research has explored adapting the curriculum to accommodate the varied personalities of special education students. The research by Phakamach et al., (2023) highlights the significance of incorporating tailored learning and evaluation methods to cater to diverse personalities for optimal learning outcomes.

Furthermore, the study demonstrates the efficacy of special education programmed designed to assist special education children with distinct personalities. Customized learning methods are essential for reaching educational objectives and interests in the refrigeration and air conditioning industry. Previous study, when combined with these findings, offers a crucial foundation for comprehending the intricate dynamics associated with various individual personality types in attracting special education students to TVET programmed focusing on refrigeration and air conditioning. The practical consequences of the previous study can assist in designing a more comprehensive and adaptable learning method tailored to the unique requirements of special education students (Sari et al., 2023). The next stage is to analyze the components of the learning style in the Dunn and Dunn Model. This involves a thorough analysis of five main dimensions: environment, emotion, social, physical, and psychological. An examination of environmental elements in learning styles from Table 7 shows a noteworthy pattern of responder responses to different characteristics of the learning environment.

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Table 7 *Analysis factor in learning styles of environmental aspects*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I like to study in a quiet classroom without noise.	Environmental Aspects	4.11	0.824	High
2. I like to study in bright classrooms.		4.34	0.758	High
3. I like being in a cool classroom like having an air conditioner.		4.34	0.706	High
4. I am more comfortable studying in a classroom with chairs and tables.		4.42	0.719	High
5. I like to study in a class that has a big space.		4.38	0.765	High
Overall value		4.31	0.662	High

Question 4 is ranked top with a mean score of 4.42, suggesting a strong preference for comfort in classrooms with chairs and desks. The high means indicates that respondents are confident in this environmental component, despite a slightly elevated standard deviation of 0.719. Questions 2 and 3, which pertain to bright light and cool temperatures in the classroom, exhibit a strong positive correlation with a mean value of 4.34. This demonstrates the significance of environmental elements on learning comfort as perceived by respondents. The somewhat elevated standard deviation figures do not diminish the confidence and consistency shown in the high mean interpretations of positive reactions to these environmental variables. Questions 5 and 1, which pertain to large classrooms and peaceful class environments, also exhibit a favorable trend at elevated levels. Respondents show a favorable preference for comfort in classrooms with spaciousness and a tranquil environment, as indicated by mean values of 4.38 and 4.11. The elevated average interpretations in both questions enhance trust in the validity and consistency of favorable responses to these environmental influences. Respondents often priorities environmental components in their learning styles, highlighting the significance of environmental elements in fostering comfort and enhancing learning effectiveness. According to Table 8, the study of minimum values, standard deviations, and interpretations of learning styles towards emotional components indicates that respondents had a favorable attitude towards emotional aspects in air conditioning learning.

Table 8 *Analysis factor in learning styles of emotional aspects*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I am happy to come to school to learn the refrigeration and air conditioning subject.	Emotional Aspects	4.25	0.705	High
2. I think it's fun because the refrigeration and air conditioning subject is easy for me.		4.26	0.738	High
3. I feel happy for taking the field of refrigeration and air conditioning.		4.26	0.788	High
4. I feel interested in studying the fields of refrigeration and air conditioning because there are many job opportunities.		4.28	0.769	High
5. I will study hard to succeed in the refrigeration and air conditioning field.		4.51	0.608	High
Overall value		4.31	0.643	High

Question 10 is ranked first with a value of 4.51, showing a strong propensity towards respondents' commitment to learning and succeeding in the air conditioning industry. The small standard deviation of 0.608 and high minimum value enhance trust in the accuracy and reliability of positive replies related to this emotional element. Questions 6 to 9 exhibit a consistent trend of positive replies with notably high minimum values. Respondents experience delight and satisfaction in attending school, perceive air conditioning as an easy topic, express happiness in selecting the air conditioning field, and demonstrate enthusiasm in learning because of job prospects. These questions suggest a high level of minimum interpretations, which boosts confidence in the validity and constancy of positive emotional responses to their learning. The investigation affirms that emotional aspects significantly influence respondents' learning styles, showing a favorable inclination towards determination, contentment, and joy in the context of air conditioning education. Table 9 shows that respondents demonstrate a strong inclination towards sociological aspects affecting their learning in the air conditioning area, as indicated by the minimum values, standard deviations, and interpretations.

Table 9 *Analysis factor in learning styles of sociology aspects*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I am comfortable learning in groups about refrigeration and air conditioning subject.	Sociological Aspects	4.06	0.864	High
2. My parents always supported me to take the refrigeration and air conditioning field.		4.53	0.608	High
3. My teacher helped me a lot in understanding the refrigeration and air conditioning subject.		4.43	0.636	High
4. My friends always cooperate in doing the refrigeration and air conditioning practical work.		4.25	0.705	High
5. My achievements in the refrigeration and air conditioning industry bring optimism to my parents.		4.51	0.576	High
Overall value		4.35	0.548	High

Questions 12 and 15 have high values of 4.53 and 4.51, low standard deviations, and significant minimum interpretations. Respondents show a preference for group learning and priorities social contact in the learning process. Questions 11, 13, and 14 exhibit high minimum values and have standard deviations that vary from low to substantial. The consistent high minimum interpretations for each question reflect respondents' inclinations towards sociological factors like family support, teacher assistance, peer cooperation, and family expectations, which are crucial in motivating and reinforcing learning in the air conditioning field. The analysis shows that sociological factors have a strong and positive impact on respondents' learning styles. The high minimum scores and low standard deviations suggest consistency and alignment with their preferences regarding sociological influences on learning. Substantial minimum interpretations indicate that sociological elements significantly contribute to their learning in the air conditioning area. Table 10 shows an intriguing pattern in the research of learning styles based on physical parameters.

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Table 10 *Analysis factor in learning styles of physical aspects*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I enjoy studying refrigeration and air conditioning due to the extensive practical work involved.	Physical Aspects	4.34	0.649	High
2. I enjoy collaborating with friends on practical tasks related to refrigeration and air conditioning.		4.15	0.794	High
3. I like working in the refrigeration and air conditioning area because I have the opportunity to gain practical experience during the internship.		4.40	0.631	High
4. I enjoy studying refrigeration and air conditioning due to my frequent usage of hand tools.		4.40	0.599	High
5. I enjoy being in the workshop since it allows me to physically interact with refrigeration and air conditioning components.		4.38	0.562	High
Overall value		4.33	0.509	High

Questions 18 and 19 had the greatest minimum values, suggesting that respondents favor hands-on learning and practical use of instruments in air conditioning studies. The low standard deviations of 0.631 and 0.599, together with high minimum values, indicate the constancy and validity of favorable responses to these physical effects. Questions 1 and 5 demonstrate a strong inclination towards hands-on labor and workshop settings that include interacting with air conditioning components, as seen by their high minimum interpretations and values. Question 17 has a high minimum interpretation but may not strongly highlight the favorable trend towards collaborative practical work. The research of physical elements indicates that respondents are stable and confident in giving favorable replies regarding the physical aspects of learning about air conditioning. Educators and stakeholders should develop more engaging and effective learning ways to better understand and address students' needs, as highlighted by this investigation. According to table 11, the research of psychological components in learning styles shows that respondents have a strong preference for psychological features associated with learning about air conditioning.

Table 11 *Analysis factor in learning styles of psychological aspects*

Question	Classification	Mean value	Standard deviation	Interpretation Mean
1. I enjoy working on refrigeration and air conditioning tasks in the workshop as it enhances my cognitive abilities.	Psychological Aspects	4.08	0.756	High
2. I can efficiently do the refrigeration and air conditioning task when provided with precise guidance from the teacher.		4.26	0.711	High
3. I swiftly identified the issue in the faulty refrigeration and air conditioning component.		4.25	0.705	High
4. I enjoy acquiring new knowledge in the field of refrigeration and air conditioning.		4.23	0.800	High
5. I enjoy working on refrigeration and air conditioning tasks in the workshop as it enhances my cognitive abilities.		4.38	0.713	High
Overall value		4.23	0.642	High

Question 25 had the greatest comfort rating among classrooms furnished with seats and desks. A low standard deviation and high minimum indicate the reliability and consistency of favorable reactions to certain psychological factors. Questions 22 and 24 indicate favorable reactions to well-lit classrooms and roomy spaces. Questions 21 and 23 imply that respondents might not priorities calm or chilly classroom settings. The investigation highlights the significant influence of psychological elements on respondents' learning styles, specifically focusing on their comfort and desire for brightness and space in the classroom.

After analyzing the elements in the learning style of special education kids, numerous important discoveries were made. Respondents exhibited a favorable inclination towards comfort, brightness, spaciousness, and a tranquil and cool ambiance in the classroom environment. The results demonstrate the significance of a supportive learning environment in engaging students' interest in hands-on learning in the refrigeration and air conditioning area. Emotional aspects are equally significant in capturing students' interest. Respondents exhibited strong interest and motivation in learning about air conditioning, with positive scores for determination, contentment, delight, and interest. It is important to recognize and comprehend the emotional component of students to enhance their enthusiasm for the TVET area (Suhaini et al., 2020) Sociologically, social connection, family support, teacher assistance, peer collaboration, and family expectations are highlighted positively. Engagement in social networks and familial assistance are crucial elements that can enhance student engagement and academic achievement.

The psychological factor plays a crucial role in creating a learning environment that promotes students' interests and needs by addressing their psychological demands (Talasbek et al., 2020). Engaging in hands-on activities including conducting experiments, utilizing manual tools, and working in a workshop environment where air-conditioning components may be touched elicits a favorable reaction in terms of physical engagement. Engaging in hands-on exercises like this helps enhance students' comprehension of TVET abilities. By comprehending the findings of this analysis, educators and researchers can develop a learning strategy that is better suited and adaptable to the interests and requirements of special education students in the refrigeration and air conditioning field, aligning with prior studies by Cheng & Lai (2020) on facilitating learning for students with special needs.

Kaya & Erdem (2021) found that students' motivation and emotional well-being significantly impact the effectiveness of learning. Furthermore, sociological factors like peer support and an inclusive learning environment can provide favorable effects. The study also focuses on physical elements, such as comfort in the learning environment, and finds that a suitable setting can enhance student comfort and performance. Previous research has demonstrated that respondents' learning preferences are impacted by various intricate characteristics, and Dunn & Dunn's Model offers a suitable structure to incorporate these aspects. Educators and researchers can develop more effective teaching strategies tailored to the needs of students in refrigeration and air conditioning by comprehending these elements.

Next, to determine the relationship between individual student personality classification and factors in learning style towards special education students' interest in TVET skills in the field of refrigeration and air conditioning, the Spearman Correlation test was used to analyze the data to study the relationship between individual student personality classification and factors in learning style. The Shapiro-Wilk Normality Test revealed intriguing findings when analyzing individual student personality classification items. Item 1, pertaining to the personality of introverted students, has a correlation coefficient of 0.924 and a p-value of 0.002, indicating statistical significance. The results indicate that the data concerning introverted personality follows a non-normal distribution. The critical value for the normal distribution exceeds 0.005 ($p>0.005$). Item 2, which pertains to the personality of extroverted pupils, has a statistical value of 0.947 and a significant value of 0.020, indicating a normal distribution. The value is considered significant when it exceeds 0.005 ($p>0.005$). Item 3, which pertains to the personality of ambivert students, demonstrates a statistical value of 0.882 and a significant value of 0.000. The test findings indicate that the ambivert personality data follows a non-normal distribution.

The Shapiro-Wilk Normality Test results indicate that the data distribution for introvert and ambivert students' personalities is not normal, whereas the extrovert personality data follows a normal distribution. The results indicate that the data for classifying individual student personalities follows a non-normal distribution. The Shapiro-Wilk Normality Test results indicated that the data for the learning style factor did not follow normal distribution. The results were derived from statistically significant values across all items, encompassing environmental, emotional, sociological, physical, and psychological elements. The data in the learning style components analyzed do not typically conform to a normal distribution. This result is crucial for the future interpretation and analysis of the student's learning style. Table 12 displays the correlation test scores between individual student personality classifications and characteristics in learning styles.

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Table 12 *Analysis of the relationship between individual student personality classification and learning style factors*

Spearman Correlation		Student Personality Classification	Learning Style Factors
Student Personality Classification	Correlation coefficient	1.000	0.296
	Significant		0.031
Learning Style Factors	Correlation coefficient	0.296	1.000
	Significant	0.031	

The correlation analysis shows a little association between individual student personality categories and components in learning styles, with a correlation coefficient of 0.296. The link is statistically significant with a significance value of 0.031, below the threshold of 0.05 ($p<0.05$). However, the low correlation value indicates a weak relationship. Thus, the research hypothesis (Ha) is supported, while the null hypothesis (Ho) is refuted. There is a correlation between individual student personality classifications and learning styles elements, however it is weak. The correlation between a student's personality classification and learning style variables indicates an intricate interaction that can greatly impact the efficacy of educational methods and teaching strategies. Although the correlation data are given in an understandable manner, it is important to highlight the practical consequences of the weak connection, as it may suggest that more individualized and adaptive educational practices are required to properly support varied learning styles in TVET settings.

The study's findings indicate that there is no substantial correlation between the personality classification of individual students and the specific learning style elements being examined. The Spearman association Test indicates that there is no significant association between individual student personalities (introverts, extroverts, and ambiverts) and factors in learning styles such environment, emotions, social, physical, and psychological. Thus, this aligns with prior research that demonstrated how individuals with specific personality qualities, including a preference for visual stimulation or studying in a calm environment (Chang, 2022), can be connected to Dunn & Dunn's model. This scenario can enhance comprehension of tailoring the teaching and learning method to align with the student's personality traits and learning style (Ibrahimoglu et al., 2013).

Studies like this can offer a more profound understanding of how specific personality qualities might impact an individual's inclination towards many components of learning, including environment, emotions, social, physical, and psychological factors. Educators can tailor the learning environment to better accommodate students' needs by comprehending this connection with personality attributes (Moè & Katz, 2021). This study's findings can offer valuable guidance to educators and researchers in developing teaching practices that better cater to the requirements and preferences of Special Education students. By comprehending the impact of personality traits on learning, we can create a more inclusive learning setting and offer equitable chances for each student to develop and succeed in the refrigeration and air conditioning industry.

4. Conclusion

The study's findings and discussion offer a comprehensive understanding of how individual personality classification relates to aspects in learning styles, specifically in the field of refrigeration and air conditioning. Personality factors including extraversion, emotional stability, collaboration, openness, and reasoning capacity significantly influence how individuals respond to learning elements. Previous research offers valuable insight into how various personality qualities might impact learning styles through contextual, emotional, sociological, physical, and psychological reasons. Educators and researchers gain a more profound insight into students' diverse requirements and how to create successful learning environments through these partnerships. This also serves as a foundation for improved learning technique suggestions and alignment of teaching methods with student personality traits. Educators can enhance the effectiveness of designing learning experiences that promote holistic student development by recognizing the impact of personality factors on learning styles. This work provides a crucial contribution to our comprehension of the intricate connection between individual personality classifications and learning styles, paving the way for future research and advancements in this field.

Acknowledgement

This research was supported by Universiti Tun Hussein Onn Malaysia (UTHM) through Tier 1 (Vot Q531) and GPPS (Vot J066).

Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: Anis Adibah Azman: ***Literature review, methodology, data collection and project administration;*** *Suhaizal Hashim:* ***Drafted the manuscript and provided substantial revisions formal analysis, and validation;*** *Noor Hidayah Che Lah:* ***Contributed to writing the results and discussion sections, conceptualization, methodology and resources;*** *Muhammad Faeiz Daud:* ***Conceptualization, and resources****.*

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