A Case Study on Relationship among MBTI Personality Tendency, HOLLAND Personality Type and Academic Achievement of Science Gifted students

Soon Joo Lee[*]

Abstract   The purpose of this study was to analyze the relationships among science gifted students' MBTI personality tendencies, Holland's professional personality types, and academic achievement, with the aim of developing individualized guidance strategies based on these results. To achieve this, we first examined the relationship between MBTI personality tendencies and Holland's professional personality types, the relationship between MBTI personality tendencies and the academic achievement of science gifted students, and the academic achievements based on the psychological functional type and psychological temperament type of science gifted students. The findings are as follows: Firstly, an analysis of the differences in Holland personality types between the introverted (I) and extroverted (E) student groups revealed significant differences in the enterprising type. Specifically, extroverted students scored higher than introverted students in the enterprising type. Secondly, a comparison of Holland personality type scores between judging (J) and perceiving (P) student groups showed that the judging (J) group scored higher in the realistic type than the perceiving (P) group. Differences in academic achievement were observed in terms of energy direction, information processing, and approach to life among the four MBTI personality tendencies. Finally, differences were found in psychological temperament type, but not in psychological functional type. The sensing perceivers (SP) type showed the highest score, while the sensing judger (SJ) type showed the lowest score in basic academic ability, and this difference was statistically significant

Keywords   Science Gifted Students, Academic Achievement, MBTI, Holland Test, Personality Tendency, Professional Personality

I. Introduction

During adolescence, which corresponds to the genital stage in Freud's psychological sexual stage and late adolescence in Erikson's psychological development stage, students face important tasks such as studying and career planning. This period is crucial for developing an integrated approach to one's personality, abilities, and interests through self-awareness formation, establishing rational relationships, and exploring career options. To do this, students need to identify their strengths, weaknesses, interests, and areas of proficiency, which will help them establish their values and career goals. To maximize the effectiveness of learning and career guidance, many researchers have focused on understanding learners' psychological characteristics and developing tailored guidance strategies for each personality type.

Numerous studies have examined the relationship between an individual's personality type and academic performance (Go Byung-yeon & Oh Hee-kyun, 2009; Song Jong-geon, 1994; Lee Sun-ah & Byun Ho-seung, 2020; Lee Joo-seong, Jang Won-chang, & Kim Cheol, 2012; Jeong Kyung-yeon, 1993; Heo Jeong, 1993; Furqurean et al., 1988; Irani et al., 2003; Lathey, 1991; O'Brien, Bernold, Akroyd, 1998; Tobyak, Hearn, Wells, 1990) and have found that there is a correlation between the two. In other words, even if students experience the same teaching and learning activities, the learning outcomes can differ depending on the individual, emphasizing the need to consider learning situations that are suitable for each student's personality type to improve academic achievement (Myers & McCaulley, 1985). Additionally, it has been revealed that personality types are closely related to academic achievement and learning styles, and that there are differences in academic performance, self-regulation, and learning abilities depending on the personality type (Kim Hyun-sook, 2002). Thus, research examining the relationship between personality types and academic performance has recently extended beyond the fields of psychology and education to areas related to human behavior and health, among other specific academic fields (Han Eun-kyung et al., 2007). While the MBTI test is the most widely used tool for measuring personality types (Kim Hyun-sook, 2002; Kim Hye-kyung, 1996; Song Jong-geon, 1994; Oh Soo-jin, 2003; Lee Yoon-sun, 1995; Choi Seon-hee, 1998; Ha Tae-sim, 2002), since 2000, there has been a significant increase in research on Holland's vocational personality types (Gong Eun-jung, 2008; Kim Sun-young, 2009; Kim Jong-ho & Shin Yong-seop, 2006; Kim Hyun-jae, 2006; Kim Hee-jung, 2007; Dik, 2005; Hwang Mae-hyang, 2004). Some studies have also presented the relationship between vocational personality types and academic performance (Gong Eun-jung, 2008; Jo Han-ik & Kim Young-mi, 2012; Choi In-sook, 2004). These prior studies all emphasize that students with a high aptitude in a particular field tend

to show high academic performance in subjects related to that field (Marshalek, Lohman & Snow, 1983; Park Hyun-joo, 2000; Kim Dong-wook, 2006; Kim Sun-young, 2009; Yang Myung-hee, Park Myung-ji & Kim Hee-jung, 2010). Based on this review of prior studies, it is evident that the MBTI and Holland tests are the most reliable tools for measuring an individual's personality type.

Based on these research findings, instructors can manage the academic achievement of science gifted students and guide them towards successful employment based on their psychological characteristics. Previous studies on personality types have emphasized the relationship between an individual's personality type and their academic achievement, highlighting the importance of incorporating students' personality traits into specific teaching and learning activities to improve academic performance. Career and learning guidance should consider students' individual personality characteristics and implement personalized and differentiated strategies based on their psychological profiles. Therefore, this study aims to provide meaningful foundational data for establishing individualized guidance strategies for science gifted students by analyzing the relationship between learners' personality types, specifically MBTI's personality tendencies, Holland professional personality types, and academic achievement.

The research questions addressed in this study are as follows:

1. What is the relationship between Holland personality types and MBTI personality tendencies among science gifted students?

2. How does MBTI personality tendency relate to the academic achievement of science gifted students?

3. What are the academic achievements according to the psychological functional type and psychological temperament type of science gifted students?

II. Research Method

1. Study Subjects

The study included 532 students who participated in the first and second rounds of the middle school gifted selection process at the gifted education institutions. The research subjects were students who participated in the two rounds of the gifted selection process between mid-October and mid-February each year from the 2019 academic year to the 2022 academic year. Out of the initial 645 students surveyed, 113 students who did not respond were excluded from the data analysis. The final sample consisted of 338 male students (63.5%) and 194 female students (36.5%).

2. Inspection Tools

2.1 Holland's Occupational Personality Test

The Holland's Occupational Personality Type Test used in this study was a personality-based occupational interest test. It provides valuable insights into one's career based on the test results (Changgyu Ahn, 2000). John Holland, an American career psychologist, who developed occupational interest classified people's job interests into six types: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C), based on the analysis of occupational characteristics and workers' interests in specific fields. The Holland's Occupational Personality Type Test (Ahn Chang-gyu, Ahn Hyun, 2007) was used as the test tool in this study, with a Cronbach's α reliability coefficient of .827. The test results were utilized to determine the dominant occupational personality type among the six types.

2.2 MBTI Personality Tendency

The Myers-Briggs Type Indicator (MBTI) is a personality type assessment tool developed by Myers and Briggs based on the psychological typology theory of Swiss psychoanalyst Carl Jung. It categorizes individuals into one of 16 psychological types based on four dimensions: Extroversion (E) - Introversion (I), Sensing (S) - Intuition (N), Thinking (T) - Feeling (F), and Judging (J) - Perceiving (P). The MBTI theory allows for constructive understanding of personality differences in advance, enabling individuals to cope more effectively. It helps individuals understand themselves and others by identifying their energy focus in different situations, how they gather information, what they pay attention to, and how they make decisions based on the information they perceive. The preference tendencies reflect an individual's innate psychological state, which they consistently, often optionally, and comfortably utilize in the processes of perception and judgment (Jun-seok Seo, 2001).

2.3 Academic Achievement

In this study, purposive sampling was used to collect data from students who participated in the gifted selection process and those who were selected as gifted, in line with the research objectives. Generally, children who participate in the gifted selection process at gifted education institutions tend to have superior academic abilities and potential compared to average children. Even applicants who are not ultimately selected as gifted are considered exceptional individuals with enough potential to be nurtured into gifted individuals if provided with appropriate educational programs at the right time. To explore the relationship between science gifted students' MBTI personality tendency and academic performance, the data were processed as follows. An independent sample t-test

was used to investigate the relationship between the four personality tendencies in MBTI and Holland personality types, as well as the relationship between MBTI personality tendencies and academic achievement. Furthermore, One-way ANOVA was conducted to examine the academic achievement of science gifted students based on psychological function types and psychological temperament types, analyzing the average and differences in academic achievement across these types. The data processing was performed using the SPSS (ver.21.0) statistical program.

3. Data Processing

This study analyzed the selection process for science gifted programs at educational institutions in South Korea, focusing on both applicants and those ultimately selected as gifted students. We examined the relationships between Holland personality types, MBTI personality tendencies, and academic achievement among students who applied to the science gifted selection process and those who were selected in the final stage. Specifically, independent sample t-tests were conducted to investigate the relationships between MBTI personality tendencies and Holland personality types, as well as between MBTI personality tendencies and academic achievement. Additionally, one-way ANOVA was performed to analyze the mean differences in academic achievement according to the psychological functional type and psychological temperament type of science gifted students. Data analysis was conducted using the SPSS statistical software (ver. 21.0).

III. RESULTS OF THE RESEARCH

1. Relationship between Holland Personality Type and MBTI Personality Tendency of Science Gifted Students

To explore the relationship between Holland's personality type and MBTI personality tendency among science gifted students, the study examined how the direction of energy flow (extroverted - introverted) relates to Holland personality types. An independent sample t-test was conducted to determine if there were any differences in Holland personality type scores based on personality tendency.

1.1 The Relationship between Personality Tendency and Holland Personality Type in terms of Energy Direction

Table 1. Analysis of Differences in Holland Personality Type based on the Energy Direction Tendencies of Science Gifted Students

Holland Personality Type	Personality Tendency	N	M	SD	T
Realistic	E	222	59.44	20.51	.125
	I	310	59.10	20.62	
Investigative	E	222	43.40	19.84	.387
	I	310	42.41	18.52	
Artistic	E	222	43.67	18.96	2.598
	I	310	37.20	18.40	
Social	E	222	57.11	17.36	4.941
	I	310	46.22	15.82	
Enterprising	E	222	58.61	19.63	8.127*
	I	310	38.92	15.76	
Conventional	E	222	47.86	16.84	-.691
	I	310	49.41	16.66	

*p< .05

To investigate whether there were differences in Holland personality types between two groups of introverted (I) and extroverted (E) students, a statistical analysis was conducted. In MBTI, introverted (I) and extroverted (E) refer to how individuals gain energy and interact with the world. Introverted (I) students derive energy from their inner world and prefer solitude, while extroverted (E) students gain energy from external sources and feel invigorated through social interactions and activities. The analysis of Holland personality type scores for these two contrasting groups revealed the following results. Specifically, as shown in Table 1, the average score for the enterprising type among extroverted students (58.61) was 19.69 points higher than that of introverted students (38.92). This difference was found to be statistically significant, with a t-test result of t=8.127 (p<.05) at the 5% significance level. These results indicate that extroverted students scored higher than introverted students in the enterprising type.

1.2 Relationship between Personality Tendency and Holland Personality Type in terms of Gathering Information

Table 2. Analysis of the Differences in Holland Personality Types According to the Personality Tendencies of Science Gifted Students in Terms of Gathering Information

Holland Personality Type	Personality Tendency	*N*	*M*	*SD*	*T*
Realistic	S	167	59.43	19.91	.238
	N	52	58.68	22.48	
Investigative	S	167	40.94	18.87	-2.645
	N	52	48.54	18.54	
Artistic	S	167	36.08	17.35	-5.710
	N	52	51.50	18.67	
Social	S	167	51.01	16.39	.378
	N	52	50.01	19.95	
Enterprising	S	167	46.94	19.94	-.258
	N	52	47.73	20.20	
Conventional	S	167	50.92	16.60	3.496
	N	52	42.21	15.43	

In MBTI theory, Sensing (S) and Intuition (N) describe how individuals process information and perceive the world. Specifically, Sensing (S) individuals prioritize concrete and practical information, focusing on present facts and details, whereas Intuition (N) individuals value abstract and theoretical information, preferring to understand the world through intuition and potential future possibilities. An analysis comparing Sensing (S) and Intuition (N) students within the context of Holland's personality types reveals that, as shown in Table 2, there are no significant differences between the two groups across any of the six Holland personality types. Despite the contrasting tendencies in how Sensing (S) and Intuition (N) students process information, no meaningful differences were observed among the Realistic, Investigative, Artistic, Social, Enterprising, and Conventional types.

1.3 Relationship between Personality Tendency and Holland Personality Type in terms of making decisions

Table 3. Analysis of the Differences in Holland Personality Types according to the Personality Tendencies of Science Gifted Students in Terms of Making Decisions

Holland Personality Type	Personality Tendency	N	M	SD	T
Realistic	T	352	61.53	19.86	2.387
	F	180	54.78	21.20	
Investigative	T	352	43.46	19.10	.707
	F	180	41.58	19.00	
Artistic	T	352	37.92	18.44	-2.237
	F	180	43.75	19.22	
Social	T	352	47.22	16.52	-4.518
	F	180	57.67	16.79	
Enterprising	T	352	47.19	19.90	.050
	F	180	47.05	20.22	
Conventional	T	352	50.19	17.40	1.823
	F	180	45.97	14.99	

Table 3 illustrates the differences between Thinking (T) and Feeling (F) types in terms of decision-making. In MBTI theory, these types describe how individuals make judgments and decisions. Thinking (T) individuals make decisions based on logical and objective criteria, whereas Feeling (F) individuals prioritize emotions, relationships, and personal values in their decision-making process. Despite these opposing characteristics, an analysis of Holland's personality types reveals no significant differences in scores between the two groups across all six types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. However, the largest score difference between the two groups was observed in the Social type. Specifically, the average score for Feeling (F) students in the Social type was 57.67 (SD=16.79), while the average score for Thinking (T) students was 47.22 (SD=16.52). Despite this difference, the t-test did not yield a significant result (t=-4.518, p>.05).

1.4 Relationship between Personality Tendency and Holland Personality Type in terms of approach to life

Table 4. Analysis of the Differences in Holland Personality Types according to the Personality Tendencies of Science Gifted Students in Terms of Approach to Life

Holland Personality Type	Personality Tendency	*N*	*M*	*SD*	*T*
Realistic	J	217	60.67	18.78	.905*
	P	315	58.24	21.69	
Investigative	J	217	46.96	17..70	2.804
	P	315	39.91	19.48	
Artistic	J	217	39.36	19.54	-.361
	P	315	40.28	18.44	
Social	J	217	51.86	18.33	.803
	P	315	50.00	16.56	
Enterprising	J	217	49.49	20.50	1.502
	P	315	45.48	19.49	
Conventional	J	217	54.64	17.11	4.671
	P	315	44.62	15.17	

* p< .05

Table 4 presents the results of an analysis comparing Judging (J) and Perceiving (P) students across the six Holland personality types. These groups are categorized based on their lifestyle preferences and approaches to processing and perceiving the world. The analysis reveals that Judging (J) students, who favor structure and planning, show significantly higher scores in the Realistic type compared to Perceiving (P) students, who prefer a more flexible and open approach. Specifically, the average score for Judging (J) students was 60.67 (SD=18.78), while the average score for Perceiving (P) students was 58.24 (SD=21.69). The t-test yielded a result of t=.905 (p<.05), indicating a significant difference at the 5% significance level.

Moving on to the relationship between MBTI personality tendency and academic achievement, the study analyzed the relevance of the direction of energy flow with academic achievement based on the tendencies of extroversion (E) and introversion (I). Independent sample t-tests were conducted to investigate whether there were any differences in academic achievement according to personality tendency.

2. The Relationship between Personality Tendency and Academic Achievement

2.1 Relationship between Personality Tendency and Academic Achievement in Term of Energy Direction

Table 5. The Analysis of the Difference in Academic Achievement according to the Personality Tendency of Science Gifted Students in Terms of Energy Direction

Field	Personality Tendency	*N*	*M*	*SD*	*T*
Basic Academic Ability	E	185	85.03	13.38	-1.45
	I	240	87.62	12.24	
Creative Problem-solving Ability	E	191	82.46	11.23	-8.0
	I	266	84.02	12.16	

For basic academic ability, there was no significant difference between extroverted (E) and introverted (I) students. Similarly, for creative problem-solving ability, there was no significant difference between the two groups. Table 5 shows that in both fields the academic achievement of introverted(I) was not higher meaningfully than extroverted(E). In other words, there is no significant difference between extroverted(E) and introverted(I) students in 2 fields.

2.2 Relationship between Personality Tendency and Academic Achievement in Terms of Taking in Information

Table 6. Analysis of Differences in Academic Achievement according to the Personality Tendency of Science Gifted Students in Terms of Taking in Information

Field	Personality Tendency	*N*	*M*	*SD*	*T*
Basic Academic Ability	S	347	82.85	11.98	1.767*
	N	105	80.34	15.08	
Creative Problem-solving Ability	S	358	81.22	13.96	-.661
	N	99	82.18	12.47	

* $p < .05$

Table 6 shows the results of the independent sample t-test to find out the difference in academic achievement between the two opposing tendencies in terms of taking in information, namely, sensing and intuition students. It was found that there was a significant difference only in the field of basic academic

ability between sensing (S) student group and intuition (N) student group. In other words, the average score of basic academic ability for the sensing (S) student group was 82.85 (SD=11.98), while the average for intuition (N) students was 80.34 (SD=15.08), and the t-test result showed t=1.76 (<.05), which was significant at the 5% significance level. In the field of creative problem-solving ability, intuition (N) students were slightly higher than sensing (S) students, but the difference was not significant (p>.05).

Table 7. Analysis of the Difference in Academic Achievement according to the Personality Tendency of Science Gifted Students in Terms of Making Decisions

Field	Personality Tendency	*N*	*M*	*SD*	*T*
Basic Academic Ability	T	303	82.74	13.06	1.15
	F	149	81.30	12.22	
Creative Problem-solving Ability	T	300	82.10	13.57	1.46
	F	157	80.13	13.74	

Regarding making decisions, Table 7 shows that there is no significant difference between thinking (T) and feeling (F) students in both fields of basic academic ability and creative problem-solving ability. In other words, the academic achievement of feeling (F) students was slightly higher in both fields, but these differences were found to be not significant (p>.05).

2.3 The Relationship between Personality Tendency and Academic Achievement in terms of approach to life

Table 8. Analysis of the Difference in Academic Achievement according to the Personality Tendency of Science Gifted Students in Terms of Approach to Life

Field	Personality Tendency	*N*	*M*	*SD*	*T*
Basic Academic Ability	J	206	84.87	12.25	4.03***
	P	246	80.09	12.86	
Creative Problem-solving Ability	J	200	83.94	13.23	3.53***
	P	257	79.47	13.67	

*** p< .001

Table 8 displays the results of the independent sample t-test to find out whether there is any difference in academic achievement between the two opposing tendencies in terms of approach to life, namely, judging (J) and perceiving (P) students. It was found that the academic achievement of judging

(J) students was significantly higher in basic academic ability and creative problem-solving ability than that of the perceiving (P) students. In other words the average score for judging (J) students in basic academic was 84.87 (SD=12.25), while that for perceiving (P) students was 80.09 (SD=12.86). In creative problem-solving ability, the judging (J) students scored 83.94 (SD=13.23), while the perceiving (P) students scored 79.47 (SD=13.67). The t-test results showed t=4.03 (<.001) for basic academic ability and t=3.53 (<.001) for creative problem-solving ability, both significant at the 0.1% significance level.

3. Academic Achievement according to Psychological Functional Type and Psychological Temperament Type of Science Gifted Students

3.1 Academic Performance according to Psychological Functional Type

Table 9. Academic Achievement according to Psychological Functional Types

Fields	Psychological Functional Type	*N*	*M*	*SD*	*F*
Basic Academic Ability	ST(Sensoring Thinker)	252	81.86	12.87	2.27
	SF(Sensoring Feeler)	96	84.22	11.67	
	NF(Intuitive Feeler)	53	79.03	15.74	
	NT(Intuitive Thinker)	49	84.06	10.94	
Creative Problem-solving Ability	ST(Sensoring Thinker)	252	79.92	14.88	2.59
	SF(Sensoring Feeler)	96	83.87	10.93	
	NF(Intuitive Feeler)	53	81.21	14.09	
	NT(Intuitive Thinker)	49	83.51	9.25	

As shown in Table 9, there was no significant difference in basic academic ability and creative problem-solving ability when comparing academic achievement according to psychological functional types. The average score of SF (sensing & feeling) type in the field of basic academic ability was the highest at 84.22, while the average score of NF (intuition & feeling) type was the lowest at 79.03. However, these differences were not statistically significant. Similarly, in the field of creative problem-solving ability, the average score of SF (sensing & feeling) type was the highest at 83.87, and the average score of ST (sensing & thinking) type was the lowest at 79.92, but these differences were also not significant.

3.2 Academic Achievement according to Psychological Temperament Type

Table 10. Achievement according to Psychological Temperament Types

Fields	Psychological Functional Type	N	M	SD	F
Basic Academic Ability	SJ(Sensoring Judger)	51	78.82	16.02	3.67*
	SP(Sensoring Perceivers)	48	84.29	10.93	
	NF(Intuitive Feeler)	162	80.70	13.87	
	NT(Intuitive Thinker)	189	84.04	11.08	
Creative Problem-solving Ability	SJ(Sensoring Judger)	51	80.91	14.22	1.13
	SP(Sensoring Perceivers)	48	84.22	9.09	
	NF(Intuitive Feeler)	162	80.29	14.98	
	NT(Intuitive Thinker)	189	81.74	12.84	

* $p < .05$

In terms of basic academic ability, there was a significant difference between psychological temperament types. The SP (sensing & perceiving) type showed the highest score of 84.29, while the SJ (sensing & judging) type showed the lowest score at 78.82. On the other hand, there was no significant difference in the field of creative problem-solving ability. In other words, the average score of SP in creative problem-solving ability was the highest at 84.22, and the average score of NF was the lowest at 80.29. However, the analysis results showed that these differences were not significant.

IV. Discussion

The objective of this study was to analyze the relationships among science gifted students' MBTI personality tendencies, Holland's professional personality types, and academic achievement, with the aim of developing individualized guidance strategies based on these results. To achieve this, we first examined the relationship between MBTI personality tendencies and Holland's professional personality types, the relationship between MBTI personality tendencies and the academic achievement of science gifted students, and the academic achievements based on the psychological functional type and psychological temperament type of science gifted students. The findings are as follows:

Firstly, an analysis of the differences in Holland personality types between the introverted (I) and extroverted (E) student groups revealed significant differences in the enterprising type. Specifically, extroverted students scored higher than introverted students in the enterprising type. This result is interpreted as reflecting the direct relationship between the students' tendencies. Extroverted students, who are sociable, active, and enjoy interacting with various people, share common characteristics with Holland's enterprising type, which values social interaction, goal achievement through interpersonal relations, and leadership. In other words, both MBTI's extroverted (E) type and Holland's enterprising type emphasize social interaction, leadership, an active approach, and proactive engagement with changes, leading to the higher enterprising type scores observed among extroverted students.

Secondly, a comparison of Holland personality type scores between judging (J) and perceiving (P) student groups showed that the judging (J) group, characterized by a strong inclination toward following rules, adhering to planned schedules, and seeking systematic and organized decisions, scored higher in the realistic type than the perceiving (P) group, which prefers flexible and open-ended thinking and activities. This difference was found to be statistically significant. The analysis indicates a close relationship between the judging (J) tendency, which involves decision-making and planning in everyday life, and Holland's realistic type, which focuses on practicality, specificity, and realistic problem-solving. Both Holland's realistic type and MBTI's judging (J) type prioritize a practical and results-oriented approach, and prefer systematic and organized methods for problem-solving, as confirmed by this study's results.

These findings suggest that MBTI and Holland personality types are complementary and closely related. Previous research on the relationship between personality types and academic achievement (e.g., Koo, Oh, 2009; Song, 1994; Lee & Bae, 2020; Lee, Jang, Kim, 2012; Jeong, 1993; Furqurean & Meisgeier, 1988; Irani et al., 2003; Lathey, 1991; O'Brien et al., 1998; Tobyak & Hearn) has highlighted the close interrelationship between these two elements.

The analysis results of the relationship between MBTI personality tendency and academic achievement of science gifted students in this study revealed differences in academic achievement in terms of information processing and approach to life among the four MBTI personality tendencies. A study by Jae-yong Park and Woo-sung Park (2005) presented an analysis result indicating that students of the thinking (T) type, who prefer to infer cause and effect and distinguish right from wrong, showed higher academic achievement than students of the feeling (F) type in the field of basic academic ability. However, in this study, there was no significant difference between the thinking (T) type and feeling (F) type in terms of basic academic ability. On the other hand, it was found that the sensing (S) student group performed better in the field of basic academic ability than the intuition (N) student group in terms of information

processing. These results are consistent with the findings of many previous studies (Min-Jung Kim, 2002; Hyeon-suk Kim, 2001; Hye-kyung Kim, 1996; Hee-Young Kim, 2003; Se-hee Park, 2005; Jeong-Suk Shin, 1998; Jung Huh, 1991; Furqurean, Meisgeier, Swank, 1988). This suggests a harmonization between the learning methods of the academic field and the tendencies of sensing (S) students. Additionally, in terms of lifestyle, judging (J) students showed significantly higher academic achievement than perceiving (P) students in basic academic ability and creative problem-solving ability.

To conclude, through the analysis results of this study, it was once again confirmed that learning guidance considering individual differences in students' psychological personality characteristics is necessary. It is essential to actively implement learner-centered education by catering to the diverse learning styles and preferences of students through learning guidance strategies that suit their psychological styles. In other words, it is necessary to develop educational programs for each personality type to enhance the academic achievement of science gifted students who face challenges in various learning activities. For example, for introverted (I) students who focus on their thoughts and internal activities rather than enjoying external activities or self-expression, and thinking (T) students who solve problems rationally and analytically based on logic and principles, it is necessary to provide customized special programs that can develop the characteristics of the social type, guiding them to achieve psychological balance. That is, it is necessary to encourage introverted (I) and thinking (T) students, who tend to focus on their inner world, to participate in programs that allow them to experience the joy of helping others and interacting with peers. To this end, first, instructional strategies should be developed and provided in forms of activities that can help these two types of students develop social skills so that they can express their sociality and diversity within the gifted education program. Additionally, for students of the sensing (S), feeling (F), and perceiving (P) types, it is interpreted that there is a need to prepare differentiated programs and learning guidance methods that can foster the characteristics of the investigative personality type.

As such, utilizing students' personality characteristics in learning guidance activities is highly effective in improving their learning abilities, as evidenced by numerous previous studies (Fairhurst & Fairhurst, 1995; Schurr, et al., 1992). By implementing specialized educational activities that align with the psychological characteristics of each individual, instructors can guide students to realize their potential. Therefore, instructors should actively utilize the personality type information of students and incorporate personality theory into teaching and learning strategies to contribute to the improvement of gifted students' learning abilities.

Acknowledgment

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