

Influence of Students' Personality on The Evaluation of Their Positive Attitude Towards Learning

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Abstract

This study aims to construct a method of using ICT to evaluate students' "Positive Attitude Towards Learning". In the experiment, we investigated the relationship between student collaboration and student personality in a collaborative learning situation in order to determine whether personality could be related to how they performed in an assessment of their "Positive Attitude Towards Learning". In this paper, two hypotheses were formulated and tested. The results showed that (H¹) there was no correlation between student personality and the number of students involved in exchange learning. (H²) In some cases, there was a connection between students with moderate levels of extraversion and openness, otherwise, no relationship was found.

Keywords

Learning analytics, Teacher support, Visualization, Characteristics

1. Introduction

Transition of Learning Assessment in Japan

Learning assessment within Japanese schools is based on the School Education Law established in 1947, which, in Article 30, section 2, introduces and broadly defines the concept of "Positive Attitude Towards Learning". Japan has adopted an assessment system in accordance to this law, which focuses on three dimensions:

Knowledge and Skills

Thinking, Judgement and Expression

Positive Attitude Towards Learning

These perspectives are used for each subject to evaluate students' learning. In the past, the evaluation method of "Positive Attitude Towards Learning" was not elaborated. For example, it was noted that teachers recorded situations in which personality and behavioral tendencies were temporarily expressed, such as the number of times an individual raised their hand or whether they were taking notes (Central Council for Education 2019). Starting from the three dimensions aforementioned, this paper suggests that two other aspects should be considered for a more accurate evaluation, namely:

Aspects of persistent efforts toward acquiring knowledge and skills, and acquiring the ability to think, judge, and express.

Aspects of attempting to self-regulated learning through persistent efforts

Self-regulated learning (SRL) is "the self-directive process through which learners transform

their mental and physical abilities into task-related skills” (Zimmerman 2001). A previous study utilizing this concept points to the link between grit and this SRL in foreign language learning (Guo et al. 2023). “Grit” refers to the ability to work toward a goal on one's own without being discouraged in difficult situations and is considered to be an important ability for success. A previous study by Duckworth et al. elaborated a measure that utilizes grit (Duckworth et al. 2007). Since this scale is not designed for classroom use, Japan is developing a scale using “grit” in learning situations (Hisasaka et al. 2019, Hirasawa et al. 2021). It is worth mentioning that, at the time of writing this paper, these studies are still under development, so validation of their methodology and findings is pending. Nevertheless, student performance should not be a determining factor in performance evaluation. In other words, active students should not be appraised more favorably than passive students, as it is possible to envision situations in which a student may appear passive on the surface but, in reality, is paying attention to others and silently managing them.

These factors need to be judged comprehensively to evaluate “Positive Attitude Towards Learning”. The current evaluation offers the following specific methods to dispel the public misconceptions mentioned earlier (National Institute for Educational Policy Research 2019): “Writing in notebooks, reports, etc., comments made in class, behavioral observations by teachers, and self- and peer-assessments by students may be used by teachers as materials to consider when making their evaluation.” The reality is that there is no consistency between these methods and the “Positive Attitude Towards Learning”, which is why we believe these methods to be insufficient when evaluating the “Positive Attitude Towards Learning”. In the experiment conducted in this paper, in addition to the above elements, exchange learning utilizing ICT was implemented. The reason for incorporating exchange learning was to create an environment in which the students' attitudes toward learning can be evaluated. As a result, the use of ICT during the exchange learning made it possible to record which students were interacted with, which provided data that could be used to evaluate the students' attitudes toward learning independently.

1.2 Prior research on evaluation methods for “Positive Attitude Towards Learning” and its issues

In Japan, there are many previous studies on how to evaluate attitudes toward independent learning. Hirasawa and Hisasaka (2021) attempted to create a scale that could be used as an indicator for evaluating attitudes toward independent learning, aiming for effective instruction and evaluation in science classes. The scales developed in this previous study were the two aspects introduced in 1.1, and the results of calculating the correlation coefficients between the two scales show a strong positive correlation. In addition, the results of calculating the correlation coefficients with academic performance in science showed a significant positive correlation. Therefore, a certain level of external validity was recognized. For example, Kawamura (2020) developed a similar scale, which was adapted to focus on students' learning strategies, independence, and collaboration, and was subsequently confirmed to have a degree of reliability and validity. Furthermore, Takahashi (2021) proposes an example of a student self-reflection sheet for a science class and illustrates its utility in student assessment.

In common with these previous studies, students were asked to complete questionnaires and reflection sheets after class, and their learning was evaluated based on these materials. In recent years, classes that incorporate group learning and collaborative learning have become common, and it has become clear that there are no evaluations that incorporate direct assessment of active learning, such as which students interacted with whom when participating in class, or whether the students concentrated on learning by themselves. In addition, from the viewpoint of school teachers, an evaluation method that leads to a reduction of their workload is desired. In order to solve these problems, it is necessary to construct a method of utilizing evaluation indicators using ICT.

2. Hypothesis

This study aims to construct a method of using ICT to evaluate indicators of students' attitudes toward independent learning. Then, we investigated the relationship between student collaboration during exchange learning and the personality of students who participated in the class, and examined whether student personality could be related to the evaluation of attitudes toward proactive learning.

The following hypotheses and null hypotheses are formulated and tested in this paper:

- H¹. There is NO relationship between the number of students who interacted and their personality.
- H². The relationships between students that occur during exchange tends to be linked to SIMILAR personalities.
- H₀¹. There is relationship between the number of students who interacted and their personality.
- H₀². The relationships between students that occur during exchange tends to be linked to DIFFERENT personalities.

3. Methods

3.1 Outline

An experimental study was conducted on January 25, 2024, to evaluate the hypotheses of this study. In the experimental study, the students' learning behavior was recorded using the developed system described below. The experimental subjects were 30

students at a private high school in Japan (male:16 and female:14, age: 16-17). The structure of the Japanese school year should be noted, as the first semester generally starts in April. This implies the fact that by January, the student body has already established social bonds and students are more comfortable in interactions with their peers.

The students who participated in the experiment were given an overview of the experiment and how to use the system. After that, a pre-experiment questionnaire was administered. The pre-experiment questionnaire included 10 questions based on the TIPI-J (10 questions). The subjects used in the class were Japanese Classic Literature and Mathematics. In the Classic Literature class, the students were asked to extract the main points from given passages (3 questions), and in Mathematics, there were questions that required analytical thinking skills (2 questions).

3.2 TIPI-J (TIPI in Japanese)

The TIPI (Ten Item Personality Inventory) is a survey that measures personality traits (Gosling et al. 2003). The survey measures the Big Five personality traits through 10 questions. In this survey, since our study targeted Japanese speakers, we used the TIPI-J, which is translated TIPI for Japanese (Oshio et al. 2012). TIPI measures five factors: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness, with two items each in the positive and negative directions. Details of each factor are as follows:

- Extraversion: Indicates whether someone is outgoing and focused on the outside world or more inward-looking. If this indicator is high, their personality is sociable, energetic, and proactive; if this indicator is low, their personality is introverted, quiet, meek, and reserved.
- Agreeableness: Indicates how one treats others. If this indicator is high, they are warm and kind to others; if this indicator is low, they are suspicious and selfish.
- Conscientiousness: Indicates the student's attitude toward things. If this indicator is high, one is sincere, responsible, and enthusiastic about things; if this indicator is low, one is quick to give up and has no sense of responsibility.
- Neuroticism: Indicates the mental stability of the student. If this indicator is high, one tends to feel inferior, to think nervously about everything, be easily troubled and sensitive; if this indicator is low, one is stable, calm, and easygoing.
- Openness: Indicates the student's degree of imagination and curiosity. If this indicator is high, one has a strong desire for knowledge and likes to work on new things; if this indicator is low, one is less curious and has difficulty thinking.

The question items used in the measurement are shown in Table 1 (a Japanese translation was used in the experiment). The stability of the scale has been verified by the retest method (retest method) by Oshio et al. Similarly, construct validity (convergent and discriminant validity) and criterion-related validity (concurrent validity) have been examined. As for the range of adaptation of the scale, the experiment by Oshio et al. was conducted with college students, but the scale can be adapted for adolescents.

Table 1. Questionnaires (TIPI)

Question	Factor	Content
1	Extraversion	Extraverted, enthusiastic.
2	Agreeableness	Critical, quarrelsome.
3	Conscientiousness	Dependable, self-disciplined.
4	Neuroticism	Anxious, easily upset.
5	Openness	Open to new experiences, complex.
6	Extraversion [R]	Reserved, quiet.
7	Agreeableness [R]	Sympathetic, warm.
8	Conscientiousness [R]	Disorganized, careless.
9	Neuroticism [R]	Calm, emotionally stable.
10	Openness [R]	Conventional, uncreative.

[R] denotes reverse-scored items.

3.3 Participants and Experimental Environment

Thirty students (16 males and 14 females) between the ages of 16 and 17 participated in the experiment. These students' academic performance is on par with the national average. In this experiment, one tablet device was used for each person. All tablet devices were Chromebooks. Before the experiment began, we checked to see if the students could learn using Chromebooks. In this experiment, no arbitrary groupings were made to encourage learning interactions within the class. By not assigning groups and allowing students to share information with whomever they wanted within the class, we ensured that the experiment was not

interfering with the student’s natural behavior. The experiment was conducted throughout two class periods, namely Japanese and Mathematics, each lasting 45 minutes. In Japanese, the students were asked to read classical texts, whereas in Mathematics they were asked questions to test their thinking skills. There was one teacher per subject, both males in their 40s, who were familiar with the methodology of collaborative learning and who prepared the exercises used during this experiment. A total of seven exercises were assigned, three Japanese-related questions and two about Mathematics.

3.4 Developed the System

The system developed for this experiment is a web application. For more details on the functionality of this application, please refer to section 3.3 of Matsushita et al. (2021).

4. Result

4.1 Questionnaires Survey Results

Each factor was scored as follows:

- Extraversion: Question1 + (8-Question6)
- Agreeableness: (8-Question2) + Question7
- Conscientiousness: Question3 + (8-Question8)
- Neuroticism: Question4 + (8-Question9)
- Openness: Question5 + (8-Question10)

The results for each factor (16 males, 14 females) are shown in Figure 1 and Table 2. Figure 1 shows the data used for validation in the present experiment. Table 2 shows the mean and standard deviation for each factor in the present experiment.

Table 2. TIPI-J results (Mean Score)

	Mean Score (S.D.)
Extraversion	7.88 (±3.15)
Agreeableness	9.94 (±1.62)
Conscientiousness	7.13 (±2.20)
Neuroticism	8.47 (±2.30)
Openness	8.19 (±1.36)

These results indicate that the data show higher values for Agreeableness and Conscientiousness, and lower values for Neuroticism. Thus, the data collected in this experiment may exhibit the following characteristics. Compared to the general class:

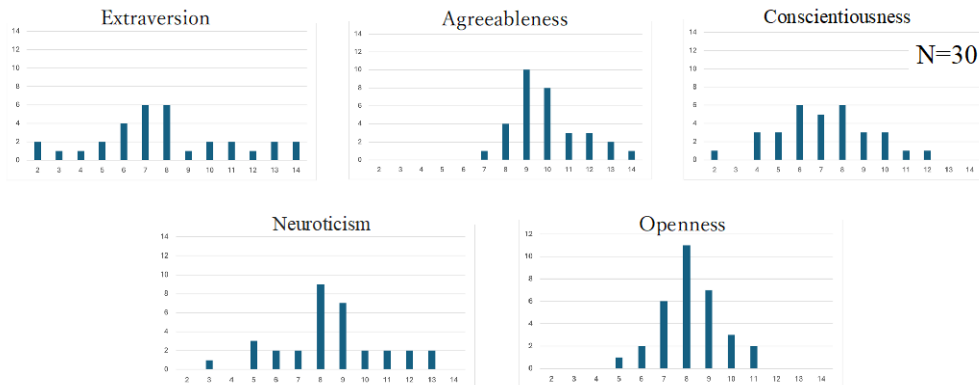


Figure 1. TIPI-J results (histograms)

- Many students are cooperative and kind to others, avoid conflict and confrontation, and take an interest in the neighbors.
- Many students are very particular and perfectionistic and only a few are emotional and intuitive.

- Fewer pupils are emotionally stable, less distressed and stressed, and less likely to be exposed to tense, anxious and stressful environments and situations, which also affect their mental and physical health

Therefore, while the classes targeted in this experiment were comfortable with expressing their opinions, they also showed a preference for learning alone or in small groups until important information, i.e. hints of how to solve the problems, was made available.

4.2 Flow of information in a class as seen in the log

In this section, we present a visualization of the learning exchanges collected by the system as logs as a network diagram and a representation of the self-assessment transitions as a reserve graph. In this section, the number of logs collected by the system is shown for each issue (Table 3).

Table 3. Number of data per question

Subject	Question	Data	Time	Data/min.
Japanese	Q.1	102	11:30~11:43	7.85
	Q.2	44	11:45~11:56	4.00
	Q.3	40	11:57~12:05	5.00
Mathematics	Q.4	29	12:18~12:43	1.16
	Q.5	9	12:44~12:55	0.82

The following figure shows a summary of the learning exchanges for all questions. The squares in this diagram represent students, with blue representing males and red representing females. A learning exchange is considered to have occurred when there is a connection between these squares. The thickness of each line corresponds to the number of exchanges between the students involved. From this figure, the following can be read:

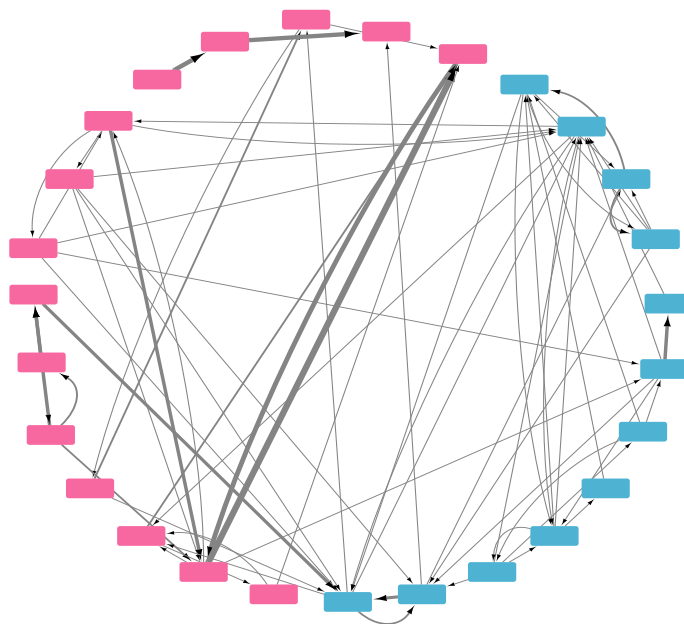


Figure 2. Aggregation of human networks (excluding students who did not engage in learning exchanges)

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- Some students are always in the same group for learning interactions, regardless of the issue (especially some female groups).
- The men change the groups they interact with depending on the question.

With a few exceptions, there is little learning exchange between men and women

4.3 The relationship between learning exchange networks and personality

In this section, the results of our survey of the relationship between the human network diagram and personality according to the TIPI-J. Figure 3 shows a network of the relationship between learning exchange and personality. The results suggest that students who show a remarkable degree of either Extraversion or Conscientiousness tend to be weakly connected to each other. In addition, students with high Neuroticism tend to be related to many other students. Students with low Openness tend to be less involved with others and more on the receiving end.

Based on these results, we hypothesized that there is some relationship between the number of interactions with others and personality. In order to verify this hypothesis, we investigated the relationship between personality and the number of times one was involved with others (in network analysis, “degree”), the number of times one has received information from others (“in-degree”), and the number of times one sent information to others (“out-degree”). The results are shown in Figure 4. The results show that the correlation coefficients between the number of relationships with others and personality were between -0.04 and 0.28. Therefore, no relationship was found between them.

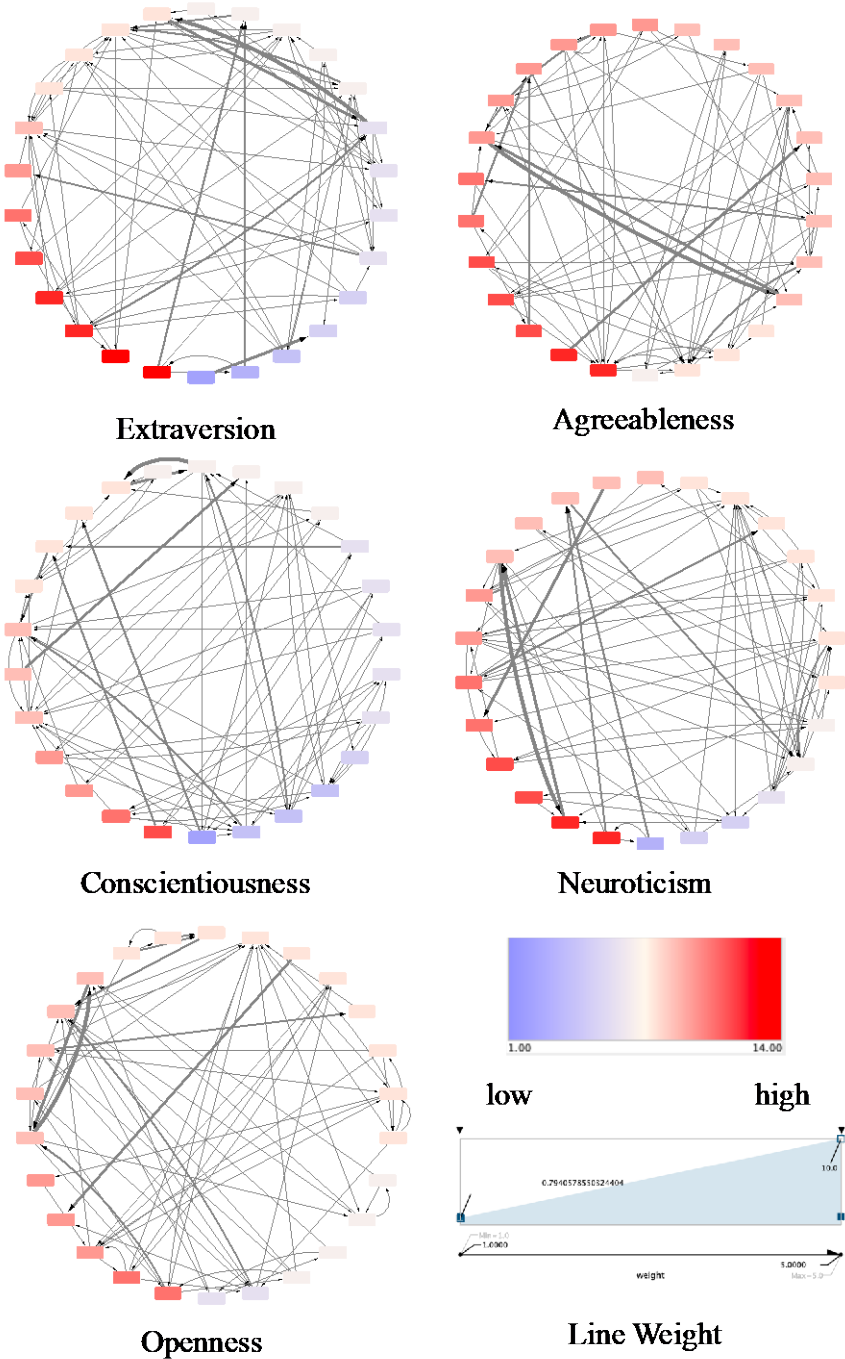


Figure 3. Relationship between learning exchange and personality in the network

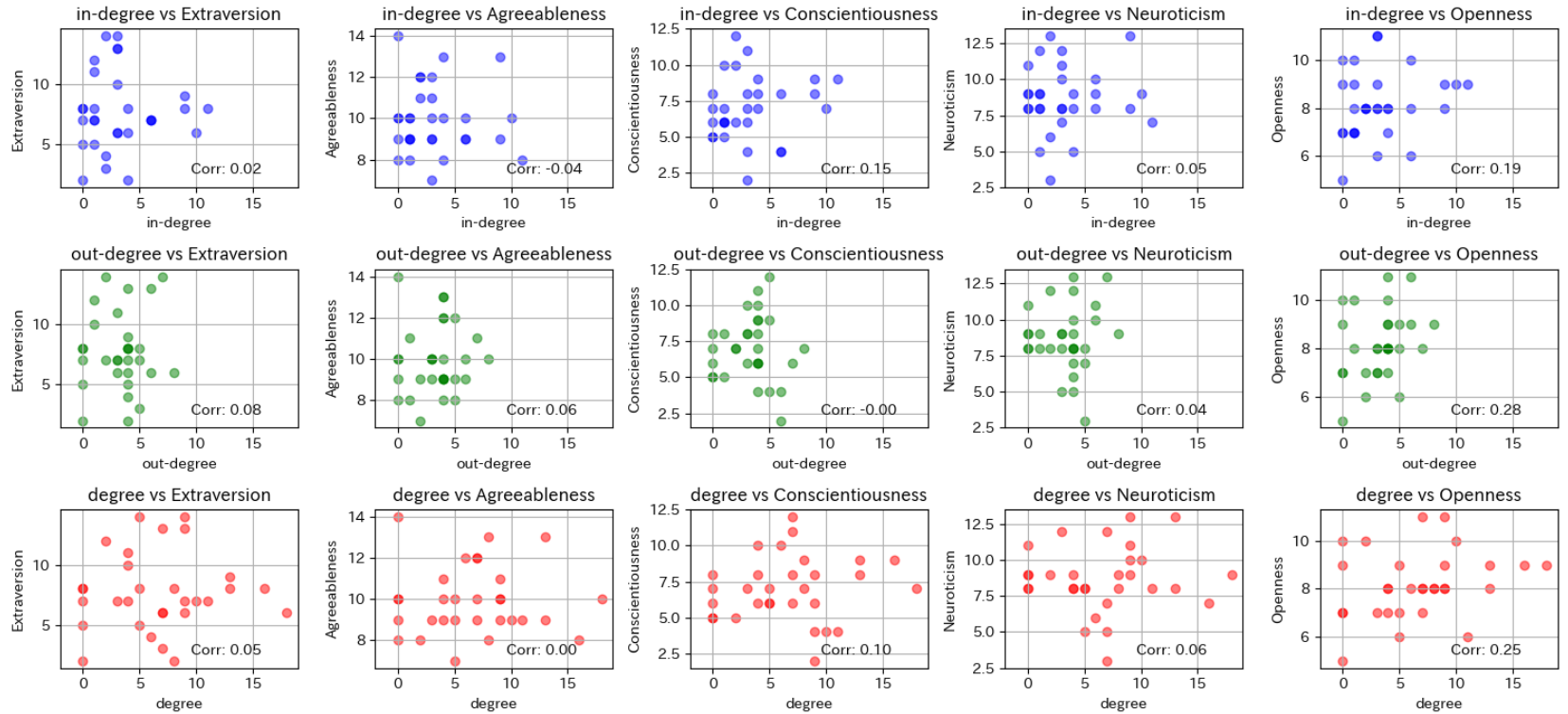


Figure 4. Relationship between learning exchange and personality

5. Discussion

In this chapter, we summarize our discussion using the two hypotheses established in Chapter 2.

5.1 The relationship between students' personalities and their positivity in exchange learning

In this section, we summarize our discussion of hypothesis H¹. 4.3 and Figure 4 show that there was no correlation between student personality and the number of students involved in the exchange learning. Furthermore, it was also the case for only those students who conveyed and collected information. Based on these results, hypothesis H¹ can be adopted only for the present case, but there is a need to increase the number of cases.

According to these results, there is no relationship between personality and the number of students involved in exchange learning. We are of the opinion that the evaluation of “Positive Attitude Towards Learning” should not depend on the personality of the students. Extroverted students may score higher on this assessment because they are more likely to actively engage with others in the classroom. On the other hand, an introverted student may receive the opposite rating. There are a number of studies that have investigated the transformation of this personality as a function of age, with some cases reporting a gradual change in personality from childhood to adulthood (Roberts et al. 2006). Therefore, we consider this personality to be an invariant value in the short term. In the present case study, the number of students involved in collaborative learning did not differ depending on the level of extraversion. Therefore, we believe that the number of students involved in exchange learning can be used as a variable to utilize in this evaluation. Since the students in this case study were in a state of mutual understanding, the results may be different when students are meeting each other for the first time or in a similar state.

5.2 Relevance by student personality through exchange learning

In this section, we summarize our discussion of hypothesis H². The results in Figure 3 indicate that in the present case study, while there were cases of strong connections between students with moderate levels of extraversion and openness, no other relationships were observed. Therefore, it is clear that the relationships between students that occur during exchange learning do not tend to be linked by similarities in personality. Confirming previous studies, similarity of personality between friends does not determine the level of satisfaction between students, as there is a case that similarity of personality does not relate to the level of satisfaction with friendship (Körner 2023). How, then, do students decide with whom to interact? Considering internal factors, they may choose to associate with members of the same gender, club, or region as themselves. Considering external factors, temporary and arbitrarily formed groups influenced by the layout of the classroom and the student proximity may also influence group affiliation. In this type of situation where students interact freely, their interactions are governed by a variety of factors as opposed to the situation in which they have to interact within pre-assigned groups.

This concept is similar to the free address concept that has been adopted by companies. One of the objectives of free address is to improve the facilitation of communication. Simon (1997) states that the layout of offices is one of the important formal determinants of the communication system. In exchange classes, it is necessary to create a classroom environment in which students can interact freely to facilitate communication and increase motivation to achieve class goals.

6. Conclusion

This study investigated the relationship between student association during collaborative learning and the personality of students who participated in the class. It also examined whether student personality may be related to the assessment of students' attitudes toward independent learning. In this paper, two hypotheses were formulated, and experiments were conducted to test the hypotheses. The results showed that (H¹) there was no correlation between individual personality and the number of students involved in collaborative learning. Furthermore, it revealed that there was no correlation between the number of students who were involved in collaborative learning, the number of students who only engaged by relaying information, and the number of students who were not engaged at all. It was similar when we specified students who provided or collected the information. (H²) In some cases, there were strong connections between students with moderate levels of extraversion and openness, but otherwise no relationship was found. Therefore, when evaluating “Positive Attitude Towards Learning,” it is possible to use the number of students involved in exchange learning as a measure of evaluating performance. However, factors such as internal and external motivators for affiliation, as well as student personality should also be considered in any evaluations going forward.

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