Learning Effects and Learning Satisfaction of Different Character Trait Groups through Blended Animation Instruction

Yuan-Chang Guo
Chaoyang University of Technology, Taichung City, Taiwan

Clayton Ray Diez
Western Illinois University, USA

Shi-Jer Lou (Corresponding Author)
National Pingtung University of Science and Technology, Taiwan
lou@npust.edu.tw

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ABSTRACT. *This study aimed to explore the differences in learning effects and learning satisfaction of different character trait groups in blended animation instruction. Qualitative and quantitative approaches were employed. In the twelve-week course, both weekly in-person courses and online discussions are used to conduct learning activities. In addition to personal learning, students also work in groups for collaborative learning. Students are provided with relevant content for discussion and sharing for the online portion based on the assigned work for each week. In addition, at the end of the course, each group needs to complete a group theme project. After the course is complete, "learning achievement assessment" and "student learning satisfaction questionnaire" surveys are disseminated. The collected quantitative data are analyzed using statistical methods and compared with qualitative observations. Finally, the results are analyzed and discussed to obtain relevant research conclusions. The findings of the study are: (1) students with personality traits that are inclined toward the middle of the scale have significantly higher learning effects than students with stronger or weaker personality traits; (2) a correlation exists between character trait groups in their pre-learning scores and post-learning scores, but no correlation exists between post-learning scores and thematic project; (3) different character trait factor groups show significant differences in terms of learning motivation, peer interaction, and total learning satisfaction scores, but no significant differences in learning achievements and instructional method.*

Keywords: *blended teaching, Facebook, mathematics learning attitude, Interactive Response System (IRS)*

1. Research Background and Motives

Production of modern animation not only requires basic aesthetic literacy but also computer operation capabilities, such as digital drawing, coloring, and modeling and 3D image output. Thus, it is difficult to train a computer animator with professional techniques. An important issue for relevant departments in schools and in industry is how to more effectively train computer animators with professional literacy. Additionally, many scholarly studies demonstrate that learner personality traits and learning strategies show significant a correlation with learning effects (Conti. & McNeil, 2011; Ntalianis, 2010). However, further research is still necessary to determine the effects of different personality traits in animation learning and in the blended learning environment, which is the focus of this study. The instructional experiment is implemented with a blended instructional model that combines traditional and online instruction, after which the instructional outcomes are analyzed to understand how the learning effects of students' personality traits differ. This approach is used in hopes of proposing more effective instructional plan designs in the field of animation instruction.

2. Literature Review

This study provides a composite description of studies related to personality traits and blended learning regarding learning effects and learning satisfaction.

2.1 Studies related to personality traits

Personality refers to the sum of unique attitudes of personal innate traits and learned traits, and behaviors and expressions, which includes totality and consistency between social character in social culture and personal independent characteristics. Personality theory generally includes psychoanalysis, phenomenology, cognitive theory, trait theory, behavioral theory, and social cognitive theory. The five factors in trait theory are views that have been widely accepted. Four main methods are used to measure personality traits: 1) projective techniques; 2) subjective techniques; 3) self-reported scales; and 4) behavioral tests. Currently, most people in Taiwan use Lai's Personality Test.

"New Lai's Personality Test" was revised by Lai (2003). The norm test was conducted in September 2002 in northern, central, and southern Taiwan with junior high school students as the test sample. The test used 1,673 boys and 1,588 girls as samples to establish percentile norms for junior high and university men and women. There are a total of 150 questions in 15 sub-scales (activity, leadership, social extroversion, thinking extroversion, ease, variability, inferiority complex, neurosis, nervousness, anxiety, depression, objectivity, cooperation, hostility, and falseness) and four factors (introversion/extroversion, emotional stability, psychological health, and social adaptation). Personality types are divided into A, B, C, D, and E based on the responses (Dai et al., 2009; Lai, 2003). Personality traits are important factors that compose the psychological and social dimensions of individuals. Scholarly research shows a significant correlation between personality traits and learning satisfaction, but there is a need for further research on the influence of personality traits in the blended learning environment and the influence of different personality traits on group collaborative learning.

2.2 The definition of blended learning and related studies

Scholars have broad definitions for blended learning. Driscoll (2002) describes the four following concepts of blended learning:

1) various models that apply web-based technology; 2) a combination of various pedagogical approaches; 3) combinations of any instructional technology; and 4) a combination of instructional technology and actual job tasks. Khan (2005) proposed that the framework of blended learning, which is composed of an octagon, including pedagogical approaches, technology, interface design, evaluation, management, resource support, ethics, and institutions. When planning blended learning, the eight elements can be blended in the design, development, and management of the instructional model.

In essence, blending usually refers to the combination of different learning activities, including face-to-face instruction, synchronous online learning, and online self-learning. The most common method is to combine traditional classroom learning and online learning in blended instructional activities (Singh, 2003). Chen proposed the CRC (Cyber-Real-Cyber) model of blended learning (Chen and Yang, 2006), as shown in Figure 1. Online learning does not fully utilize online

instructional methods, but instead intersperses online virtual cyber space and the real world to achieve better learning effects. Traditional in-person courses are arranged to benefit from the advantages of both cyber space and the real world.

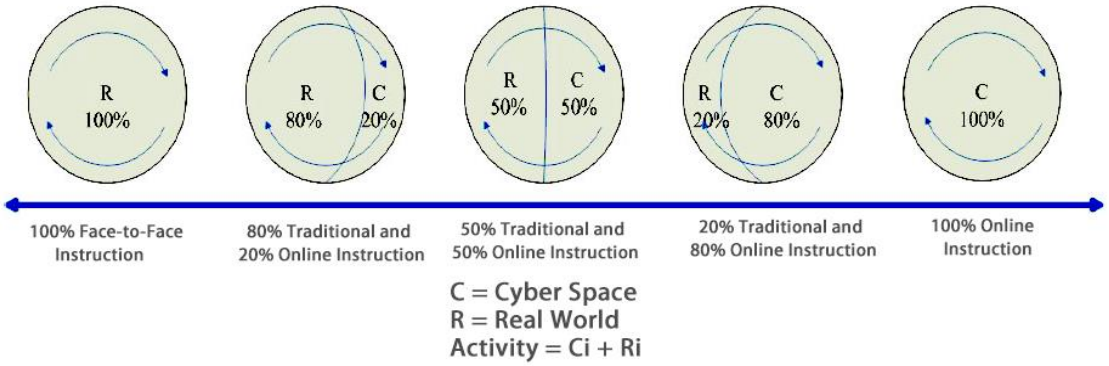


Figure 1 CRC (Cyber-Real-Cyber) model

In sum, blended learning integrates the methods of traditional and digital learning, which combines the advantage of technology in digital learning and the joint participation of teachers and students in traditional learning. Classrooms are no longer the only place for transmission. Advantages are provided by traditional classroom learning being combined with digital learning to obtain greater learning effects.

2.3 Studies relating to animation instruction

Major recent developments in computer animation software and technology have provided creators with powerful and convenient systems to produce dynamic media. Thus, all digital industries, including image industries and game production companies, have replaced traditional graphical animation with computer animation. Learning computer animation is somewhat different than learning traditional animation. In the 1990s, Rogers used the concepts of digital art as a theoretical foundation to propose the four stages of "digital instructional model" in computer animation (Chen, 2008), the steps of which are shown in Figure 2:

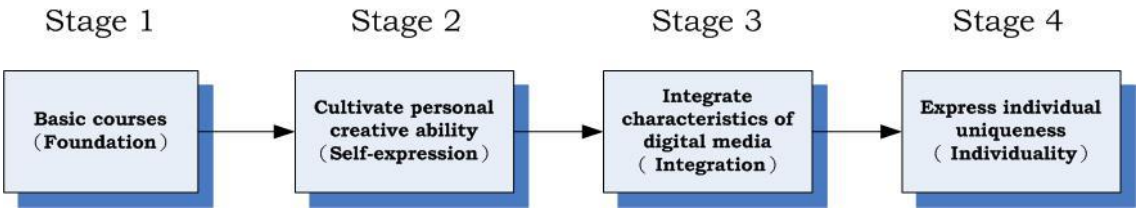


Figure 2 computer animation "digital instructional model"

In integrating the characteristics of digital media, computer animation generally uses computers to assist with instruction, and students directly interact with computers as part of the learning activity. This approach is a means of presenting instructional materials in a controlled sequence by the computer. The teacher uses the computer broadcast system to directly transmit course content to the computer screen in front of students, so that students learn the steps and commands for computer animation before conducting individual practice.

2.4 Studies relating to learning effects and learning satisfaction

Learning achievements refer to what one can actually accomplish academically, or the psychological abilities that can be actually expressed in one's learning behavior (Zhang, 1996). Broader definitions of "effect" exist, referring to the outcomes and benefits after instructional activities and learning; evaluation indicators are generally divided into objective indicators and subjective indicators. Learning effects can refer to changes, benefits, and achievements that occur to learners after engaging in learning activities. However, even though the definition of learning effects is simple, the implementations and interpretations differ. Issues such as how to determine the dimensions of learning effects or how to evaluate indicators of learning effects are all worth exploring. Thus, when conducting learning effects evaluations, it is necessary to first clearly define which dimensions are representative of learning effect factors.

Learning satisfaction is an important indicator in learning effects (Mayadas, Bourne, and Bacsich, 2009). Learning satisfaction is an important criterion for determining curricular efficacy and learning quality, and learning satisfaction is highly correlated with classroom participation. High satisfaction is

expressed in high classroom attendance and usually high willingness to participate in class. Thus, So and Brush (2008) believed that learning satisfaction is an important basis for evaluation in the instructional field because students would have more expectations for learning and would have better learning effects.

3. Research Method

The purpose of this study is to understand the impact of different personality traits in the blended learning environment on learning effects, where learning effects include personal cognition, capabilities, and group thematic project. Next, the study seeks to understand whether in the learning process, personal background variables and personality traits impact learning effects and learning satisfaction. In the instructional model, this study uses problem-based and theme-based design in blended instruction, hoping to explore whether the learning effects in group collaborative learning produce intersecting effects. The following will explain the research subjects, research tools, data processing, and analytical methods.

3.1 Research subjects

Research samples of this study are second year students in the digital media department in a vocational high school in Taiwan, and two classes are randomly selected as instructional experiment subjects. There are 101 students in the two classes. The students themselves are interested in digital media design and have taken basic design courses in their first year, but have not formally taken animation courses.

3.2 Experimental design

The experiment uses triangulation design in the blended method design, and a convergent model is used to compare qualitative and quantitative methods for explanations. The design models are shown in Figure 3.

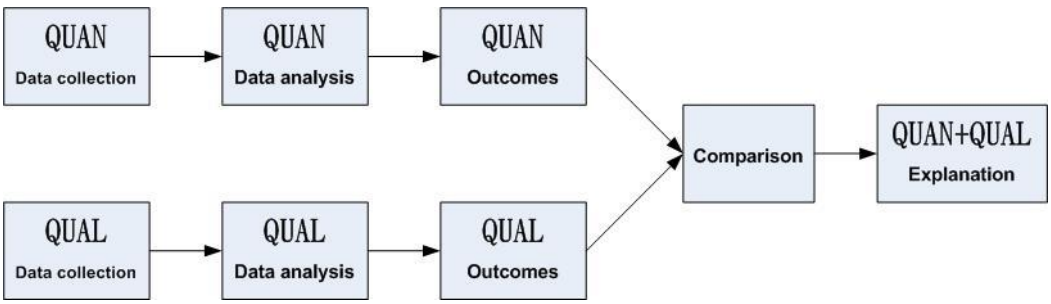


Figure 3 triangulation design in the blended method design: convergent model

The study uses a single-step design, simultaneously collecting quantitative and qualitative data for analysis (Creswell & Plano, 2006). In group collaborative learning, this study groups by homogeneous personality traits. Based on data from the personality test, the students are divided into groups based on the strength of their personality features. Each group has 3-5 people. The groups in the two classes are Class A, which uses social introversion/extroversion groups, and Class B, which uses social adaptability groups. In quantitative factors, student learning effects have their computer grades at school as the "pretest" covariance, which is analyzed using one-way ANOVA to understand whether the groups of students with different independent variables show statistically significant differences in their "posttest" scores. To prevent the Hawthorne Effect and diffusion effect, students were not allowed to know that they were being observed. In addition, in-depth observation was conducted on the groups, the performances of the students in the learning process were recorded, and qualitative data were found to support the results of quantitative data.

3.3. Blended course design

Blended course design in this study is based on Chen's CRC model, with an intersecting usage of cyber space and the real world to achieve better learning effects.

The instructional procedures are 1) Preparation stage; 2) Instruction stage; 3) Practice stage; 4) Practical work stage; 5) Achievement presentation stage. CR ratio changes in the entire instructional process are shown in Figure 4:

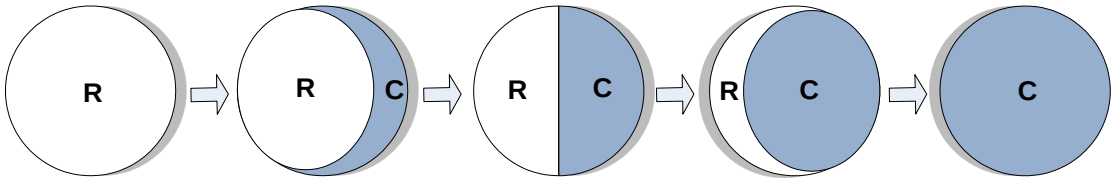


Figure 4 Flowchart of instructional changes in cyber space and real world

Figure 5 shows the instructional steps in each unit.

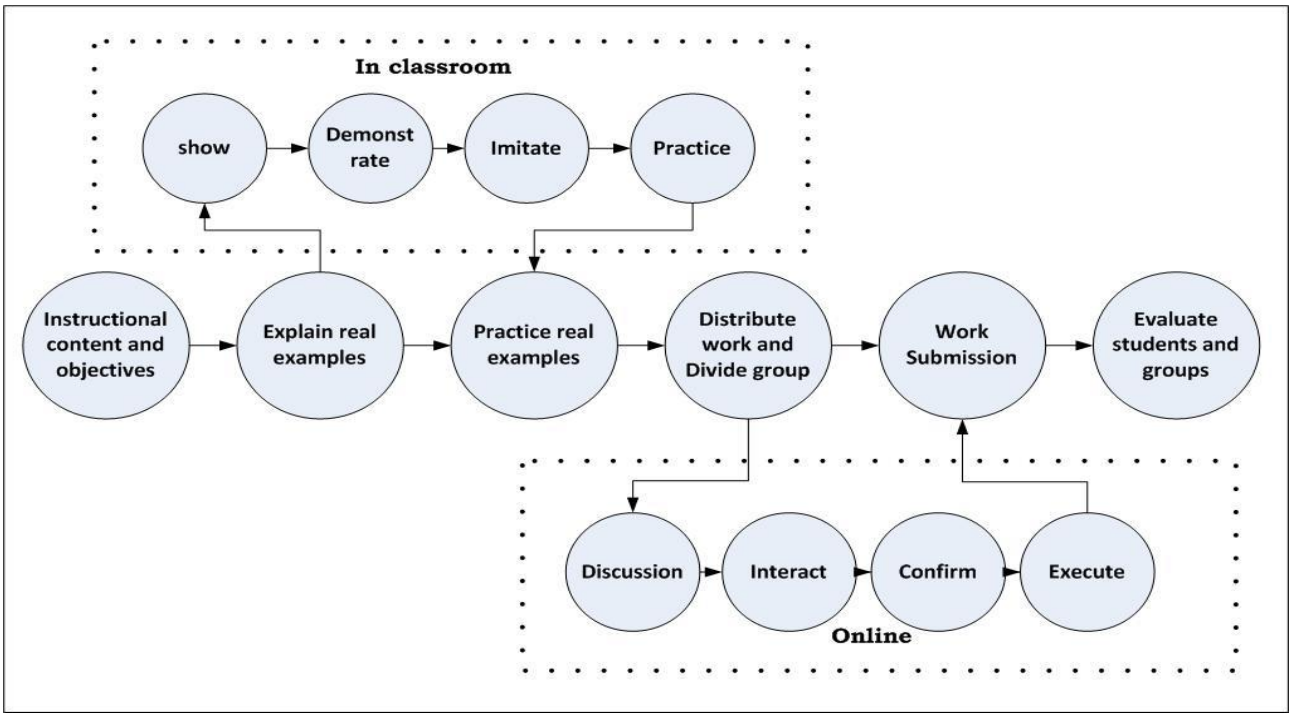


Figure 5 Instructional steps

As shown in Figure 5, the dotted lines represent cyber space (online) and the real world (classroom), the ratio of which changes together with the course progression. Refer to the flowchart of instructional changes in cyber space and the real world. The circles in the middle are the instructional or learning steps in each unit. From the time instructional objectives and contents are set, to lectures on examples, to practice, to work distribution (thematic task groups), students must use the knowledge and techniques they learned in the classroom, engage in online discussion and exchange feedback to

complete tasks in each unit. The instructional experiment takes 12 weeks, with 3 hours of classroom instruction per week.

3.4 Research tools

This study uses evaluations and questionnaire surveys, first administering Lai's Personality Scale to students before the course. During the course, student learning processes are observed and the teacher's instructional reflections are recorded. After the course, students undergo a "learning effects ability test" and a "student learning satisfaction questionnaire," and students are interviewed to supplement the results of quantitative statistics.

3.5. Data processing and analysis

Quantitative data processing in this study first encodes the data collected and then enters the data into the computer to be processed by SPSS software. The data are then analyzed. Statistical methods include descriptive statistics, t-test, product momentum correlation, One-way ANOVA, and analysis of covariance. In terms of qualitative data, the data collected in the experiment include student learning process records, classroom and online data, the instructional reflections of teachers, students' individual work, thematic group projects, and interview records. The observed records are compared with quantitative data to confirm results or analyze differences.

4. Data Analysis

4.1. Analysis of student backgrounds

The research subjects of this study are students in the digital media department of a vocational school in southern Taiwan. Their basic data include gender and numbers of people. These data are summarized in Table 1.

Table 1, Basic student data

Class	Gender	Number of students	Ratio

A	Male	35	66.7%
	Female	15	33.3%
	Total	50 people	
B	Male	36	69.4%
	Female	15	33.6%
	Total	51 people	

4.2 Analysis of personality traits

Class A uses leadership (A) and social introversion/extroversion (S) as a grouping basis. Class B uses objectivity (O) and coordination (Co) as a grouping basis. Student test results plus and minus a standard deviation are used to create groups; the groups are shown in the following table.

Table 2 introversion/extroversion group summary leadership (A) and social introversion/extroversion (S)

Personality traits			Social introversion/extroversion (s)			Number of people in the group
			Extroversion	Medium	Introversion	
Leadership (A)	Strong	Number	A1S1	A1S2	A1S3	
		Groups (number)	1	2	1	
		Students (people)	3	6	3	12
	Medium	Number	A2S1	A2S2	A2S3	
		Groups (number)	1	4	1	
		Students (people)	4	14	3	21
	Weak	Number	A3S1	A3S2	A3S3	
		Groups (number)	1	3	2	
		Students (people)	3	9	5	17
		Number in category	10	29	11	A total of 50 people

Based on data derived from the personality tests, the personality feature strength or weakness in each group is shown in Table 2. The numbers mark the groupings, the group numbers denote the groups with more than 5 people in a homogeneous group, and the number of students is the sum of all students in the feature group. After grouping, most students are found to have medium characteristics, or medium social introversion/extroversion and leadership; 29 students have medium social introversion/extroversion, and 21 students have medium leadership. The numbers are highest in the group labeled A2S2 and in the medium groups with 14 students, followed by the group with weak leadership and medium introversion/extroversion, or group A3S2 with 9 students. This outcome shows that students in the instructional experiment are weaker in terms of leadership.

Table 3 Social adaptability factor group summary - objectivity (C) and coordination (D)

Personality traits			Coordination (D)			Number of people in the group
			External	Medium	Internal	
Objectivity (C)	Strong	Number	C1D1	C1D2	C1D3	
		Groups (number)	1	1	1	
		Students (people)	5	3	3	11
	Medium	Number	C2D1	C2D2	C2D3	
		Groups (number)	1	3	2	
		Students (people)	4	10	7	21
	Weak	Number	C3D1	C3D2	C3D3	
		Groups (number)	2	2	2	
		Students (people)	6	6	7	19
		Number in category	15	19	17	a total of 51 people

Social adaptability factors are also based on data from personality tests, from which Class B students are grouped. Personality feature strengths and weaknesses are shown in Table 3. The numbers mark the groupings, and the group numbers show the groups of the personality traits. To facilitate encoding in the study, objectivity uses C and coordination uses D to mark the groups. For instance, C1D1 means strong objectivity with good coordination.

4.3. Analysis of teacher instructional processes

Twelve instructional sessions are conducted in this study, including pretest, posttest, regular homework, midterm evaluation, three instances of learning discussion by groups, and thematic project expression. Students' instructional processes, learning performance, and discussion and feedback are shown as follows.

(1) Knowledge: after 12 weeks of learning, the production of projects can be used to observe the composite applications of knowledge integration. The group with the highest leadership and social extroversion did not have better performance.

(2) Emotions: in terms of emotions, student groups with medium leadership and introversion/extroversion have greater satisfaction in collaborative learning; students with weak leadership and introversion have lower satisfaction with collaborative learning.

(3) In terms of Group Feedback, students were able to give positive feedback to other groups and to learn salient points from other groups. Overall, the observations show that students approve of the collaboration and feedback for thematic projects. Interviews also show that this was one of their favorite learning activities.

(4) Learning of student learning processes

Observation of student learning processes, including work practice and online discussion, shows the following:

(1) Students incorporated previous life experiences into learning activities, especially in learning the establishment of models. Interviewer asks S-6: "Why does the bottom of your cup handle not connect to the cup?" S-6 says: "Because the cup on my table is this way!"

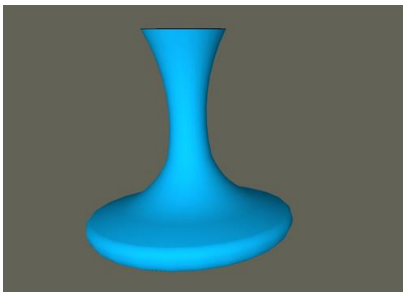
Table 4 Student model work – evaluation of cup objects

Students	Work	Personality traits	Work comparison and analysis
Number S-1		Strong leadership with extroversion.	Student S-1's work has completeness, the handle is a closed loop, the cup is a standard cylinder, and the cup has a clear image on the outside.
S-6		Medium leadership and introversion/extroversion.	Student S-6 demonstrates the general structure on the cup: the handle is open; the cup is wide on the top and narrow on the bottom. The cup has an image on the outside but it is smaller and less significant.

(2) Personality traits of medium social introversion/extroversion and medium social adaptation and coordination have best learning effects, and groups with extremes in introversion/extroversion or social adaption performed worse.

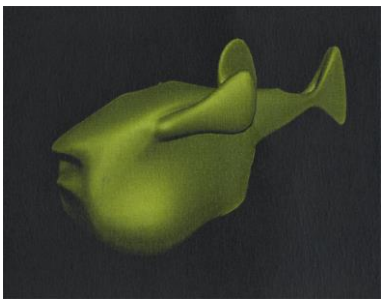
Table 5 Student model work - 2D cups or bottles

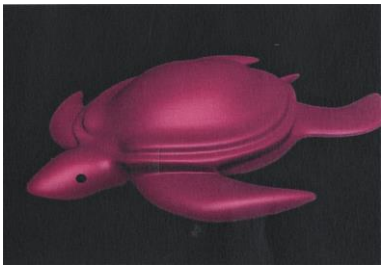
Students	Work	Personality traits	Work comparison and analysis

Number S-79		Medium objectivity, medium coordination.	Student S-79 has smooth curved surfaces on the work, which can show the vase shape. The mouth part is more unique with wave forms, which shows that this student has clear abstract concepts of converting 2D to 3D.
S-71		Weak objectivity and coordination.	Student S-71 has an uncoordinated work and asymmetric left and right sides in size, which shows that he still needs more practice on grasping spatial concepts.

(3) Greater difference is observed in work that requires integration ability, especially when the work begins to be complex and nuanced. Differences in learning effects are also greater.

Table 6 Comparison and analysis of representative marine organism works by students

Students	Work	Personality traits	Work comparison and analysis
Number S-53		Weaker subjectivity and coordination.	Student S-53's work only shows the fins and tail in terms of structure, the curves are not smooth, and it does not show details, making it fall behind the works of other students.

S-69		Medium subjectivity and coordination.	Student S-69 chose to design a turtle, which expresses the general structure with smooth curves.

(4) During the model establishment instructional stage, using actual objects is more conducive to student learning.

(5) Observation of student posts and responses on the online blogs shows that these comments can be classified into meaningful and meaningless. At the start of a discussion, the teacher should intervene with guidance or regulate online posts and responses to reduce the number of meaningless comments.

(6) A significant positive correlation exists between discussion frequency on online blogs and learning effects of groups.

4.5 Analysis of student learning effects

(1) Analysis of thematic projects

End of term thematic projects by student groups are evaluated by three professional teachers. The teachers give scores based on the thematic project rubric. The scoring content includes overall feel, technical application, and creative design. The more nuanced categories include grasp of theme, work completeness, compositional ability, expressive techniques, development of expression, uniqueness of ideas, insight of work, and stylistic innovations. Mean teacher scores are ultimately used as the evaluation indicators. The means and standard deviations of thematic projects are shown in Table 7.

Table 7 Mean and standard deviation of thematic projects

Thematic project	*Mean*	*SD*
Score	86.83	5.77

The mean of all thematic project scores is 86.83 points. Scores from teachers are in the range of 75-95 points, and 5 groups have 88 points and 92 points, which are clustered in the groups with medium leadership and introversion/extroversion, as well as groups with medium objectivity and coordination. The other groups have an even distribution, except that the scores of those with weak objectivity and coordination personality traits were clearly lower than those of the other groups, at only 70. These personality traits are in the social adaptability dimension. Observation of their learning processes shows that the group had almost no intra-group interaction. Thus, social adaptability personality traits evidently had a greater influence on group learning. If students have weaker objectivity and coordination personality traits, poor interaction will occur that ultimately affects learning effects.

(2) Differences in thematic project scores for the character trait factor groups

The thematic project score means and standard deviation of social introversion/extroversion groups and social adaptability groups with different personality traits are shown in Table 8.

Table 8 Differences in thematic project scores for the character trait factor groups

Character trait factor groups	Mean grades (Mean)	Standard deviation (SD)	*t*	Significance (two-tailed)
social introversion/extroversion	87.37	4.303	.814	.423
social adaptability	85.66	6.661		

Table 8 shows that the social introversion/extroversion groups have slightly higher in mean scores by 2 points (87.37 points) with smaller intra-group differences in scores (SD=4.303), but the t-test of character trait factor groups did not show significant difference in thematic project scores. Thus, no significant differences in learning effects exist regarding character trait factor groups.

(3) Analysis of thematic project features

Thematic projects of the groups can be used to observe groups in the composite application of knowledge integration; the performance of content and creativity also shows significant differences. Comparing the personality traits of groups shows their differences in thematic project performance. Table 9 shows the representative group works and comparisons for the personality dimensions.

Table 9 Thematic project analysis and comparison

Group	Work	Personality traits and styles	Comparison and analysis of work
Number 6		Medium leadership, medium introversion/extroversion.	The interior arrangement by students shows diversity and decorativeness; the paintings on the wall, hanging decorations, small tables and chairs show rich spatiality. This is an excellent work in applying techniques, materials, and lighting techniques.
Number 1		Strong leadership, extroversion.	The student's work design is monotonous, the objects are simple geometric shapes, and the details are not expressed. Even though there are simple images, compared to previous works, this is mediocre.

Overall, most thematic projects met the basic requirements of the work through discussion, group interaction, and division of work and cooperation. As thematic project design is a composite activity expression at a higher level, it is necessary to integrate abilities such as understanding, application, analysis, and composition. This component also focuses on the expression of creativity. Therefore, the achievements of the works reflect certain differences. Groups with medium personality traits and leadership (as in No. 6) showed better performance in their work, while groups with stronger leadership and extroversion (as in No. 1) performed worse.

4.6 Analysis of student learning satisfaction

Means and standard deviations in dimensions of overall learning satisfaction for students are shown in Table 10.

Table 10 Mean and standard deviation in dimensions of learning satisfaction for subjects

Dimension (N=101)	Number of questions	Mean	Mean score	Standard deviation
Learning motivation	9	27.42	3.05	4.295
Learning achievements	8	26.27	3.28	4.434
Peer interaction	7	22.54	3.22	4.855
Instructional method	8	25.83	3.23	3.776
Total learning satisfaction scores	32	102.06	3.19	13.737

In learning satisfaction, the means of dimensions are higher than 3 points. The overall learning satisfaction reaches the minimum level of satisfaction.

Differences in dimensions of learning satisfaction are shown in Table 11.

Table 11 Summary of significance of learning satisfaction

Dimension	Overall satisfaction	Social introversion/extroversion	Social adaptability
Learning		*	

motivation			
Learning achievements	*	*	*
Peer interaction	*	*	
Instructional method	*	*	*
Total learning satisfaction scores	*	*	

* shows significant satisfaction

As shown in Table 11, the summary of learning satisfaction significance shows that the social introversion/extroversion grouping has greater satisfaction for the different dimensions, while grouping by social adaptability only has better satisfaction in terms of learning achievements and instructional method, but not in the other dimensions. Thus, in animation instruction, from the perspective of learning satisfaction, the social introversion/extroversion grouping in instructional experiments is a better method, while group division by social adaptability is less appropriate.

In the learning process, students performed well overall, showing high learning interest, and worked hard to complete the work assigned by the teacher. The students proposed many insightful opinions, such as (1) Students believe that peer groups are the main source of help for them; thus, the appropriate use of group collaborative learning can effectively promote learning effects; (2) Students believe that classroom learning is more efficient and allows them to gain more knowledge as compared to online learning; therefore, face-to-face learning in the classroom is necessary; (3) Online learning, group feedback, and observation of other projects are thought to be the most useful learning activities by students in blended learning. Observation of work, in particular, can be used to discover one's inadequacies, to understand others' views, and to modify one's own work to improve it; (4) Mutual feedback within groups online is very important. Students believe that mutual feedback can be used to understand insufficient learning and to learn from others, as well as to improve relationships and learn more techniques; and (5) Students believe that, in group collaborative learning, good communication and interaction, a sense of responsibility among group members, and suitable work task distribution are all important factors that affect group collaborative learning.

5. Conclusion and Suggestions

5.1 Conclusion

Based on the research goals and considering the analysis of the research results, the following conclusions are reached:

(1). Students in groups with medium personality traits had significantly better thematic project scores than groups with stronger or weaker personality traits. A group needs members with different roles (Sun et al., 2007), and if members are all strong in leadership, they would lose group cooperation; the converse is also true. Thus, when forming groups, personality strengths and weaknesses need to be noted. Blog discussions also show that students with medium leadership generally outperformed groups with higher or lower leadership. In the middle and later periods of instruction, groups with high leadership decreased their feedback and interaction, showing fatigue. The same situation occurred for groups with medium objectivity and coordination, with greater interaction and endurance, and their feedback content can be more focused on learning content, the subjects and opinions give positive approval and suggestions to members. Thus, in discussion and feedback, students with characteristics inclined toward the middle outperformed groups with extreme characteristics in terms of interest expression, interaction, and performance in feedback content.

(2).Character trait groups are correlated in pre-learning scores and post-learning scores, but no correlation exists between post-learning scores and the thematic project. Pre-learning scores improved after the blended instructional experiment in the elevation of post-learning scores, which shows the efficacy of the instructional model in this study. However, the scores for the thematic projects are from the collaborating groups; thus, the thematic project scores and pre-learning scores or post-learning scores are not closely related. However, the factor of group collaborative learning has a greater effect on the thematic project than does individual learning.

(3). In different character trait factor groups, social introversion/extroversion grouping shows significant satisfaction in learning motivation, learning achievements, peer interaction, and instructional method under learning satisfaction. Conversely, social adaptability grouping only shows significant satisfaction in learning achievements and instructional method. According to personality

traits theory, social introversion/extroversion is an interpersonal interaction factor, while social adaptability is a personal emotional factor (Lai, 2003). In group learning, interpersonal interaction factors have a greater effect on learning satisfaction; therefore, group collaborative learning should focus on interpersonal interaction factors in personality traits.

5.2 Suggestions

Based on research results, this section summarizes some suggestions as a reference for subsequent research. Suggestions for animation instruction: (1) it is suggested that, for animation instruction, medium social introversion/extroversion in personality traits and medium coordination in social adaptability be used as the basis for group division, because this method yields the optimal learning effects for students. Grouping methods based on extreme introversion/extroversion or extreme social adaptation should be avoided; (2) improve discussion and feedback in the same group: traditional animation rarely engages in discussion and feedback; this study finds that groups with more energy in discussion and feedback performed better in group collaborative learning. Thus, teachers should encourage groups to engage in discussion and feedback so that students can learn from peer feedback. In addition, before instruction, it is necessary to strengthen students' abilities regarding discussion and feedback so that they can better perform these tasks in their peer interactions; (3) consider student characteristics: to achieve the objective of "effective collaborative learning," ideally we often pick and choose students to form "high efficacy cooperative teams"; however, in actual instruction, we cannot give up on any student. Therefore, it is necessary to consider different student characteristics and use different classification methods so that every student can enter a collaborative learning group that is "good enough."

Suggestions for future study are (1) to explore the effect of peer discussion and feedback on learning ability: although this study conducted peer discussion and feedback, it only compared different groups for discussion and feedback and did not actually explore the effect of peer discussion and feedback on learning ability. Thus, the researcher suggests that future experiments in animation

instruction can engage in in-depth exploration of the effect of peer discussion and feedback on learning ability; (2) to analyze the correlation between peer appreciation ability and learning ability: in reviewing peer works, is there a positive correlation between student appreciation ability and learning ability? If a positive correlation exists, it is possible to effectively increase learning ability by improving student appreciation ability? If a negative correlation exists, this relationship is worth exploring; and (3) to explore the effect of blended learning on students in groups with heterogeneous personality traits: in comparing the learning effects and learning satisfaction of blended learning, this study only researched group division by strong and weak personality traits. Even though there are groupings by two factors, other personality factors are not included, and this study did not have an in-depth analysis of how heterogeneous groupings based on different personality traits affect students with different learning abilities. Thus, the researcher suggests that when incorporating blended learning into animation instruction, it is possible to explore the effect of heterogeneous groups with different personality traits on learning effects and learning satisfaction in blended learning.

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