

The Influence of Design Strategy of Peer Learning on 3-D Software Learning

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The research is now an instructor in the department of animation in a college, discovering that students can not pay attention to their study and lack of motivation to learn. Therefore, the research motivation is how to restore students' learning motivation and have them plunge into course learning. The study aimed to develop "design strategy of peer learning" and to conduct observation in the classroom. The researcher took "observation survey" as a research method and utilize it to design teaching methods, hoping to improve class learning atmosphere and learning attitude. Finally, based on the survey data analysis, it is concluded that (1) students consider it is appropriate that the teacher leads the curriculum but peer tutor's help is also needed; (2) design strategy of peer learning reduces learning difficulties and enhance students' learning motivation; (3) design strategy of peer learning is more helpful on female students than male students.

Keywords: design strategy, peer learning, peer mentoring, peer tutoring

INTRODUCTION

Background and research motive

With the rapid development of technology media, in 2013, the computer animation industry output value in Taiwan was about NT\$ 5.834 billion dollars, about 9.2 percent more in comparison to that in 2012 (Digital Content Industry in Taiwan, 2013). In response to the labor needs for the country's industrial upgrading and increase the quality of digital content industry in Taiwan to enhance the international competitiveness, the relevant departments of institutions and colleges have been established to follow up the trend. Also, the settlement of some departments related to animation and digital games have mushroomed and they become popular majors. How to use existing tools to express animation concepts have become the primary goal of animation education.

The researcher was also an instructor in the department of animation, teaching courses such as 3D animation, video production and so on. During the courses,

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students' lack of motivation and concentration was discovered. Peer learning atmosphere in the classroom was poor. Teaching a large number of students in one class could not be beneficial to the learning of some students with low achievement and motivation. To catch up with course syllabus, class duration and a bit difficult course material, to narrow the learning gap between efficient and less efficient learners is very difficult. Therefore, the study utilized the mentality that adolescents value friendship of peers to create positive interaction between peers so as to bring out revolutionary spirit and learning sparkles. Then, teachers can have opportunities to make their teaching efficacy produce more students' learning effectiveness (Chen, 2013).

Research goal

The study developed new strategies, called "peer learning design strategies," aiming to deal with problems of students' poor classroom learning atmosphere and motivation. The strategies were actually implemented in classroom teaching. The study goals were described below:

First of all, the study collected relevant literature of peer learning and probed into the advantages and disadvantages of peer learning so as to develop design strategies to be implemented in the study. Secondly, after the implementation of the design strategies in teaching and observation of utilizing them in the classroom for one school year, students' feedback from collected questionnaires was analyzed to render conclusions and suggestions in order to provide references for future animation education and study.

Research limitations

The study was conducted in two classes from the same grade. Due to time and space limits, the study limitations were as follows:

1. For samples, as the study selected the third graders from the department of animation as the main participants, researchers can expand participant grade to others so as to compare the differences between each grade in the future.
2. For space, the main field of the study implementation was in the computer classroom because of the needs of teaching tools. Researchers in the future studies can also compare the influences of different fields for peer learning.

LITERATURE REVIEW

The chapter collected and reviewed relevant literature for peer learning. First, the meaning of peer mentoring was defined and the advantages and disadvantages

State of the literature

- First, the meaning of peer mentoring was defined and the advantages and disadvantages of peer learning were investigated. The study adopted "Students in the same class learn from each other." Hence, the strategies were developed to implement in the class.
- Teaching strategies corresponding with the course needs was developed to lead the thread of the study. The study utilized "unstructured peer tutoring." It means that a peer tutor needs to help guide one or more peer students and choose their ways of presenting materials provided by teachers.
- The study applied "peer tutoring." That is, students were with similar ages from the same grades or classes. Efficient students as peer tutors to help tutor less efficient ones. In designing unstructured peer tutoring, peer tutors must relink teaching materials with individual knowledge in order to successfully help guide less efficient students.

Contribution of this paper to the literature

- The students considered that the course should be led by the teachers but with peer tutors' assistance. Adjusting course dominance was recommended; students could experience the course differently but mainly with teacher-dominant instruction.
- Peer learning design strategies reduced the learning difficulties and enhanced learning motivation that could help less efficient students and reduce the burden for the teacher to teach a large number of students.
- Peer learning design strategies were more helpful for female students' learning than males'. It is suggested that different grades and classes could be compared and the number of samples could be increased.

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Peer mentoring

Peer Mentoring means "In peer groups, experienced ones spend longer time in teaching, guiding, tutoring, coaching or counseling inexperienced ones in a one-by-one manner for them to learn new knowledge and skills. They have some special feelings and relationship in each other different from how they feel about their general peers (Chen, 2004).

In the school education system, there are four ways to utilize peer learning: (1) Students in the same class learn from each other; (2) In the same grade, efficient students help less efficient ones; (3) Senior efficient students guide juniors in the same school; (4) Elder students guide younger students from different schools or institutions (Falchikov, 2001).

The study adopted "Students in the same class learn from each other." The reason to choose this manner is because the researcher had taught the participant class for one semester; therefore, the class learning atmosphere and students' characteristics were understood. Hence, the strategies were developed to implement in the class.

The planning of peer learning tutoring

The study applied "peer tutoring." That is, students were with similar ages from the same grades or classes. Efficient students as peer tutors to help tutor less efficient ones. Since peer tutors and peer students were with similar ages and from the same grade or class, teachers can assign efficient students to assist tutor less efficient students without taking extra time from other courses. It is more flexible for teachers to arrange peer tutoring and avoid difficulties coordinating administration work (Rekrut, 1994).

Besides, because peer tutors and peer students were with similar ages and from the same grade or class, they shared similar preconception, language and social status. Therefore, it was much easier for them to open their minds and share opinions with each other than with teachers (Kalkoswski,1995; Gaustad, 1992). While in the process of tutoring, "labeling effect" should be taken into consideration to avoid lower self-esteem from peer students with different social status (Gaustad, 1992).

On the perspective of implementation and teaching materials, "peer tutoring" can be categorized into three types; that is, unstructured peer tutoring, structured peer tutoring and semi-structured peer tutoring (Lin, 2010). The study utilized "unstructured peer tutoring." It means that a peer tutor needs to help guide one or more peer students and choose their ways of presenting materials provided by teachers. In designing unstructured peer tutoring, peer tutors must relink teaching materials with individual knowledge in order to successfully help guide less efficient students.

The larger the gap of age, knowledge and experiences between peer tutors and peer students, the better to utilize "unstructured peer tutoring" for peer students; however, the smaller the gap of age, knowledge and experiences between them, the better to use "unstructured peer tutoring" for peer tutors. Therefore, instructors need to consider the beneficial balance between peer tutors and peer students when adopting "unstructured peer tutoring" (Goodlad & Hirst, 1989).

Table 1. Basic data of classes

Classes	Animation 3A	Animation 3B
Student number	32	21
Gender (male/ female)	18 / 13	15 / 6
Peer tutors	9	6

METHODOLOGY

The study adopted "Observation Survey" as the main research method. Tsai (1987) pointed out that observation survey belongs to a scientific method. Researchers can immediately notice phenomena or behaviors to occur through observation. While peer learning design strategies were implemented, unstructured observation in the computer classroom was conducted. Finally, peer learning questionnaires were used to investigate students' feedback.

Basic data of classes

Two classes taught by the research were chosen to be the study participants, as shown in Table 1. At the beginning of the semester, peer tutors were assigned and appointed as leaders to groups. The leaders could choose their team members freely. A group included four people for maximum and two people for minimum. The groups under two people would be assigned with more team members by the researcher. One class per week and three hours per class.

Participants were all three graders. Classes were conducted in two semesters, as the first semester and the second semester in one year. "Peer learning design strategies" was implemented in the second semester. For the first semester, the researcher became acquainted and made connection with the students. It was an important basis for the researcher to choose peer tutors. Hence, at this stage the researcher needed to understand the learning atmosphere and characteristics of each student in the class in advance.

The differences of learning atmosphere between these two classes were obvious. The number of students in Animation 3A class was 32. It seemed that students would lose focus in class easily, but they would help each other to solve the problems in class. As for the number of students in Animation 3B class, it was 21. They were separated into two groups according to their learning motivation. One group had the efficient students with more learning interests. The other had the students with less learning interests and with learning deficiency. There was no interaction between two groups when dealing with problems in the course. The "Peer Learning Design Strategies" were developed by the researcher to adjust the proportion of peer tutor numbers based on the characteristics of the class. Furthermore, the students with good leadership and high learning interests would be chosen as peer tutors.

Peer learning design strategies

"Peer Learning Design Strategies" was converted from a researcher/instructor-oriented course to a peer-tutor-oriented course, as shown in Figure 1. The original teaching mode was that the teacher-researcher introduced topics and made demonstrations. The efficient students with more learning interests in class would communicate with the teacher effectively but not those with less learning interests and learning deficiency. The less efficient learners sometimes asked efficient learners for help. Therefore, the researcher revised the original teaching pattern into a new one. That is, the high-interest and efficient students as peer tutors to

teach less efficient students directly. Every peer tutor needed to preview the materials that the teacher provided in advance before the course.

Classroom procedures described as below:

1. Peer tutors started to preview the materials before the beginning of the course each week and made reference to the teacher's design.
2. Peer tutors taught their classmates in their groups in class and revised the teacher's procedures to teach their group members.
3. Before the end of the course, the teacher answered questions that peer tutors and their group members couldn't solve, gave some supplementation to them and finally reminded the peer tutors of the preview they needed to have before next week.

Research structure

In the study, the researcher identified the problems in the classroom where learning atmosphere was poor and students' lack of motivation and concentration. This study with an emphasis on "peer learning" was developed.

Firstly, the advantages and disadvantages of peer learning in the literature were reviewed. Afterwards, the researcher developed the "Peer Learning Design Strategies" adjusted for the participants to better improve their learning atmosphere. Then, at the beginning of the second semester, the researcher chose the peer tutors from the study participants. The peer tutors were led to instruct and assist their peer students. During the class, the researcher adopted "Observation Survey" to record the students' learning condition. Finally, students' feedback from collected questionnaires were analyzed before the end of the semester.

For data analysis, the study adopted "reliability analysis" to examine the reliability of peer learning scale and used "KMO and Bartlett's test" to confirm if factor analysis was suitable to analyze questionnaires. Moreover, the study used factor analysis to rotate the aspects of the questionnaire data to new factors and adopted "independent t test" to compare the significant differences between new factors and variables in this study.

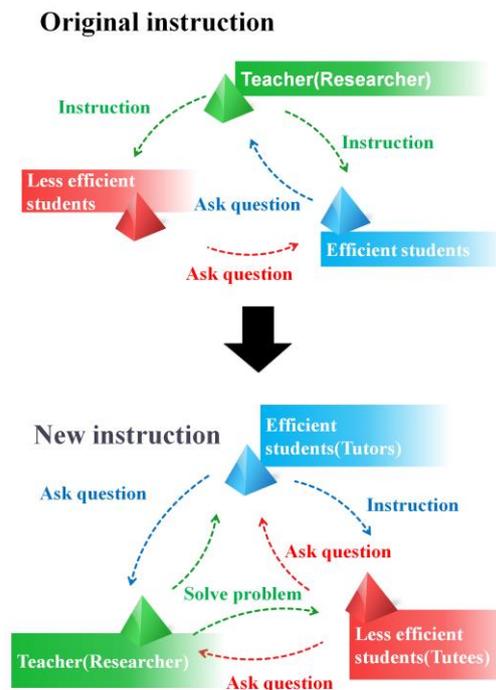


Figure 1. Adjustment of instruction pattern

Peer Learning Scale

The study designed the "Peer Learning Scale" questionnaires through reviewing relevant literature. It was divided into five aspects, cognitive domain, affective domain, psychomotor domain, effectiveness of learning software and peer learning design strategies, in total, 26 questions. Likert Scale was used to evaluate students' opinions and feedback.

There were six questions related to the cognitive domain. They were used to investigate whether the students understood the knowledge of 3-D software learning after the course. The aspect emphasized knowledge acquirement and application. There were five questions relevant to the affective domain. They were utilized to investigate whether the students were able to share their own ways of making 3-D animation and further help others. The aspect emphasized students' positive or negative psychological responses such as preference, disfavor and so on from outer stimuli and their influences upon their behaviors. There were five questions related to the psychomotor domain. They were applied to see whether the students have their own abilities of 3-D software learning and to make the basic animations. They emphasized skill learning. There were five questions related to the effectiveness of learning software. They were used to investigate whether peer tutors could assist their peer students' learning of 3-D software. At last, there were five questions related to the peer learning design strategies. They investigated if peer tutors' instruction could arouse peer students' learning motivation and improve their learning atmosphere and attitudes.

DATA ANALYSIS

Before the end of the semester, the researcher began handing the questionnaires out to the two classes of 53 students. 43 questionnaires were retrieved from 53 students. The retrieval rate was about 0.811. IBM SPSS Statistics was used for data analysis as described below:

Reliability analysis

First, reliability analysis was conducted to analyze the questionnaire data to know if the internal consistency was greater than 0.7, as shown in Table 2. The questionnaire facets were divided into two categories to be investigated using

Table 2. Reliability analysis from questionnaire data

Variable	Items	Cronbach's α
Peer Learning scale	1.Cognitive domain 2.Affective domain 3.Psychomotor domain Total 16 questions	0.954
	1.Effectiveness of learning software 2.Peer learning design strategies Total 10 questions	0.961
	Total 26 questions	0.966

Table 3. KMO and Bartlett's test

	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's test of Sphericity	P value
CAP	0.847	573.176	0.000
EP	0.868	437.252	0.000

Note: CAP representing Cognitive domain, Affective domain and Psychomotor domain; EP indicating Effectiveness of learning software and Peer learning design strategies.

Cronbach's α : (1) cognitive domain, affective domain and psychomotor domain; (2) effectiveness of learning software and peer learning design strategies.

Extraction of variable factors

KMO and Bartlett's test

Before performing factor analysis, the study used "KMO and Bartlett's test" to examine if factor analysis was suitable or not. According to Kaiser (1974), $KMO > 0.8$ indicates good. It can be seen from Table 3 that there was a reasonable internal consistency among items. From Bartlett's test, significant P values were less than 1%, indicating the fact that the sample data was appropriate and suitable for factor analysis.

Factor analysis

There were sixteen questions to detect students' cognitive domain, affective domain and psychomotor domain; ten questions to examine effectiveness of learning software and peer learning design strategies. Hence, factor analysis was used to extract common factors for data analysis. The study conducted principal component analysis to extract factors and used method of varimax to rotate factors. The result of factor analysis was shown in Table 4. After the rotated factor loadings from varimax were compared, two new factors were identified and named as "Ability of conceptual learning" and "Designer confidence" in Table 4.

Table 4. Extraction of cognitive domain, affective domain and psychomotor domain

Aspect questions and factor loadings	Factor 1	Factor 2
c5	.864	.270
c3	.836	.229
c4	.816	.300
c2	.807	.416
c6	.763	.256
c1	.669	.452
p3	.619	.615
a5	.258	.843
a1	.198	.834
a2	.335	.762
a4	.185	.730
p4	.502	.673
p1	.436	.666
a3	.440	.598
p2	.558	.590
p5	.445	.503
New Factor Name	Ability of conceptual learning	Designer confidence

Note : *c* representing cognitive domain; *a* representing affective domain and *p* representing psychomotor domain.

Table 5. Extraction of effectiveness of learning software and peer learning design strategies

Aspect questions and factor loadings	Factor 1
t4	.946
s2	.924
s1	.878
t2	.871
t5	.858
s4	.841
s3	.839
t1	.838
t3	.835
s5	.770
New Factor Name	Effectiveness of peer learning design strategies

Note : *s* representing effectiveness of learning software ; *t* representing peer learning design strategies.

Table 6. Independent t test of gender and three factors

Variable of gender	Male	Female	Average	t	Distinctiveness (two-tailed)
Ability of conceptual learning	3.82	3.68	3.76	0.516	0.305
Designer confidence	3.75	3.73	3.74	-0.083	0.467
Effectiveness of peer learning design strategies	3.63	4.04	3.78	-1.781	0.041*

Note: * indicates significance for $p < 0.05$

Table 7. Independent t test of peer tutor quality and three factors

Variable of peer tutor quality	t	Distinctiveness (two-tailed)
Ability of conceptual learning	-0.981	0.166
Designer confidence	1.190	0.120
Effectiveness of peer learning design strategies	-1.781	0.179

A new factor was obtained and named as "Effectiveness of peer learning design strategies" after the rotated factor loadings from vaimax were compared (according to Table 5).

Analysis of comparison of variables and new factors

The study scale obtained three new factors through factor analysis, that is, "Ability of conceptual learning," "Designer confidence" and "Effectiveness of peer learning design strategies." Finally, to investigate if gender and peer tutor quality affected peer learning design strategies or not, the study identified gender and peer tutor quality as variables to perform variance analysis with three aspects. Therefore, "independent t test" was used to see if significant differences exist.

In Table 6, "Effectiveness of peer learning design strategies" was the only factor out of three new factors showing significant differences. Then, based on this factor, male and female average statistics were compared; male average was 3.63 and female 4.04. Female average was greater than male average. It could be resulted that "Effectiveness of peer learning design strategies" were more influential to females than males. In addition, the test results (according to Table 7) showed no significant differences between peer tutor quality and the three factors.

CONCLUSIONS

The study analyzed students' feedback of peer learning design strategies and concluded some findings and advices as shown below.

The students considered that the course should be led by the teachers but with peer tutors' assistance. One of the strategies in the study was that peer tutors led the course. The advantage was that as peer tutors, they needed to develop their own design methods in order to teach their classmates. However, it caused pressure to peer tutors as they needed to preview the materials in advance. Moreover, if they could not comprehend the materials provided by the teacher, they could not teach their classmates. Hence, from questionnaire data and classroom observation, it was concluded that students needed the teacher to lead the course and peer tutors to assist less efficient students. After observing the implementation, adjusting course dominance was recommended; therefore, students could experience the course differently but mainly with teacher-dominant instruction.

Peer learning design strategies reduced the learning difficulties and enhanced learning motivation. The survey results indicated that about 70% of the students (30 people) felt that the strategies allowed them to learn more effectively and reduce frustration of learning. Therefore, they transformed negative attitudes to positive ones. It was recommended that in conducting professional courses such as 3D software learning, a number of peer tutors could be selected to assist the course. It

could not only help less efficient students but also assist in reducing the burden for the teacher to teach a large number of students.

The survey data pointed out significant differences between peer learning design strategies and gender. Peer learning design strategies were more helpful for female students' learning than males'. For future study, different grades and classes could be compared. More findings might be gotten.

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