An Empirical Study of the Effect of Online Peer Assessment on College Students' Engagement in Learning

Hongyun Li[1,a], Ying Yang[2,b,*]

[1]School of Information, Yunnan Normal University, Kunming, China
[2]School of Information, Yunnan Normal University, Kunming, China
[a]3072016240@qq.com, [b]79261313@qq.com
*Corresponding author

Abstract: *Peer mutual assessment is an important learning strategy to cultivate higher-order thinking and enhance learning performance. However, in teaching practice, peer assessment has the problem of low quality of mutual assessment, and the effect of peer assessment requires students' active participation and cooperation, which is related to students' learning engagement. This study aims to explore the impact of peer assessment on college students' learning engagement by designing three rounds of peer assessment activities and conducting a tracking survey and in-depth analyses of college students participating in peer assessment after a three-week empirical study. The study indicates that peer assessment has a positive effect on college students' engagement in learning, peer assessment has a significant impact on students' academic performance, peer-to-peer communication, and feedback can stimulate learners' active reflection and learning, and college students have a higher level of participation and satisfaction when conducting peer assessment activities. Finally, this study suggests strategies to improve the quality of peer assessment based on practical experience.*

Keywords: blended learning; peer assessment; learning engagement; higher education

1. Introduction

Engagement in learning is an important factor affecting students' academic success and the quality of education and teaching, and its effective measurement can provide a basis for teachers to judge teaching activities. However, in higher education, students' engagement in learning is still low, and the United States is the international leader in the field of college student engagement research, but the overall situation is not satisfactory [1]. Chinese university students are generally dissatisfied with their engagement in learning because they are mostly trying to follow and implement the school's educational regulations, and they seem to study hard on the surface, but their real engagement is not very high. Therefore, how to improve students' engagement in course learning is still an issue that needs to be explored in higher education.

Peer assessment is an effective pedagogical strategy to achieve "learner-centredness", which can give students a sense of ownership, stimulate motivation, promote engagement [2], and develop critical thinking and metacognitive skills [3][4]，Students can view and evaluate each other's work in the process of participating in peer-to-peer assessment activities, to complement each other's strengths and weaknesses, and to improve together, to enhance the learning effect, and the wide application of peer-to-peer assessment is conducive to promoting the change of higher education assessment.

Therefore, this study focuses on the application of online peer assessment in a blended learning environment, analyses the impact of peer assessment on college students' engagement in learning, and puts forward suggestions to improve the quality of peer assessment.

2. Research Overview

2.1 Current status of domestic and international research on learning engagement in blended learning environments

Research on learning engagement at home and abroad is very rich, and the research increasingly presents the characteristics of the plurality and integration of tools and the diversity of methods, etc. Moreover, the rise of the blended teaching mode, not only broadens access to educational resources but also provides students with a more flexible and diverse learning experience. Scholars at home and abroad have conducted in-depth research on this issue and explored students' learning engagement in a blended teaching environment from different perspectives.

From the perspective of constituent dimensions, Schaufeli believes that learning engagement includes three dimensions of vitality, dedication, and concentration [5], and Christenson, Fredricks, and Kong Qiping all agree that learning engagement is composed of behavioral, emotional, and cognitive engagement [6][7][8]. In terms of influencing factors, Cham et al. found that learning engagement is negatively correlated with learning burnout and that high standards of self-requirement can promote students' learning engagement [9]. Skinner et al. found that the learning motivation of those with low learning engagement is further weakened by negative feedback from teachers' behaviors, which in turn reduces learning engagement [10]. Wang Yashang and other scholars pointed out that learning interest is a key factor affecting learning engagement [11]. In terms of measurement tools, there are many classic learning engagement scales used to measure learning engagement at home and abroad, such as Connell and Wellborn's Rochester School Assessment Package, Martin's Motivation and Engagement Scale, Fredricks' Classroom Learning Engagement Scale, Li Shuang's Distance Learning Student Learning Engagement Evaluation Scale, etc. [12][13]. In terms of training models, Smith and Anderson's cognitive flexibility theory emphasizes the need to promote students' learning engagement through diverse teaching and learning activities [14]. Lu and other researchers found that teachers in blended learning environments should provide rich learning materials and design practical activities to enhance students' learning engagement [15].

2.2 Current status of domestic and international research on peer-to-peer assessment

In terms of the significance of peer-to-peer assessment, Brkić L et al. state that peer assessment significantly enhances students' engagement and motivation to learn, as it increases students' autonomy in assessment [16]. Through peer assessment, students can participate more actively in their learning and increase their self-drivenness, thus contributing to the development of their competence in several ways. Kong Wei-liang et al. believe that peer assessment can promote students' development on the one hand, and on the other hand, it has a good effect on motivating students and improving their learning performance, and it is one of the effective strategies for fostering the development of learners' higher-order thinking [17]. In terms of influencing factors, Orsmond et al. pointed out that peer-to-peer assessment is susceptible to personal subjectivity, which may impair the fairness of the assessment results [18]. Wang Zhixu pointed out that the dimensions of learners, teachers, and the way peer-to-peer assessment is organized can influence the quality of peer-to-peer assessment [19]. In terms of model construction, Wang Xin et al. helped learners improve their academic English writing performance by constructing an online multiple-feedback model [20]. Kong Weiliang et al. introduced artificial intelligence technology to construct a credible peer-to-peer assessment model to improve the acceptance of peer-to-peer assessment [21].

2.3 A Study of the Relationship Between Peer Mutual Assessment and Engagement in Learning

There is a close relationship between peer assessment and engagement in learning, and peer assessment not only improves students' critical thinking and assessment skills but also enhances students' motivation and engagement, which in turn improves learning outcomes. For example, Double K S et al. found that peer assessment enhances student performance and has a positive effect on learners' self-concept and motivation [22]. A study by Hongxia Li et al. revealed that students who actively participated in peer assessment tended to be more motivated to complete the course and that their cognitive engagement was an effective predictor of learning effectiveness [23].

3. Survey design and implementation

3.1 Questionnaire design

The division of dimensions and the design of questions in this study refer to Professor Kong Qi-ping's division of learning engagement, based on which the dimensions and questions of this study about the design of the learning engagement questionnaire were determined [8]. The questionnaire consists of three dimensions: cognitive engagement, behavioral engagement and, affective engagement, open-ended questions were added to the post-test questionnaire, aiming to collect students' feedback and suggestions on peer-to-peer assessment activities. The specific measurement dimensions are shown in Figure 1.
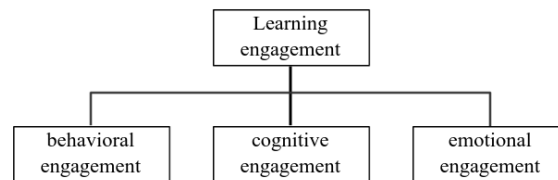

Fig.1 Measurement dimensions

3.2 Research target

The subjects of the study were students in a class of freshmen majoring in Biology at the University of X. The experimental course was University Computer Fundamentals, and the class consisted of 45 students, of which 12 were male and 33 were female. These students had just entered the university and had no prior experience in peer assessment but had some experience in operating online teaching platforms before this study was conducted.

3.3 Experimental procedure

Due to implementation constraints, this study can only carry out single-group pre-test and post-test experiments, pre-test to understand the status of students' learning engagement, online blended teaching relying on the Learning Channel platform, the content of the teaching: "Chapter 5 Word word processing software", "Chapter 6 PowerPoint presentation", "Chapter 7 Excel spreadsheet", students complete the teacher's post-course assignments and participate in peer assessment during this period for three weeks.

After three rounds of peer assessment activities, a posttest was administered to examine the effect of peer assessment on students' engagement in learning. Students completed their homework and uploaded it to the Learning Commons platform by the requirements within the specified time after each class, and after uploading it, they also needed to complete peer assessment within the specified time. Each peer assessment activity was set by the teacher on the Learning Commons platform, and at the same time, the teacher provided the corresponding evaluation criteria according to the requirements of each assignment, and the students carried out peer assessment according to the evaluation criteria, and each of them evaluated three assignments, and took the average value as the final score of the peer assessment. The average is the final grade of the mutual assessment, and the offline teacher provides comments and feedback. The general experimental flow of this study is shown in Figure 2.
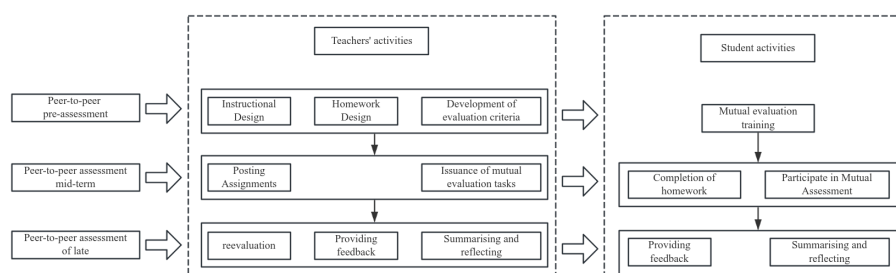

Fig.2 Experimental procedure

3.4 Reliability analysis

In this study, the questionnaire was first analyzed for reliability using SPSS 27.0 statistical analysis software and the reliability was equal to 0.971 greater than 0.6, indicating good reliability. Then KMO and Bartlett's test of sphericity were used and the resulting KMO value was 0.86 greater than 0.6 and the significance was 0.001 less than 0.050, which indicates that the questionnaire is suitable for factor analysis, thus testing the validity of the questionnaire.

4. Findings and analyses

4.1 Peer assessment has a significant effect on students' engagement in learning

After identifying the experimental subjects, a pre and post-test experiment was conducted on the students of the class, and 45 pre and post-test questionnaires were distributed each, with a validity rate of 100 percent. To examine the overall change in students' engagement in learning, the study took students' pre and post-test scores as variables and conducted a paired samples t-test to find out the significance of the change in students' engagement in learning. The results of the data analysis showed that the mean values of the total pre-test and total post-test scores were 44.46 and 75.3143, respectively, and the post-test data showed a significant improvement over the pre-test data. The value of Sig is 0.001, which is less than 0.05, indicating that there is a significant difference in the student's engagement in learning in this class after a period of integration of peer-to-peer assessment in teaching and learning activities, which shows that peer-to-peer assessment activities can promote students' engagement in learning. The value of the standard deviation also decreased from 11.503 to 8.59470, indicating that students' options converged.

To further understand whether there is any difference in the effect of peer-to-peer assessment activities on these three dimensions, statistical analyses were conducted on the dimensions of the pre-test and post-test, as shown in Table 1. From the data in the table, it can be seen that overall the post-test is higher than the pre-test in all dimensions of learning input, especially cognitive input and emotional input compared to the pre-test, indicating that the integration of peer-to-peer assessment activities in teaching and learning can make the students participate in teaching and learning activities more actively, and enjoy the peer-to-peer assessment activities. The data of the three dimensions of the posttest are more stable in terms of standard deviation. The sig values of behavioral, cognitive, and affective engagement are 0.001, 0.001, and 0.001, respectively, which are all less than 0.05, indicating that students' engagement in learning in all dimensions has been greatly improved after peer assessment activities.

Table 1 difference-in-difference test

dimensions	Subgroups	average	standard deviation	T	Sig
behavioral engagement	Pretest	2.1852	0.63387	-13.066	0.001
	Posttest	3.7905	0.43035		
cognitive engagement	Pretest	2.3083	0.61791	-9.729	0.001
	Posttest	3.6464	0.49491		
emotional engagement	Pretest	2.1037	0.52619	-12.188	0.001
	Posttest	3.9000	0.57622		

4.2 Peer assessment has a positive effect on improving students' academic performance

After the students completed the assignments and participated in peer assessment, the grades of the three assignments of the students in the class were collected, and the collected grades were collated and then analyzed, it was found that the overall trend of the class mean score of the class showed a steady increase after the peer assessment activities. It can be seen that students' engagement in learning and their grades increased after peer-to-peer assessment.

To further investigate the effects of peer mutual assessment on students' learning engagement in a blended learning environment and the relationship between the two, this study continues to explore the effects of the frequency of mutual assessment and the quality of mutual assessment on students' learning engagement.

1) The Effect of Mutual Assessment Frequency on Students' Academic Achievement and Engagement in Learning: The frequency of mutual assessment here refers exclusively to the number of times students participate in peer mutual assessment, which is limited to the grading session. In this experiment, the teacher releases course assignments and mutual assessment tasks based on the Learning Pass platform, and the mutual assessment time of each assignment is set for one week, and students have the option to participate or not. The percentages of those with mutual assessment frequency greater than 3 for each assignment were 93.3%, 97.8%, and 80%, respectively. To further analyze the impact of mutual assessment frequency on students' learning engagement, we focused on students with a mutual assessment frequency of less than 3 and screened out 13 students whose mutual assessment frequency was less than 3 for each mutual assessment activity, among which 6 students' mutual assessment frequency for the three assignments was less than 3. Combined with their homework grades Further study of their homework and final grades found that 9 out of 13 students' homework grades were lower than the class average, and 5 out of 6 students whose frequency of mutual assessment was less than 3 on three occasions were at the bottom of the class, and their pre and post-tests showed little change in their commitment to learning, which indicates that there is a certain correlation between the student's commitment to learning and their final grades and their frequency of mutual assessment. This indicates that there is a certain correlation between students' learning engagement and final grades and their mutual assessment frequency.

2) The Effect of Mutual Assessment Quality on Students' Academic Achievement and Engagement in Learning: The quality of inter-assessment here refers to the caliber of students demonstrated during their participation in peer inter-assessment, which involves not only fair and objective marking, but also the ability to provide constructive and high-value feedback. We used the length of comments as a criterion for the quality of comments, and after ranking the comment lengths of all the comments on the three assignments, we sorted out the three students with the longest and shortest comments on each assignment, as shown in Table 2. The analysis results show that in the two activities of "Word Assignment - Thesis Layout" and "PowerPoint Assignment - Appreciation of Tang Poetry"', the longest and shortest comments were made, the longest comments came from the same student, in which student 259 has the highest rank of the number of words in three comments in three assignments, while student 083 and student 113 have the lowest rank of the number of words in three comments in three assignments, respectively, student 083 and student 113 have the lowest rank of the number of words in three comments in three assignments, and we compare this table with the final grades and find that the final grades of students 241, 259 and 140 are all higher than 90%. 140 have final grades higher than 90 points, while the comments of Student 083 and Student 113 are very short, with only single words such as"good" and "very good", lacking in-depth analyses and specific feedback, and their final grades are not satisfactory.

We continued to observe the students' engagement in the pre and post-tests and found that the engagement in the post-tests of Student 241, Student 259, and Student 140 increased compared to the pre-tests, while the engagement of Student 083 decreased instead of increasing, and the engagement of Student 113 was the same as that of the pre-tests. This shows that there is a correlation between students' engagement in learning and final grades and the quality of their mutual assessment.

Table 2 Word order of comments

Homework	Ranking	Student Number	comment word count
Word Assignment - Thesis Layout	Top Three	241	63
			55
		150	47
	Last three	134	3
		042	2
		123	2
PowerPoint Assignment - Appreciation of Tang Poetry	Top Three	259	45
			39
		160	34
	Last three	083	4
		113	4
		265	2
Excel Assignment - Report Card	Top Three	010	51
		259	38
		140	28
	Last three	083	1
			2
		113	2

3) Higher student participation and satisfaction with peer-to-peer assessment activities: While completing the questionnaire, we also randomly selected 10 students for interviews, including 5 boys and 5 girls. Overall, students generally hold a high willingness to participate in peer assessment activities. On the one hand, they believe that they can improve their knowledge network and skills by reviewing other students' assignments, and to achieve better grades and recognition from others, students will also put more energy and time into the completion of their assignments, and their learning engagement is enhanced. On the other hand, peer-to-peer assessment helps to reduce the possible bias of teachers' assessment and ensures the timeliness of feedback. However, it is also found that there are some problems in this online peer assessment practice, for example, some students said that there are cases of malicious low scores in some students' assessments, and some students think that the assessment should be done anonymously, and others hope that the grading criteria are more detailed, and so on.

5. Conclusions

5.1 Peer assessment enhances students' engagement in learning

Through the experiments on peer assessment to improve students' learning engagement and the summary analysis of the results, it is found that the adoption of peer assessment activities in the classroom significantly improves students' learning engagement in the classroom in general and in various dimensions, especially in the behavioral and cognitive engagement dimensions, both of which have a mean increase of more than 1.5 points. In peer assessment activities, students can not only help others to find the strengths and problems in their assignments, but also see other students' excellent assignments and reflect on their learning effects, students' participation and satisfaction are high, which indicates that peer assessment can increase their motivation and initiative, build up sufficient trust between students and teachers, and promote the development of students' metacognition.

5.2 Peer assessment activities have a significant effect on students' academic performance

The three rounds of the experiment showed that students who participated in peer-to-peer assessment multiple times and gave high-quality feedback tended to get better grades on the final exam, and also indicated that students were more attentive and invested in their coursework.

6. Discussions

Although the results of the study show that peer-to-peer assessment activities have a significant impact on college students' engagement in learning, there are some limitations in this study, due to implementation constraints, only a single-group pre and post-test experiment can be carried out, and the sample size is relatively small, which limits the generalization and representativeness of the results of the study.

In the course of the experiment, we also noticed some phenomena, some students gave similar scores and comments to others for each assignment or the comments were similar but the scores were inconsistent, we also observed that some students directly gave full marks in the process of mutual assessment, and we believe that this part of the students lacked specificity in their scores and comments, and the scores were more random, which may affect the validity and fairness of the evaluation, based on this, we consider adopting the method of complaint re-assessment to solve the situation of disagreeing with others' evaluation.

7. Recommendations

In addition, after collating the interview records, this study further understood some of the students' suggestions for conducting peer-to-peer assessments in the classroom, according to which we came up with the following suggestions:

First, rationally set the evaluation criteria to improve the quality of student evaluation. Teachers should refine the scoring criteria when setting the evaluation criteria to avoid the phenomenon of inconsistent evaluation because the evaluation criteria are too broad let will reduce the binding force on the evaluators, increase the arbitrariness of mutual evaluation, and cause the phenomenon of inconsistent evaluation.

Second, anonymous evaluation is more conducive to the development of peer assessment. In the process of peer evaluation, students are often happy to accept evaluations that agree with them or support their viewpoints and are skeptical about evaluations that hold inconsistent viewpoints, and then deny and ignore the evaluation. To reduce the subjective bias that students can have and to improve the objectivity and validity of the evaluation, the evaluation should be set up in a double-blind way, i.e., the identities of the evaluator and the evaluated are unknown to each other, which can reduce the bias of the students when they evaluate each other.

Thirdly, the mutual evaluation of works should provide timely feedback, and add the links of second evaluation and appeal after revision. Peer assessment can cultivate students' critical thinking and reflective ability, and students can reflect on their shortcomings and improve their knowledge network after participating in peer assessment. Therefore, it is necessary to provide timely feedback and follow-up activities after completing the peer assessment, so that students can make timely revisions or appeals to improve their learning effectiveness.

Acknowledgment

References

[1]Chang Tongshan. A comparative study of learning expectations and students' learning engagement in undergraduate courses in China and the United States[J]. China Higher Education Research, 2019(04):10-19.

[2] Heyman J E, Sailors J J. Peer Assessment of Class Participation: Applying Peer Nomination to Overcome Rating Inflation[J]. Assessment & Evaluation in Higher Education, 2011, 36(5): 605-618.

[3] Qiong Wang, Jiayu Ouyang, Yizhou Fan. A study of the relationship between reflective awareness and learning effectiveness in MOOC peer assignment mutual assessment[J]. Research on Electrochemical Education, 2019, 40(6): 58-67.

[4] Hongquan Bai. The construction and practical analysis of mobile homework exhibition and assessment system based on peer mutual assessment[J]. Research on E-Chemical Education, 2017(3):75-79.

[5] Chaufeli W B, Martinez I M, Pinto A M, et al. Burnout and engagement in university students: a cross-national study[J]. Journal of cross-cultural psychology, 2002, 33(5): 464-481.

[6] Christenson, S., A. Reschly & C. Wylie. the Handbook of Research on Student Engagement[M]. New York: Springer. 2012.

[7] Fredricks J A, Blumenfeld P C, Paris A H.School engagement: Potential of the concept, state of the evidence[J]. Review of Educational Research, 2004, 74: 59-109.

[8] Kong Q P. Conceptual connotation and structure of 'student engagement'[J]. Foreign Education Materials, 2000(02): 72-76.

[9] Yiwen Zhang, Yiqun Gan, Heining Cham. Perfectionism, academic burnout and engagement among Chinese college students: a structural equation modeling analysis[J]. Personality and Individual Differences, 2007, 43(6).

[10] Skinner, E. A., & Belmont, M. J. Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year[J]. Journal of Educational Psychology, 1993, 85(4): 571-581.

[11] Wang Yashang, Wang Xia. An empirical study of students' learning engagement and its influencing factors in higher vocational colleges and universities[J]. Education Research, 2017, 38(01): 77-84.

[12] Zhang Na. A review of domestic and international studies on learning engagement and its school influencing factors[J]. Psychological Research, 2012, 5(02): 83-92.

[13] Li Shuang, Yu Chen. Development and application of evaluation scale for distance students' learning input[J]. Open Education Research, 2015, 21(06): 62-70+103.

[14] Smith T W, Anderson M J. Designing learning environments for cognitive flexibility theory[J]. Journal of Instructional Psychology, 2003, 30(1): 1-10.

[15] Lu GQ, Liu QT, Zhang CW, et al. Perception and input analysis of blended learning environment based on multi-subject interaction[J]. Research on E-Chemical Education, 2023, 44(11): 82-89.

[16] Brki L, Mekterovi I, Fertalj M, et al. Peer assessment methodology of open-ended assignments: insights from a two-year case study within a university course using novel open source system[J]. Computers Education, 2024, 213105001.

[17] Nancy Falchikov. Peer marking-Developing peer assessment[J]. Innovations in Education and Training International, 1995, 32: 175-187.

[18] Orsmond, P., Merry, S.&Reiling, K.The importance of marking criteria in peer assessment[J]. Assessment and Evaluation in Higher Education, 1996, (3): 239-249.

[19] Wang ZX. A design study of online peer assessment to promote learners' deep learning[D]. Shenyang Normal University, 2024.

[20] WANG Xin, LI Qinmeng. Exploring the online multiple feedback model of academic English writing for English majors[J]. Foreign Language Research, 2023, 40(04): 44-50.

[21] KONG Wei-liang, YU Xiaoli, HAN Shuyun, et al. Construction and validation of a trusted peer-to-peer assessment model empowered by artificial intelligence[J]. Modern Distance Education Research, 2023, 35(03): 93-101+112.

[22] Double K S, McGrane J A, Hopfenbeck T N. The impact of peer assessment on academic performance: a meta-analysis of control group studies[J]. Educational Psychology Review, 2020, 32(2): 481-509.

[23] Li Hongxia, Zhao Chengling, Shu Fengfang, et al. Evaluation for learning: a study of peer-to-peer assessment input in online open courses[J]. Research on E-Chemical Education, 2021, 42(04): 37-44.