

The Effects of Online Peeragogy on University Students' Critical Thinking

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Abstract: The globalization of the economy, the blending of various cultures, changes in the social environment, and the requirement for democratic progress as mankind enters the digital age have enhanced the importance of critical thinking and made it an important educational goal. Chinese higher education also need to create a model of training that goes beyond basic knowledge and develops critical thinking in order to produce high-level talent capable of participating in international affairs and national strategies. Thus this study design the research answering the three questions: first, what is the university fresh students current critical thinking ability? Second, can online peeragogy promote students' critical thinking ability? Third, what factors in online peeragogy influence students' learning? The study finds efficient online peeragogy activities need focus on the following three aspects to execute: technology, teaching, and learners' aspect. What's more, the key feature for linking the above three aspects is communication: between students, between students and teachers, between students and materials, between students and online apps.

Keywords: critical thinking, impact factors, online peeragogy, university students.

1. INTRODUCTION

The globalization of the economy, the blending of various cultures, changes in the social environment, and the requirement for democratic progress as mankind enters the digital age have enhanced the importance of critical thinking and made it an important educational goal. In order to create well-equipped members of society with sound critical thinking abilities, educational experts have started to create numerous critical thinking curricula based on these authoritative principles. Thus, research on critical thinking concepts started to concentrate on the subjective experiences of teachers and students in the real educational process at the beginning of the twenty-first century.

2. KEY CONCEPTS AND LITRATURE REVIEW

Critical thinking, as an implicit thinking activity of learners, is a higher-order thinking form in the cognitive domain, and it is difficult to detect the development process of learners' critical thinking by conventional means in traditional teaching [1]. Researches conducted by scholars in different majors, fields and countries have testified that peer learning can facilitate critical thinking. [2] reveal English majors in Chinese universities considered content-rich materials, teacher-facilitation, and peer learning benefited them most in terms of critical thinking development. MAES@methodology as peer-to-peer learning method can improve critical thinking components [3]. [4] also mention in the peer- learning project, the learners report improved knowledge about critical thinking. Participants feel that a 2:1 model where a focus on peer learning strongly contributes to a supportive learning environment and improves critical thinking [5]. [6] report that the weakest dental students born in the 1980s and 1990s benefit most from peer learning and their critical thinking skills are fostered during the unique educational experience. [7] stress peeragogy is an old idea that has been reexamined with the appearance of Education 4.0, which promotes students' transversal competency such as critical thinking, cooperation, collaboration, communication, creativity and innovation.

Peeragogy is about peer produced learning or peers learning together and teaching each other[8] . Peeragogy is a kind of educational skill used in peer training [9]. Thus peeragogy in this study refers to a collection of the best practices of effective peer learning. Peer learning is "the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions. It involves people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by so doing" [10] . [11] propose a theoretical model for peer- assisted learning (Figure 1).

The model is a continuous loop with five focuses to create an individualized learning habit, deepen the cycle from unconscious knowledge absorption to conscious knowledge expansion, and enhance learner’s self-confidence and self- esteem. The first is organization and engagement which facilitates the helper and the helped to form individualized learning style by interaction. The second is cognitive conflict which are the challenges met by the helper and the helped when they clarify their ideas and concepts. The third is scaffolding and error management which are the process which the helper and the helped scaffolding each other to modify their mistakes in their knowledge and cognition. The fourth is communication which includes listening, explaining, questioning, summarising, speculating, and hypothesising to promote learners’ mutual understanding. The last is affect which means to establish a trustworthy relationship by modelling or self-disclosure. The five focuses will help the pair to become self-esteemed learners by amassing, retuning and restructuring their knowledge, automating and generalizing their skills, and self-monitoring and self-regulating their learning habits.

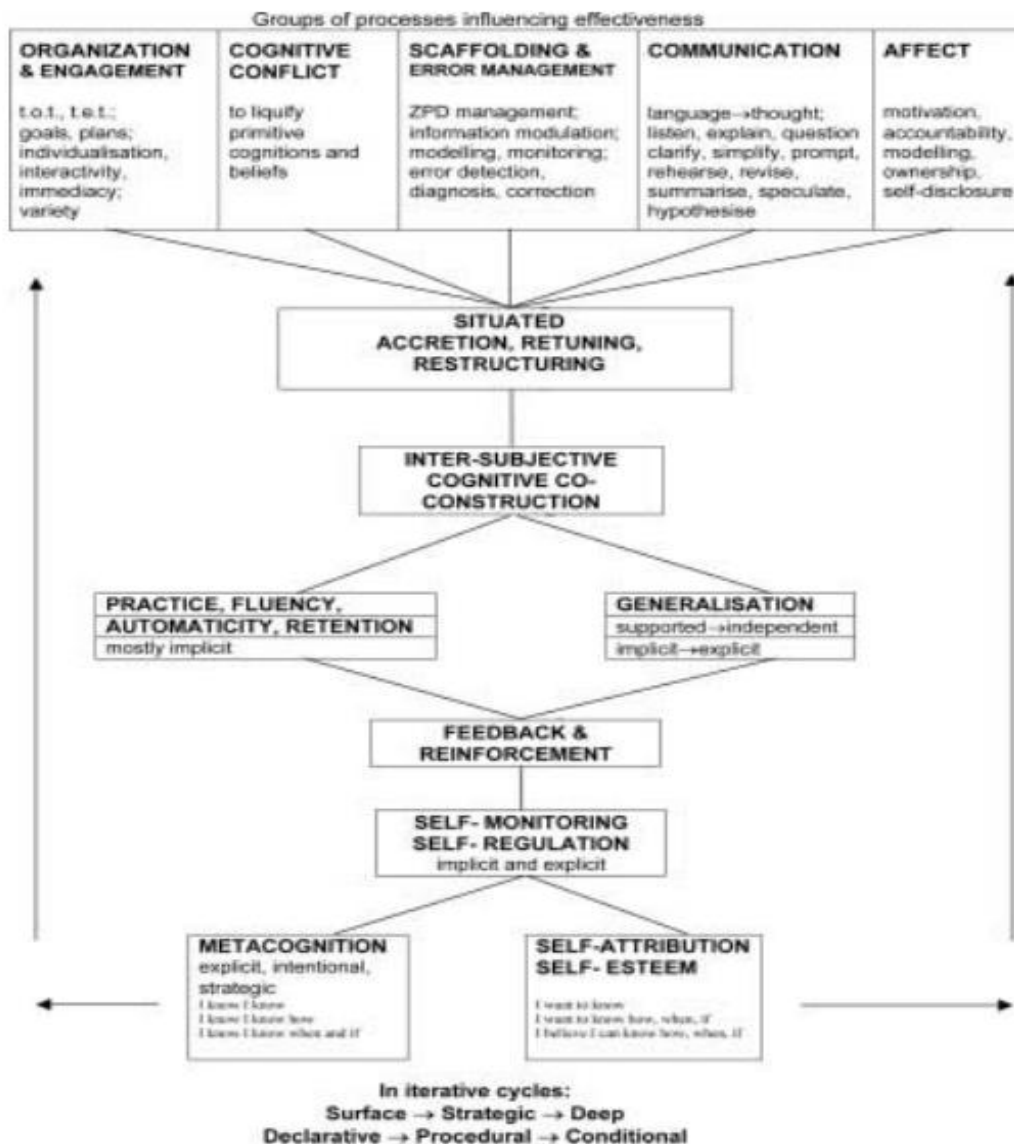


Figure 1 Theoretical model for peer- assisted learning[10]

[12] further develop the theory from peer learning to peeragogy at the age of digital time and use patterns to develop peeragogy project for future learning, in and out the higher education (Table 1 and Figure 2).

Table 1. An overview of the problems and solutions in our pattern language.

Pattern	How can we. . .	Here’s how:
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PEERAGOGY	. . . Find solutions together?	Figure out what the real problems are.
ROADMAP	. . . get everyone on the same page?	Build a plan that we keep updating.
REDUCE, REUSE, RECYCLE	. . . avoid undue isolation?	Use what's there and share what we make.
CARRYING CAPACITY	. . . avoid becoming overwhelmed?	Clearly express when we're frustrated.
A SPECIFIC PROJECT	. . . avoid becoming perplexed?	Focus on concrete, doable tasks.
HEARTBEAT	. . . make the project "real" for participants?	Keep up a regular, sustaining rhythm.
WRAPPER	. . . stay in touch?	Circulate any adjustments to the plan.
NEWCOMER	. . . make the project accessible to new people?	Let's learn together with newcomers.
SCRAPBOOK	. . . maintain focus as time goes by?	Keep coming back to the priorities.

Connections between the patterns of peeragogy

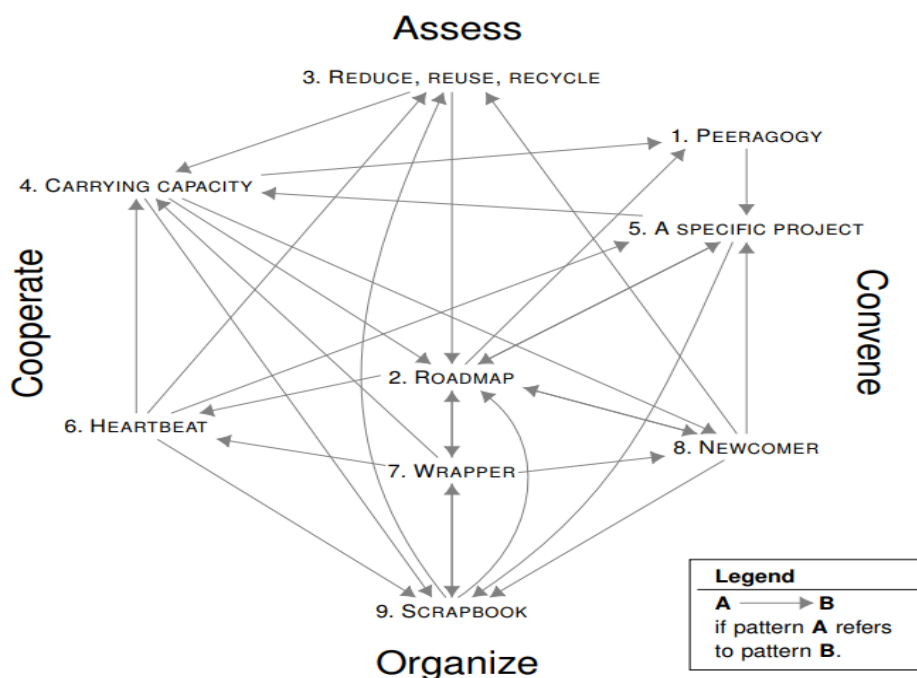


Fig. 2: Peeragogy patterns are highly interconnected. This figure shows how they fit together with and within a wider context. Specifically, the labels at the four edges of the figure correspond to the most closely related sections of the *Peeragogy Handbook*.

Figure 2 Peergogy pattern [12]

Basis on table 1 and figure 1 and 1, it can be seen that first, peeraogy has gone through a process from face to face to online; second, there are four basic elements for online peeragogy: convene, organize, cooperate, and assess. Convene includes three factors peeragogy, a specific project and new comer; organize comprises scrapebook, wrapper and roadmap; cooperate consists of heartbeat and carrying capacity and assess is made up of reduce, reuse and recycle.

Although acknowledging the growth of higher education in China, [13], a former president of Yale University, has noted that undergraduate education in Chinese universities is lacking in two crucial areas: the first is the development of critical thinking, and the second is a lack of interdisciplinary breadth. The overemphasis on knowledge learning in

Chinese education has also been questioned by [14], a Chinese professor working in the United States. Zhao claims that Chinese education falls short in creating a critical mindset and creativity. Critical thinking is at the core of this significant paradigm shift in education and curriculum leadership, according to [15], who contends that Chinese higher education must create a model of training that goes beyond basic knowledge and develops higher-order skills in order to produce high-level talent capable of participating in international affairs and national strategies.

Moreover, In the traditional learning model, Although there is peer interaction, students find it difficult to participate actively because the discussion's goal is unclear and there is a free-rider effect. Individual responsibility is also considerably diminished in learning that is entirely online due to the lack of teacher supervision and the potential for anonymous peer engagement [16]. Some researchers have questioned the effectiveness of online peer-to-peer assessment because of its weak interactive behavior [17], low quality of the rubric, and insufficient reliability [18]. [19] states most study limits peer-to-peer learning to the face to face classroom and school-based curriculum in China, thus less study has been done on online peer learning and at the same time most students have a poor level of knowledge construction and do not learn well in online learning because the quality of learner interaction is low. How to improve the effectiveness of online peer assessment and interaction has become an issue that cannot be ignored [16].

Thus this study design the research in line with the four basic elements of online peeragogy and mainly focus on answering the three questions: first, what is the university fresh students current critical thinking ability? Second, can online peeragogy promote students' critical thinking ability? Third, what factors in online peeragogy influence students' learning ?

3. RESEARCH DESIGN

The participants of this study's research are 28 first-year students of business majors at a provincial comprehensive university. Among the 28 students, there are 19 female students and 9 male students and 24 of them are arts students and 4 of them are science students. They all participated a 14 weeks of College English Course with the purpose to cultivate their critical thinking ability in online peeragogy. The Factor loadings for the critical thinking scale by [20] which has considerable correlation with the CCTDI suggesting a strong link between the two and a good criterion related validity, are distributed to the students at the beginning of the study and the findings of the questionnaire are served as the pre-test data. It attempts to investigate the current state of college students' critical thinking ability. The Factor loadings for the critical thinking scale by [20], are given to the students once more at the end of the semester, and the results are served as post-test data. Online peeragogy survey is also handed out among students at the end of the term to analyse learners' online peeragogy behaviors and to identify relevant factors that influence the effectiveness of online peeragogy. Both of the surveys are in Chinese, so the students can have a better understanding about the questions.

4. RESEARCH METHODS

Factors loading for the critical thinking scale are made up with 17 items which can be categorized into three factors. First, Critical thinking abilities. This test consists of eight questions and evaluates a person's capacity to systematically obtain, analyze, and judge the validity of contextual data related to a given situation. Higher scores represent more critical thinking capacity. Second, Openness to criticism. This test, which consists of five questions, gauges a person's tenacity in gathering and analyzing information. According to the prior idea, each of the five questions was given an inverted score, with lower scores denoting greater stubbornness and a lack of critical thinking and higher scores denoting greater propensity for doing so. Third, Use of criticality. This measure of how well individuals use critical thinking and consists of 4 questions. A high score indicates a critical response to a problem, while a low score indicates a lack of critical thinking. The total score range is 17-119. Negative critical thinking ability is a total score below 60; ambivalent or unstable critical thinking ability is indicated by a total score between 60 and 80 points; positive CTD is revealed by a total score between 80 and 98 points; and a total score above 98 points indicate a strong positive critical thinking ability. The reliability of the scale can be shown from Table 2. Its coefficient value is 0.765, which is higher than 0.7, as can be seen from the table below, indicating that the reliability quality of the study data is good.

Table 2. Reliability of Factors loading for the critical thinking scale

Cronbach

item	number	Cronbach α
17	28	0.765

Online peeragogy survey consists of 17 questions in the its main body; questions 1 through 9 and 17 are online peeragogy surveys designed to identify issues with learners' peeragogy, while questions 10 through 16 are peeragogy influence surveys designed to explore learners' willingness to improve their peeragogy and ideas. Using a link to the survey website, the questionnaires were created and delivered to students, who then filled them out. In a consistent manner, the questionnaires were gathered. During the study, 28 questionnaires in all were distributed and 28 of them were returned, with 100% return rate.

5. RESEARCH RESULTS

A. Critical Thinking

Table 3. Paired t-test for critical thinking

Item	Paired t-test		Dif.	t	p
	Paired t-test				
	Pre-test	Post-test			
Pre-test and post-test	59.46±7.42	86.11±10.90	26.65	40.357	0.000**

* $p < 0.05$ ** $p < 0.01$

From table 3, it indicates the following data: the difference, standard variance, t value and p value of average score for critical thinking ability. This table can answer research question 1 and 2. Before the study, learners' critical thinking ability is 59.45 that belongs to the negative or poor level of critical thinking. After one term of College English Course via online peeragogy, the learners' critical thinking ability average score has improved to 86.11 which is positive level. p value in the Table 3 is lower than 0.000. The average score for critical thinking ability between pre-test and post-test is significant. Thus, the conclusion can be drawn that online peeraogy has significant influence on students' critical thinking ability. Basis on the above findings, research question 1 and 2 can be answered.

B. Online peeragogy

The issues with online peeragogy from question 1-9 and 17 can be shown in Table 4.

Table 4. question 1-9 and 17

Questions	1	2	3
1. the role of learners in peeragogy	82.14% equal partner	7.14% mentor	10.71% mentee
2. close interacting learning partners	53.57% more than 2	46.43% less than 1-2	
3. problems in communicating and cooperating with other peer learners		78.57% Sometimes	21.43% Rarely
4. actively contribute to facilitating peer-to-peer learning by offering peers mutual learning guidance, resources, techniques, etc	32.14% Often	67.86% Sometimes	
5. share learning resources in the learning platform	85.71% Yes	14.29% No	
6. feel happy when you share your learning with other students in the learning platform	46.43% Very happy	53.57% happy	
7. access and use the learning recommendations of others through interaction	100% Yes		



Figure 4. word cloud for beneficial factors

Figure 4 is also in Chinese, and the top five leading beneficial factors are translated in English: competent, have their own ideas, active in expressing their own views, have a clear plan, and willing to help.

Basis on Pearson correlation between gender and online peeragogy, it can be concluded that gender has significant influence on learners' communication and competition within the group in Table 6. Basis on the above findings, research question 3 can be answered.

Table 6. Pearson correlation

3. Do you have problems in communicating and cooperating with other peer learners	Coefficient	-0.382*
13. In peeragogy, how do you like to communicate with other peers	<i>P value</i>	0.045
B. Competition within the group	Coefficient	0.664**
	<i>p value</i>	0.000

6. DISCUSSION

As newcomers of online peeragogy, 82.14% learners regard their role in online peeragogy are equal, 7.14% as mentor and 10.71% as mentee. Thus a further investigation is needed to figure out the reasons why some students regard themselves as mentors, some other students regard themselves as mentees, what will be the influence of peer's role on their critical thinking ability.

78.57% students sometimes have communicative problems, and 21.43% rarely. This data indicates students have met some problems in online communication and teachers should offer guidance on learners' online communication or provide more channels for students to have a better understanding about each other's ideas. 32.14% freshmen often facilitate peer learning, and 67.86% sometimes. 100% group mates offer help. 46.43% are very happy when sharing on the platform, 53.57% are happy. 35.71% learners regard their peers' information are very valuable, 64.29% valuable. It shows students have a clear awareness about the purpose of online peeragogy, they are willing to promote each other's learning and they are able to provide valuable assistance for each other.

85.71% learners share learning resources, and 14.29% don't. 100% learners have an access and use others' recommendation. Majority students can share their resources and ready to learn from each other, but there are still some students who do not share information with their peers. Further interview can be conducted to figure out reasons for students avoiding of sharing information.

The most beneficial group size regarded by students is 14.29% of 2 students and 82.14% of 3-5 students. Thus teachers can adopt pair work and group work of 3-5 to organize the activities online.

Ideal study partners 10.71% students think the same sex, 35.71% most of the same sex, 21.43% equal number of both sexes, and 32.14% doesn't matter. 46.43% students prefer more talented partners, 21.43% similar ability,

32.14% students they know. Therefore, teachers should take sex, ability and familiarity into consideration when dividing students into groups.

Students like to communicate with other peers in a way of 85.71% Discussing a topic, 17.86% competition within the group, 100% help and cooperate with each other, 21.43% role play, thereby cooperative tasks rather than competitive tasks being more favorable among Chinese university students.

Factors are not conducive to establishing a mutually supportive relationship between learning peers, 89.29% unclear learning goals and tasks, 75% partners are unwilling to share, 82.14 % distrust of peers and lack of emotional communication, 50% insufficient platform communication tools. Accordingly, teachers need to provide students tasks with clear goal and requirements, encourage students to share information and feelings with each other, facilitate students to build a trustful relationship and provide online platforms which can assist students to have good communication with each other.

Prerequisites for a successful peer support group 96.43% strong team leader, 96.43% peer active interaction, 100% peer trust and willingness to share, 85.71% positive evaluation and provide opinions for others. The top five leading beneficial factors for online peers are: competent, have their own ideas, active in expressing their own views, have a clear plan, and willing to help. The top five preventing factors for online peeragogy are: insufficient communication, unclear goal, lack of face to face communication, and distrust between peers. Hence online peeragogy need focus on the following three aspects to execute efficient activities: technology aspect, providing suitable and sufficient online platforms for students to communicate efficiently; teaching aspects, offering cooperative tasks with clear goal and plan, supplementing with timely and positive feedback; learners' aspect, competent, critical, trustworthy, willing to communicate and share being the requirements for ideal online peers.

7. CONCLUSION

All above findings are keep a line with [10] peer learning is a continuous loop with five focuses: organization and engagement, cognitive conflict, scaffolding and error management, communication, and affect to facilitate the pair to become self-esteemed learners by self-monitoring and self-regulating their learning habits and [12] online peeragogy activities go through four basic steps: convene, organize, cooperate, and assess. What's more, the study finds the key feature for linking the above three aspects for successful online peeragogy is communication: between students, between students and teachers, between students and materials, between students and online apps. Thus in conclusion, how to design a task or project facilitate students' communication is vital for successful online peeragogy.

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