

# Analyzing Knowledge Construction Behavior of a Project Based Online Discussion Instructional Activity Using Facebook – An Example of Art Course of Adult and Continuing Education

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**Abstract:** Social networking service (SNS) is known for its ability to facilitate people's interaction and build connections. Recent research also showed students' interest in learning activity using SNSs. Besides, few studies have also investigated the effect of adopting SNSs in learning activity. However, studies that examine knowledge construction behaviors in asynchronous online discussion using SNSs in adult and continuing education are quite limited. The purpose of this study is to explore the knowledge construction behavior in an art course which involved a project-based learning activity using a popular SNS, Facebook, as a discussion tool. Participants are comprised of 62 students in the school of continuing education of a university in northern Taiwan. The results show that students primarily share knowledge and information when discussing online. The diversity of knowledge construction is limited in the context of this study. In addition, further analysis on the relationship between students' individual differences and knowledge construction and the extent of participation suggests that there is a gender difference in and correlation between age and knowledge construction behavior. Implications and limitations are discussed while pedagogical suggestions for instructors using SNS as an online discussion tool for teaching activity in adult and continuing education are also proposed.

**Keywords:** Social Networking Service, Adult education, Continuing education, Knowledge construction, project-based learning, Facebook

## Introduction

The maturity of networking environment and information technology facilitates the applications which implement web 2.0 concepts in various fields. Among web 2.0 applications, social networking service (SNS) is known to be the most popular one. On a SNS, people can easily share information in forms of text, picture, audio and video. Regarding its popularity, SNS has attracted experts across fields in exploring its practical implications, applications and users' behavior [2].

Facebook is known to be a popular SNS in the world. According to the statistics from Checkfacebook.com, Facebook now has over 700 million users worldwide. In Taiwan, there are over 10 million Facebook users. Most of the users in Taiwan are of age between 18 ~ 34 years (65% approximately). Witnessing Facebook's highly social interactive and multi-media features, researchers also centered their focus on investigating the possibilities and effectiveness of using Facebook in teaching activity [1][14][19]. Gray (2010) points out that students are interested in learning activities involving Facebook [6]. However, it is not

addressed in their work whether the discussion process on Facebook can achieve meaningful interaction and knowledge construction. It needs further investigation.

Adult learners have special characteristics other than traditional college students; for example, they have a wide span of age, most of them have to play multiple roles in whether work or home, etc. These characteristics may thus constrain the commitment or time that adult learners can devote themselves to learning [18]. Homberg (1995) suggest that incorporating information and communication technology (ICT) in support learning help address time and location constraints [8]. Moreover, adult learners are usually more experienced and may have more individual differences. Through intensive interaction among learners, instructors and learning environment, adult learners may be able to collaboratively construct deeper understanding which leads to meaningful learning [17-18]. LeNoue et al. (2011) suggest that a well-designed SNS could provide opportunities for learners to broadly and intensively interact with each other which allow them to work collaboratively in discovering, processing information and learning with multiple styles [18].

Previous research has investigated adult social activity on Facebook [25]. However, studies that further examined the effect of using SNSs in adult and continuing education with online discussion are quite limited. Moreover, despite the fact that many studies investigated the application of online discussion to teaching [5][10][13], very few studies have conducted further analysis over learners' knowledge construction in online discussion using SNSs.

To understand the knowledge construction of adult learners in asynchronous online discussion using SNSs, this study seeks to adopt Interaction Analysis Model (IAM) [7] as coding scheme to quantitatively analyze students' online discussion content on SNS. The distribution of knowledge construction phases is to be explored in this study. Moreover, Payne and Monk-Turner (2006) suggested that each learner has his own preferred approach of learning [23]. This diversity of preferences may come from individual differences, such as gender, age, or race etc. Justice and Doman (2001) pointed out that older students are more likely to adopt higher level learning strategies. Meanwhile, older female students exhibit higher cognitive monitoring ability than their male counterpart [16]. Bye et al. (2007) suggested that age is a significant predictor of cognitive maturity and learning styles for university students [3]. Besides, previous studies have also shown there are differences in learning approach, motivation, cognitive ability and learning performance among learners of varied ages and genders [3-4][20-21].

Adult learners are known for their diversity of individual differences. Knowing the relationships among adult learners' individual differences and their knowledge construction behavior and the extent of participation in online discussion may be helpful in designing better pedagogical methods. Therefore, this study seeks to further explore the potential differences of knowledge construction phases and the extent of participation in learners of different ages and genders. Concluding from above, the objectives of this study are presented as follows:

1. To explore the distribution of different knowledge construction phases in an online discussion activity using Facebook among adult learners.
2. To explore the gender difference in knowledge construction and the extent of participation in an online discussion activity using Facebook among adult learners.
3. To explore the relationship between age and knowledge construction behaviors and the extent of participation in an online discussion activity using Facebook among adult learners.

The implications of the results are to be discussed. Furthermore, practical pedagogical suggestions and future research for adult education are also presented in this study.

## Method

### 1. Participants and procedure

Participants of this study are comprised of 62 students from school of continuing education of a university in northern Taiwan. All students have either full-time or part-time jobs. 40, or 64.52%, of participants are female while 22(35.48%) of them are male. These students are of wide span of age from 20 to 43. The course that students were enrolled is “Appreciation of Arts and Design Aesthetic”. The primary purpose of this course is to introduce major, famous, and influential artists or ideology. A project-based learning (PBL) activity that incorporated Facebook online discussion was arranged in the course. Students were divided into twelve groups with 2-7 members in each group. This project required students to jointly collect data of an artist, ideology or art movement, and collaboratively complete the project with an electronic slide for oral presentation in the classroom.

In order to understand the knowledge construction of students in Facebook discussions, closed discussion groups, i.e. secret group of Facebook, were set up by the first author for each group. Members of each discussion group are comprised of students in the same group, instructor, and the first author of this study. Students can only assess the content of their respective secret group. The course required students to discuss their project in the secret group in two weeks. Besides, after in-class oral presentation, students were also asked to reflect on both of their own and other group’s project in another two weeks. The instructor only made announcement at very beginning stage of discussion in secret group. The instructor didn’t participate or provide guidance in the subsequent discussions to avoid the instructor’s subjective guidance.

### 2. Coding Scheme and Data Analysis

To explore the students’ knowledge construction in the online asynchronous discussion process, the study adopted the IAM as the coding scheme [7]. IAM have been widely adopted as coding scheme to analyze the knowledge construction of online discussions (e.g., [9-12][15]). As shown in Table 1, the IAM coding scheme is divided into five phases (C1 -C5). Each phase represents a type of knowledge construction of discussion content while C6 refers to those not relevant to knowledge construction.

The unit of coding is a single message that students post or reply in the secret group. 585 messages in total were retrieved for content analysis. One of the authors coded each messages based on IAM as shown in Table 1. To ensure the reliability of coding, another experienced coder independently coded all messages. The Kappa of the two coders is 0.91 ( $p < 0.01$ ) which indicates high inter-coder reliability. The results of coding were thus used for further analysis.

Table 1: Interaction Analysis Model (Gunawardena, Lowe & Anderson’s, 1997)

Code	Phase	Content
C1	Sharing or comparing of information about discussion topics	Statement of observation or opinion; statement of agreement between participants
C2	Discovery and exploration of dissonance or inconsistency among participants	Identifying areas of disagreement, asking, or answering questions to clarify disagreement
C3	Negotiation of meaning or construction of knowledge	Negotiating the meaning of terms and negotiation of the relative weight to be used for various agreement
C4	Testing and modification of proposed synthesis or co-construction	Testing the proposed new knowledge against existing cognitive schema, personal experience, or other sources
C5	Agreement statement(s) or application of newly constructed meaning	Summarizing agreement and metacognitive statements that show new knowledge construction

C6	Off Topic	Discussion that irrelevant to knowledge construction
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## Results

Among the 585 message codes, the distribution of each code is as shown in figure 1. The result indicates that knowledge construction in students' discussion process was primarily C1 (sharing or comparing information about discussion topics) (86.7%). Besides, few C2 (discovery and exploration of dissonance or inconsistency among participants) was also found in students' discussion. C3 (Negotiation of meaning or construction of knowledge), C4 (Testing and modification of proposed synthesis or co-construction), and C5 (Agreement statement(s) or application of newly constructed meaning) were not observed in the discussions and thus excluded in the subsequent analysis. Moreover, the result also shows a fair proportion of C6 (off topic discussion) (12.82%).

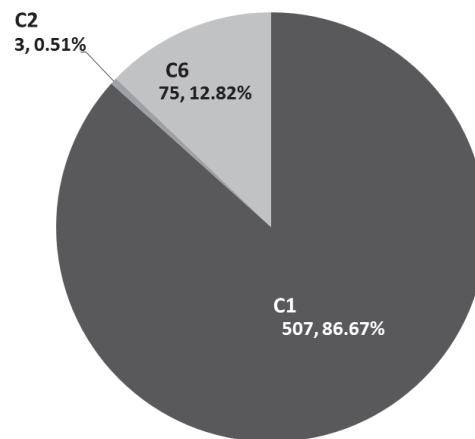


Figure 1: Pie chart of the coding of knowledge construction in the online discussion

To explore the possible gender differences of knowledge construction, this study conducted a t-test on the average number of C1, C2, and C6 between different genders of participants. As shown in Table 2, the results suggest that, in average, females have more off topic discussions (C6) than males do.

Table 2: Results of t-test for mean difference in knowledge construction in gender

Code	Gender		t
	Female (n=40)	Male (n=22)	
	M (SD)	M (SD)	
C1	8.70(6.91)	7.23(7.63)	- .77
C2	.05( .22)	.05( .21)	- .08
C6	1.53(1.93)	.64(1.09)	-2.31*
* p<.05			

To understand the relationship between students' age and knowledge construction, this study employed Pearson correlation analysis of students' age and C1, C2, C6 code respectively. The results show that students' age is significantly correlated with C2 ( $r = .341$ ,  $p < 0.01$ ) and C6 ( $r = 0.309$ ,  $p < 0.05$ ).

The extent of students' participation, i.e. the number of posts of each student, in online discussion and its relationship with students' age and gender were further examined. The

extent of participation was assessed by classifying the 585 messages into new posts (i.e. posts that initialize a new discussion thread) and reply posts (i.e. posts that reply others' messages) for each student. In addition, students' total posts refer to the summation of their respective total number of new posts and reply posts. The higher the number is, the higher the extent of a student's participation in online discussion is. Table 3 exhibits results of t-test of the extent of participation in different genders. The results show that there is no significant difference between females and males in terms of participation. Moreover, the Pearson correlation analysis of age and the extent of participation was conducted. The results showed that age has no significant correlation with whether new posts, reply posts or total posts. Interpretation and discussion of the results are to be presented in the following section.

Table 3: t-test of mean differences in the extent of participation in genders

Post categories	Gender		t
	Female (n=40)	Male (n=22)	
	M (SD)	M (SD)	
Total posts	10.28(7.71)	7.91(8.20)	.96
New posts	6.73(7.10)	4.59(4.88)	.22
Reply posts	3.55(3.11)	3.32(5.67)	.14
* p<.05			

## Discussion and Conclusion

The purpose of this study is to explore students' knowledge construction in the context of incorporating SNSs to support asynchronous online discussion in adult and continue education. Facebook, a popular SNS, was chosen to support a project based discussion activity for 62 students enrolled in the course - Appreciation of Arts and Design Aesthetics. A total of 585 messages which discuss the assigned PBL activity in the course were retrieved for content analysis.

As the results of content analysis show, students' knowledge construction is primarily knowledge and information sharing (C1=507, 86.7%), little exploration of inconsistency among participants (C2=3, 0.5%) was observed during the online discussion. Negotiation of meaning or construction of knowledge (C3), testing and modification of proposed synthesis or co-construction (C4), and agreement statement(s) or application of newly constructed meaning (C5) were not found in this study. Consistent with previous studies, in the context of incorporating asynchronous online discussion, students' knowledge construction is mostly knowledge and information sharing [7][15].

However, the results from related studies, which adopted college students as participants, showed fair proportion of C2 and C3 [10][13]. These findings are not found in this study. One possible explanation is that the time for students to discuss was not ample enough. Schering (2011) points out that the ample time for online groups to discuss and reach a consensus of the project is necessary considering the characteristics of distance learners [24]. Adult learners usually play multiple roles in both work and home which may constrain their time and effort in learning [18]. Therefore, to achieve richer multiplicity of knowledge construction, they may need more time to reflect and give feedback to the project discussion than traditional college students do. All participants in this study have either full- or part-time jobs; therefore, deeper and increasing diversity of knowledge construction may not be achieved within few weeks.

Another plausible reason could be the topics of project are not controversial. Paulus (2005) pointed out the type of group project could influence students' decision on working the project



cooperatively or collaboratively [22]. According to Paulus (2005), project designed for collaborative learning requires student working collaboratively in reaching a consensus. On the other hand, project designed with cooperative approach, students may be able to distribute the workload to each member. They could thus work independently instead of collaboratively reaching a consensus. The project activity in this study required students to collect and present information of specific artists. Meanwhile, the instructor didn't give obvious rubrics or guideline of the project's final presentation. Therefore, student may distribute the project work by assigning each group member to collect specific data. In this way, students may relatively not need to seek a consensus or negotiate on the dissonance between members' ideas, which in turn, lead to the lack of depth and diversity in knowledge construction behavior.

To further explore the relationship of adult learners' individual differences with knowledge construction and the extent of participation, this study conducted mean difference and correlation analysis of knowledge construction phases and the extent of participation in students of different ages and genders. The results suggest that females show more off topic discussions than males do. Besides, correlation analysis shows that student's age exhibits significant positive correlation with discovery and exploration of dissonance or inconsistency among participants (C2) and off topic discussion (C6). For C2, one possible explanation could be that older adults have better metacognitive knowledge and ability which may be influenced by past academic or life experience [4]. Thus, they were able to discover the dissonance or inconsistency of other members' ideas. For off topic discussion (C6), previous research suggests that older learners relatively more appreciate the opportunities and experiences of learning. Furthermore, they would apply various strategies in compensating the compressed time due to commitment in work or family [4]. This situation may drive them to participate in online discussion more often than younger students, even off topics.

Monk-Turner and Payne (2004) found gender differences in perceptions of group project [20]. Despite the fact that females are more likely to perceive that they did more work than males did, they are less likely to perceive that they devote meaningful contribution to the group project than males are. In this study, females, comparing to males, might be more likely to post encouraging messages or report the current status of project which were coded as off topic discussion (C6) in content analysis. This phenomenon may serve as a plausible explanation for gender difference in C6.

Previous studies showed gender differences in perception of participation of group project [20] and higher participation in class discussion of non-traditional, i.e. older, students than traditional college students [4]. However, in this study, the extent of participation has neither statistically differences in genders nor correlation with students' age. One plausible explanation could be that the project-based activity in this study asked students to collect information about artist(s). Besides, the instructor also asked all group members to join the discussion in the Facebook. In this information age, people can easily surf the internet and retrieve abundant information. Students may have brief discussion of distribution of work. Each group member could then collect data of a specific part of the whole project and post them on the Facebook. Therefore, all group members, regardless of their gender and age, may exhibit certain extent of participation in terms of posting collected information. This phenomenon might explain both the majority of C1 in knowledge construction codes and the insignificant results of statistical analysis.

### **Suggestions for pedagogical practice**

Based on the research findings, this study proposes suggestion for pedagogical practice as following:

1. **Allowing ample time for project discussion:** Regarding to the multiple roles that adult learners may play, they may not be able to promptly give response or feedback to the

discussion content. Thus, relatively longer time for the discussion might be necessary for adult learners to achieve meaningful online discourse.

2. **Setting controversial topic and clearly specifying the goal of project:** For example, comparing the achievements of artists in the same era or ideology with their influence over the subsequent thinking of art; in this way, students have to collaboratively achieve the consensus over the project topic instead of working cooperatively but independently. A richer multiplicity of knowledge construction is expected to be shown in the interactive process of students' reaching a consensus.
3. **Increasing the structure of online discussion activity:** Gilbert and Dabbagh (2005) suggest that providing criteria or structural guideline, such as addition of posting protocols or evaluation rubrics, is helpful in achieving meaningful online discussion [5]. Thus, this study suggests that the instructors should give the guideline or evaluation rubrics as scaffolds for student to post their messages.
4. **Focusing on developing effective pedagogical strategies:** Among current SNSs, this study adopted Facebook, which has the largest user base, as the discussion tool. Most of the students have experiences in using Facebook to interact with others and are familiar with its interface. However, incorporating technology itself doesn't automatically drive meaningful learning [17]. Rather, a well-designed pedagogical strategy, which utilizes the benefits of SNSs, could be a key to foster effective learning. Gray (2010) pointed out it could be a challenge for both students and instructors when incorporating Facebook in the learning process [6]. Therefore, the focus should be placed on how to design pedagogical strategies which can improve the depth and multiplicity of students' knowledge construction.

### Research limitations and future research

This study investigates students' knowledge construction phases in asynchronous online discussion process of the Art introductory course which incorporates Facebook as a discussion tool. The characteristics of the art course may limit the generalization ability of this study. Therefore, future research could further apply Facebook in supporting students' discussion in various courses or disciplines other than Art related courses. In addition, future studies are suggested to explore students' cognitive phases and knowledge structure in the process of online discussion. Furthermore, integrating advanced analysis techniques could help depict a clearer picture of adult learners' asynchronous online discussion behavior using Facebook. For example, a sequential analysis of adult learners' online discussion behavior in Facebook could advance the understanding of their behavioral patterns in discussion process. Also, a qualitative analysis of students' discussion content is also helpful in exploring the patterns and meaning of their discussion. Lastly, the multiplicity of knowledge construction is not observed in this study, the lack of ample time for online discussion could be the possible reason. Future research is suggested to investigate into the relationship between the length of time for discussion and the multiplicity of knowledge construction.

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