Group Communication and Interaction in project-based Learning: The Use of Facebook in a Taiwanese EFL Context

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Abstract. This study shows how Facebook and its interactive and collaborative features can help English as a foreign language (EFL) undergraduates to process and reconstruct knowledge regarding project-based learning. The research questions included: What types of communication interaction behaviors do participants exhibit? How do participants behave at various stages? How do student collaborations on Facebook help them to process and reconstruct knowledge regarding the EFL project? Open-coding and content analysis were conducted to determine what learners discussed and their communication patterns. The results confirmed that collaborative interaction on Facebook facilitated EFL and project-based learning (PBL). Among the various topics that students discussed, shared, and explored on Facebook, they linked existing knowledge with new stimuli to gain a new understanding of their experience. They developed technology skills, shared problem-solving ideas, gained academic knowledge, and finally completed the project successfully. Contributions and limitations of this paper are discussed as well.

Keywords: Collaborative Learning; Interaction Process; Project-Based Learning; EFL Learning; Facebook; Computer-Assisted Language Learning

INTRODUCTION

The popularization of the Internet and the convenience of online social utilities have changed how people communicate and influenced how students learn. Online networking sites enable students to transmit files, share resources, and send instant messages without time and space limitations. Although strengthening the interface design of these sites is essential, understanding how learners use these sites is even more crucial for educators. Without meeting face-to-face, successful network learning depends largely on communication and interaction skills. The results from analyzing these interactions might serve as references to improve teaching and learning quality, which is worthy of serious consideration. Using the social network purposively as a primary learning platform is more complex than using it to facilitate academic communication after school, particularly when it involves teamwork projects. This study employed project-based learning (PBL) and applied the leading social network, Facebook, as a primary forum for students to conduct a project.

English is the most commonly studied foreign language in Taiwan. Students are required to learn English as a foreign language (EFL) at various levels of schooling. Several studies (Allen & Rooney, 1998; Legg, 2007; Eguchi & Eguchi, 2006; Azman & Shin, 2011) have discussed EFL or English as second language (ESL) learning in the PBL environment. Other studies (Razak, Saeed, & Ahmad, 2013; Hassan & Muhi, 2012; Omar, Embi, & Yunus, 2012; Suthiwartnarueput & Wasanasomsithi, 2012) have examined how Facebook assists EFL and ESL students in enhancing their English ability. However, few studies have investigated how Facebook assists PBL, particularly in EFL settings. This paper explored how Facebook is used in constructing knowledge when working within an EFL project-based learning environment. Text communication on Facebook was analyzed to identify participant communication interaction behaviors and their learning process.

LITERATURE REVIEW

Project-based learning

Learning-by-doing has been recognized as the most effective learning approach (Lombardi, 2007), and most educators consider projects as representing learning-by-doing (Blumenfeld et al., 1991). Thus, numerous researchers and instructors adopt a positive attitude toward PBL. PBL is a comprehensive perspective concentrated on instruction by involving students in investigation

(Blumenfeld et al., 1991). In PBL, students collaborate in groups to solve authentic and curriculum-based problems, and decide how to approach a question and what activities to pursue (Solomon, 2003). PBL provides the student autonomy over and responsibility for what is learned, moves learners toward expert knowledge, and encourages them to explore and examine various problems and resources to construct strategies for solving these problems, and to negotiate and share information (Grant & Branch, 2005).

PBL projects include several key features. First, every project must have its own specific purpose, because the desire to achieve this goal is a substantial factor in collective and emotional involvement (George & Leroux, 2001). Second, the activities related to projects should be interesting and meaningful to students (Blumenfeld et al., 1991). Third, the problems associated with projects must be challenging to learners (Thomas, 2000; Solomon, 2003; Meyer, Turner, & Spencer, 1997). Fourth, upon completion of the project, students must produce artifacts, such as works or productions (Blumenfeld et al., 1991). Finally, and most crucially, the real-world focus of projects is central to the PBL process (Solomon, 2003). Researchers have observed that knowledge is contextualized and that students solve real problems in situations where they use strategies, tools, and resources (Krajcik et al., 1994). In PBL, students are motivated to persist, integrate previous knowledge with new experiences, and generate rich domain-specific knowledge and problem-solving strategies to apply to real-world problems (Blumenfeld et al., 1991; Herrington, Oliver, & Reeves, 2003; Lombardi, 2007).

Authentic questions are crucial because they involve certain distinguishing characteristics (Reeves, Herrington, & Oliver, 2002): real-world relevance requires learners to define the necessary tasks to complete the activity, comprising complex tasks for learners toward sustained investigation, the opportunity for learners to examine the task with multiple sources and perspectives, the opportunity to collaborate, the opportunity to reflect on learning, integrating an interdisciplinary perspective, integrating assessment and reflecting real-world evaluation processes, creating polished products that are valuable to learners, and allowing diverse outcomes and multiple solutions.

PBL relies on group members to take full responsibility for their learning (Milentijevic, Ciric, & Vojinovic, 2008). Learners seek solutions to realistic

problems by asking and refining questions, discussing ideas, making predictions, drawing up blueprints, collecting and analyzing data, deriving conclusions, communicating to others, forming new questions, and creating works or productions (Blumenfeld et al., 1991). The teacher's role in the PBL project is a consultant, assistant, or facilitator (George & Leroux, 2001; Thomas, 2000). In problem-focused learning, teachers break down tasks for scaffold instruction, initiate strategies for thinking and problem solving, and gradually transfer responsibility to the students (Blumenfeld et al., 1991).

The potential advantages of PBL (Frank & Barzilai, 2004; Blumenfeld et al., 1991; Grant & Branch, 2005) include students developing an integrated and deep understanding of content. The process of investigating and pursuing solutions to problems enables learners to acquire an understanding of critical concepts and principles. Second, students learn how to work with people to discover answers to questions. Third, the PBL approach fosters responsibility and independent student learning. Fourth, students are engaged in various types of task, which meets the learning needs of students. Fifth, students can develop long-term competencies, such as literacy skills and thinking skills. Sixth, student motivation and interest are increased through managing relevant issues. Seventh, the flexible PBL environment provides opportunities for students to make decisions regarding their abilities, resources, and plans.

A PBL project must meet five criteria (Thomas, 2000). First, centrality: PBL projects are not subordinate to the curriculum; they are the central teaching strategy. Learners encounter and acquire central concepts of the discipline through the project. Second, driving questions: PBL projects focus on driving questions or ill-defined problems that drive learners to encounter and struggle with conceptual knowledge. Third, constructive investigations: the central activities of PBL projects involve knowledge transformation and construction. Fourth, autonomy: PBL projects do not finish at a predetermined outcome or take predetermined paths; they should include considerable learner autonomy, choice, unsupervised work time, and responsibility. Fifth, realism: PBL projects focus on realistic challenges of authentic problems, and the solutions have the potential to be implemented.

Certain studies have addressed how PBL assists EFL or ESL students in enhancing their English ability. Allen and Rooney (1998) used a

cooperative-learning, problem-based approach with ESL students in business communication at Western Michigan University and concluded that the approach benefitted students by giving them the confidence and experience they needed to communicate and compete successfully in their courses. Eguchi and Eguchi (2006) adapted English magazine projects to help develop the speaking and writing abilities of 44 low-level EFL learners in Japan. The projects were positive in participant satisfaction, but did not exert a substantial effect on their English learning. A possible explanation might be the lack of natural contact with native English speakers outside of the classroom. Azman and Shin (2011) assessed implementing PBL in the ESL classroom with 32 undergraduates in Malaysia. The findings showed that the participants had positive perceptions of PBL, and that PBL exerted a positive effect on their language skills, particularly on speaking skills. The study also suggested that PBL can be successfully implemented on a small scale.

Technology-assisted learning

Educators have emphasized PBL for decades, and the current trend is to use technology to support it. Blumenfeld et al. (1991) claimed that technology can serve as a powerful tool to enhance learner motivation to perform projects and to assist learners in completing projects. Jonassen, Carr, and Yueh (1998) argued that technologies should serve as knowledge construction tools with which students learn. Liaw, Chen, and Huang (2008) observed that web-based technology can serve as a potential tool for collaborative learning because it enriches learning performance by constructing individual knowledge and group-sharing knowledge.

Certain scholars have explained the reasons why technology support is superior to regular classroom settings in PBL learning. Finger et al. (2006) argued that typical academic environments undermine the effectiveness of collaborative learning projects for three reasons. First, scheduling and attending meetings are often difficult for students, and certain team members might miss key information and decisions. Second, students do not typically have a dedicated meeting space. Various artifacts produced at the end of a meeting must be distributed among team members. However, no one can reconstruct the meeting. Third, students rely on the personal recall of these distributed artifacts when formulating new information, but the necessary coconstruction of knowledge is lost during the project cycle. Thus, Finger et al. proposed that

computer-mediated support meets the demands of collaborative work by providing information mobility, flexibility, and persistence.

Certain applications of communication and information technologies are designed to fulfill the needs of PBL and enhance the efficiency of project-based instructional form in practice (Collis, 1997). However, traditional online discussion forums are ineffective at recreating the natural social interaction between learners and the response and participation rates are low (Miller, 2013). This might be because students are unfamiliar with the software, or that it is difficult to relate the software to their lives. Crews and Stitt-Gohdes (2012) indicated that implementing social network sites into courses offers a familiar environment for learners.

Numerous studies support using social networking for community building and for enhancing learner engagement in higher education settings (Toliver, 2011). Virtual communities enable students to work in small groups to achieve shared goals and to reinforce their commitment to the values inherent in collaborative learning (Cerda & Planas, 2011). Thus, the author proposed that popular social networking sites, such as Facebook, serve as an ideal learning facilitator for PBL.

With over 500 million registered users, Facebook has proven to be one of the most prominent social networking sites in recent years (Cerda & Planas, 2011; Wang et al., 2012), and has become an essential aspect of many students' daily routine (Charlton, Devlin, & Drummond, 2009; Toliver, 2011). Because of its unique built-in functions offering pedagogical, social, and technological affordances, it has great potential in the educational field (Wang et al., 2012). From the viewpoint of the educational potential that Facebook offers for collaborative working, Facebook functions are not limited to behaviors involved in a shared objective (e.g., discussing topics, offering opinions, organizing events, sending information, sharing ideas and proposals, elaborating content). These functions include a social sense of belonging, developing personal relationship networks in cyberspace, switching from simple information sharing to learning and professional development, motivating learners, and forming a virtual learning community (Cerda & Planas, 2011).

The advantages of Facebook are that students already use it in their daily lives, reading posts on their Facebook status page and commenting immediately

(Miller, 2013). Individual actions are posted on the accounts of others, giving them the chance to reply, thus creating enriching and complex lines of social interaction, and generating learning and collective intelligence networks (Cerda & Planas, 2011). Moreover, Facebook displays who has read the entries, which forces students to recognize and remember those messages.

Several studies have reported that the use of Facebook promotes student motivation, satisfaction, classroom climate, and student-instructor relationships (Wang et al., 2012). The convenience of using Facebook helps foster participation in the online discussion and facilitates a sense of community within the course (Miller, 2013). Facebook is an inclusive interaction paradigm, representing a valuable chance to cultivate knowledge and intergroup cohesion (Cerda & Planas, 2011).

Several studies have highlighted the advantages of integrating Facebook in EFL and ESL classrooms. Razak, Saeed, and Ahmad (2013) investigated 24 Arab EFL learners using Facebook as a learning environment in writing English. The findings revealed that the amount of EFL learner participation in the writing activities greatly increased, the learners were motivated to generate ideas, and they regarded the Facebook group as an interactive learning environment that contributed to enhancing their writing. Hassan and Muhi (2012) surveyed and interviewed 50 Saudi EFL learners who used Facebook informally to improve their language, and the results showed that the participants held positive attitudes toward it. Omar, Embi, and Yunus (2012) used Facebook as a platform for the information-sharing task of 31 ESL learners in Malaysia. They received extremely positive feedback from the participants, suggesting that Facebook is a promising virtual tool and environment to enhance interaction in English learning. Suthiwartnarueput and Wasanasomsithi (2012) used Facebook as a medium for grammar and writing discussions among 83 low-intermediate EFL students in Thailand. The results showed that Facebook provided participants with a convenient and attractive means to engage in discussions, and they had positive attitudes toward using Facebook for learning grammar and writing.

Although previous studies have elucidated how Facebook can be used to encourage learning in EFL or ESL settings, scant empirical study has been conducted to analyze how Facebook interactions help students achieve their learning goals. Little is known about how Facebook is used for PBL and for

enhancing the interactive process. Investigating how learners use and make sense of this highly interactive virtual social network is essential (Mazer, Murphy, & Simonds, 2007). Instructor knowledge about the feedback provision during the learning process can assist them in obtaining insights into how to improve learning (Rowntree, 1987; Backer, 2010). To fill the literature gap, the author adopted a case study approach to explore group interaction behavior by applying Facebook to PBL to clarify learners' communication process.

Study framework

Grant and Branch (2005) referred to PBL as an example of a learner-centered learning approach that adopts cooperative and collaborative learning. Furthermore, Milentijevic, Ciric, and Vojinovic (2008) indicated that PBL is a constructivist pedagogy. Thus, the author inferred that the theoretical basis of PBL lies in learner-centered learning, constructivism, and collaborative learning. Learner-centered principles focus on integrating the needs, skills, interests, and backgrounds of learners into curriculum planning (Chou, 2004). PBL engages students in various types of tasks, and each team member contributes personal characteristics to acquire knowledge through the process. The crucial aspect of the learning process is that students are exposed to diverse perspectives in a problem-solving case and draw a self-selected conclusion on a specific topic (Chou, 2004).

Students acquire more effective knowledge when they can combine their experience with the course materials and make sense of them. Student learning enhances in the process of constructing knowledge (Chou, 2004). Constructivism is one of the primary learning theories (Mason & Rennie, 2008; Gunawardena et al., 2009; Ractham, Kaewkitipong, & Firpo, 2012). Constructivist concepts of learning assign primary significance to how students attempt to make sense of what they are learning and actively construct their knowledge by working with and using ideas (Krajcik et al., 1994). Recent learning theories have stressed the social and constructivist aspects of the learning process (Jonassen, Carr, & Yueh, 1998). Social constructivism is grounded on the concept that a person constructs knowledge through the process of negotiating meanings with other people (So & Brush, 2008).

A constructivist online learning environment emphasizes knowledge construction through social interaction (Chou, 2004). Certain characteristics of

social constructivist learning correspond with social networking technology: students are actively involved in the learning process, learning occurs in a social context, students engage in a learning relationship with each other in active knowledge construction, students can construct their own learning environment, and students can access data whenever they want (Ractham, Kaewkitipong, & Firpo, 2012). Learning occurs in a social context in which students interact with and internalize modes of knowing and thinking that are represented and practiced in a group and draw on the expertise of team members (Krajcik et al., 1994). In PBL, social interaction is based on collaborative learning. Collaboration in problem-oriented learning stresses inter- and intragroup interactions, where learners actively participate in the learning process while solving problems as a group (Collis, 1997).

Collaborative learning provides opportunities for students to develop, examine, and evaluate their thoughts with group members (Chou, 2004), and might motivate learners to prepare more thoroughly to avoid disappointing other team members (Umble, Umble, & Artz, 2008). Successful collaborative learning involves the constant generation, transfer, and understanding of knowledge (Liaw, Chen, & Huang, 2008).

METHODOLOGY

Research questions

Previous studies have reported that group sharing and discussion are productive learning strategies (Umble, Umble, & Artz, 2008). Certain studies have focused on PBL effectiveness, and some papers have stressed the advantages of Facebook in an educational setting. However, few studies have examined the PBL process by using Facebook, particularly in the EFL context. Therefore, this study examined the extent to which EFL college students use Facebook, and analyzed the approaches and experiences of learners using Facebook to assist in their project. The objective was to gain insight into the potential use of online social networks for learning and teaching in the EFL project context and in higher education.

The study was guided by the following research questions:

1. What types of communication interaction behavior do participants exhibit?
2. How do participants behave at various stages?
3. How do student collaborations on Facebook help them process and

reconstruct knowledge about the EFL project?

Method

The current paper employed a case study research method to examine the patterns of EFL learner–learner interactions in a Facebook-based PBL course in a learner-centered and collaborative instructional design. Open-coding and content analysis were conducted to determine what learners discussed and their communication patterns. Because of the small-scale sample size, descriptive statistics was used to analyze the collected participant data that served as the qualitative evidence.

Participants

The participating students of the study included six undergraduates studying Applied English in Central Taiwan. These students were selected from a project course that they were required to complete to meet their program criteria. They all cited Mandarin Chinese as their mother tongue, but the project artifacts were required to be in English. In the project course, these students were required to complete the project as a team within 16 months, and they met their exclusive instructor once a week for 1 hr. PBL was the central teaching strategy in this case. Students could vote for their team leader and had the freedom to choose their project theme as long as it was related to what they had previously learned. They could decide how to approach the project theme and what activities to pursue in an interesting and meaningful approach.

The participating students took a research method course for one semester before starting the project course. This experience equipped them with basic knowledge to perform the project effectively. The English proficiency level of all participants was intermediate; the consistency lowered the variation and simplified the difference between students. They were all familiar with Facebook and already used it in their daily lives.

Procedures

Participants were required to discuss the project in an exclusive Facebook group. To create a free and natural discussion environment, students could write in either Chinese or English. The project productions included a contract, a thesis in English, and a presentation in English. The project involved various challenges. First, the students were required to find an enterprise related to their

project theme and sign a contract with the company. The contract did not involve money, but simply showed support and identification. Second, the students were required to write a thesis in English. The thesis included research background, motivation, literature review, questionnaire design, expert validity, data collection, result analysis, conclusion, and suggestions. The thesis findings had to benefit the enterprise and solve problems for them. Contacting an enterprise and trying to solve related questions added authenticity to the project. Third, at the end of the project, the students were required to conduct a formal presentation in English in front of three faculty judges, and English slides were required during the presentation.

The students took full responsibility for their learning. The team instructor served as a facilitator to guide students as they engaged in the project. The instructor's task primarily included discussing with students the difficulties they encountered in the process and proofreading their thesis and presentation draft. The instructor offered guidance through Facebook or in weekly meetings. The text communication of the instructor was minimal.

Data analysis

The project duration was 16 months, and was divided into three stages: preparing, executing, and finishing (Yueh & Chung, 2005). The first stage tasks included selecting a project theme and finding a suitable enterprise. The executing stage consisted of data collection, various learning activities, and completing the thesis. The final stage goals involved preparing the presentation and reflection.

Open coding and content analysis were used to identify student-learning themes and patterns. Based on previous research (Chou, 2004; Jensen & Chiberg, 1991; Yueh & Chung, 2005), this paper divided online messages into procedural-oriented interaction, task-oriented interaction, and relationship-oriented interaction. Procedural-oriented interaction included diverse administrative behaviors to maintain the project progress. Task-oriented interaction involved various behaviors directly related to the project. Relationship-oriented interaction contained diverse social behaviors. Unlike certain educational online systems, Facebook records text communication, but does not calculate the data. To proceed with content analysis, each of the text messages were coded by the researcher. Because of the large amount of

qualitative data, the data was read multiple times before and after open coding and content analysis. To maintain completeness, the analyzed data included both students and their instructor because of the influence of the instructor on student behaviors.

RESULTS AND DISCUSSION

Research Question 1: What types of communication interaction behaviors do participants exhibit?

The participating students employed Facebook to discuss a wide range of topics related to their project. A total of 2,223 entries and responses were analyzed in this study. Based on the researcher's inductive analysis of the text communication, each interaction type was categorized into 5 to 14 communication acts. The agreeing behavior included words with agreement meaning and the "Like" button on comments. Table 1 shows the basic information regarding the interaction behaviors of participants. The descriptive statistical data reveals that the students most commonly used Facebook to agree with others on task-oriented issues (15.5%), propose suggestions (12.1%), and provide information (10.2%).

Relationship-oriented interaction includes 14 communication acts, which is the highest among the three interaction types. This result implied that students performed complex social behaviors during this period, and learned with social support. Among the three types, task-oriented interaction was the highest (52.7%) among all participants. Table 2 reports the interaction behaviors of participants.

Table 3 illustrates the number of posts and responses. The team leader made the most posts, and the instructor made the least posts. Certain students were more active than others were. Certain students might serve as leaders, whereas others might be followers. Each student performed various roles and contributed personal characteristics. The information shown in Tables 1, 2, and 3 demonstrates that Facebook offers students a space to share and interact with others on topics directly related to their project, and meets their administrative and social needs.

The social and emotional support (such as encouraging, reminding, volunteering, caring, praising, and appreciating) shown in this study indicated the potential of Facebook in promoting social interactions that can benefit knowledge development. Students did not become discouraged when they encountered difficulty regarding their project and English problems. Certain social behaviors (such as volunteering, apologizing, and self-blaming) in this case might indicate that students attempted to avoid disappointing other team members, and tended to prepare more thoroughly. This confirms the assertions of Umble, Umble, and Artz (2008), regarding how collaborative learning motivates learners.

The analysis process yielded several intriguing findings. First, although this was an EFL project, all participants communicated in Mandarin Chinese unless it was necessary to use English. This might have been caused by a lack of confidence in using the English language, insufficient English ability, or simply feeling more comfortable with their mother tongue. Second, when the instructor posted guidance or when someone passed on the instructor's message, the student responses tended to be more polite, typically exhibiting "agreeing" behavior, and fewer opinions were expressed. This phenomenon might be related to the cultural background of the students, because Taiwanese people generally value status and formality, and students are typically restrained and polite to show respect to their teachers.

Table 1. Participant Performance of Communication Acts

Interaction type	Communication acts	Number	Percentage
Procedural-oriented	Making an appointment/ Contacting each other	214	9.6
	Setting a deadline	19	0.9
	Assigning tasks	94	4.2
	Agreeing	100	4.5
	Confirming progress	20	0.9
	Total	447	20.1
Task-oriented	Instructor guidance/ Passing on instructor messages	66	3.0
	Asking questions	122	5.5
	Proposing suggestions	269	12.1

	Providing information	226	10.2
	Agreeing	344	15.5
	Checking and revising	2	0.1
	Sharing resources	142	6.4
	Total	1,171	52.7
Relationship-oriented	Greeting	19	0.9
	Making a joke	83	3.7
	Chatting	81	3.6
	Agreeing	84	3.8
	Expressing anxiety/confusion	45	2.0
	Reminding	24	1.1
	Easing the atmosphere	8	0.4
	Self-encouraging/Encouraging others	37	1.7
	Apologizing/Self-judgment/Self-blaming	20	0.9
	Self-defense	20	0.9
	Requesting help/Volunteering	118	5.3
	Caring/Responding to caring	18	0.8
	Expressing appreciation/ Responding to appreciation	36	1.6
	Praising peers	12	0.5
	Total	605	27.2
Total		2,223	100

Table 2. Participant Interaction Behaviors

	Procedural-oriented	Task-oriented	Relationship-oriented	Total
Student 1	80 (18.1%)	235 (53.3%)	126 (28.6%)	441 (100%)
Student 2	110 (19.9%)	310 (56.1%)	133 (24.0%)	553 (100%)
Student 3	67 (19.6%)	158 (46.2%)	117 (34.2%)	342 (100%)
Student 4(Team leader)	124 (20.7%)	328 (54.9%)	146 (24.4%)	598 (100%)
Student 5	23 (22.1%)	50 (48.1%)	31 (29.8%)	104 (100%)
Student 6	40 (22.9%)	83 (47.4%)	52 (29.7%)	175 (100%)
Instructor	3 (30%)	7 (70%)	0 (0.0%)	10 (100%)
Total	447	1,171	605	2,223

Table 3. Number of Posts and Responses Posted

Participant	Number of posts	Number of responses posted	Total	Percentage
Student 1	52	389	441	19.8
Student 2	56	497	553	24.9
Student 3	56	286	342	15.4
Student 4(Team leader)	142	456	598	26.9
Student 5	9	95	104	4.7
Student 6	19	156	175	7.9
Instructor	4	6	10	0.4
Total	338	1,885	2,223	100

Research Question 2: How do participants behave at various stages?

The study performed a chi-square test to determine any significant differences in participant interaction types regarding stages. The results presented in Table 5 indicate a significant difference. The number of interaction types at various stages is illustrated in Table 4. Task-oriented behaviors showed a higher level than procedural-oriented and relationship-oriented behaviors did. The participants presented a higher percentage of task-oriented interaction, consistent with previous studies (Chou, 2004; Yueh & Chung, 2005). The outcome might have been caused by the distinct behaviors or attitudes (such as strategic experience and goal setting) of students in higher education (Yueh & Chung, 2005). The students who joined this study were undergraduates, and should be goal-oriented and project-focused.

Table 4. Interaction Types at Various Stages

	Procedural oriented	Task oriented	Relationship oriented	Total
Preparing	41 (22.6%)	74 (40.9%)	66 (36.5%)	181 (100%)
Executing	331 (22.7%)	773 (53.0%)	355 (24.3%)	1,459 (100%)
Finishing	75 (12.9%)	324 (55.5%)	184 (31.6%)	583 (100%)
Total	447	1,171	605	2,223

Table 5. Chi-square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson chi-square	40.546(a)	4	.000
Likelihood ratio	42.378	4	.000
Linear-by-linear association	9.488	1	.002
Number of valid cases	2,223		

0 cells (.0%) have an expected count less than 5. The minimum expected count is 36.40

Research Question 3: How do student collaborations on Facebook help them process and reconstruct knowledge about the EFL project?

The content analysis of the entries and responses of the Facebook group indicated that the students who engaged in the project experienced and demonstrated one or more aspects of knowledge development regarding problem-solving in this EFL project.

Solving Problems by Using Technologies

The participating students attempted to solve certain problems they encountered by learning new technologies. One student made suggestions or shared resources when certain software or tools enhanced the project, and the other students followed. For new technologies, students used Google Drive to store files and Google Docs to design online questionnaires; they filmed video clips to enrich their presentation and used iPads to hold webcam conferencing when they could not meet in person; they used Skype to discuss current topics and learned to use Prezi instead of Powerpoint to show their slides. Table 6 summarizes brief examples of student technology use to assist their project.

Table 6. Examples of Student Technology Use for Project Assistance

Communication acts	Examples
Making an appointment	• "If I forget to show up on webcam conferencing on Saturday night, please call me." (Student 2) • "Let's go to Skype and talk about it now." (Student 2)
Making suggestions	• "One of my friends uses Google Docs to

	conduct surveys. Can we do that as well?" (Student 1)
	● "I found a cool way to conduct presentations (http://prezi.com). If you have any questions, please feel free to ask me." (Student 3)
Providing information	● "You can see the number of participants so far and the responses in Google Docs." (Student 4)
	● "I recorded two video clips using a single-lens reflex camera with full HD video. I will send the attachment to you later." (Student 1)
Asking for help	● "I don't know how to edit the questionnaire on Google. Could someone help me with that?" (Student 1)
	● "Why can I only see the questionnaire questions, but not the responses?" (Student 1)
Volunteering	● "I am the person who proposed using Prezi as a presentation tool, so I am responsible for teaching you how to use it." (Student 3)

Solving Problems Related to Contacting With Native English Speakers

The students all cited Mandarin Chinese as their mother tongue, and their English proficiency level was intermediate. Contacting and communicating with native English speakers posed a challenge for them. However, they decided to ask 100 Americans to fill out the questionnaire. During the survey, they attempted to locate Americans, and had to explain the questions to them individually. Table 7 presents a brief summary of the examples of student ideas for contacting Americans to complete the survey. Facebook provided a forum that enabled students to share their ideas on how to contact native English speakers.

Table 7. Examples of Student Ideas for Contacting Americans

Communication acts	Examples
Making suggestions	● "We can go to kindergartens or cram

	schools to find Americans to fill out the questionnaire" (Student 4)
	• "How about chatting on Omegle so we can meet Americans who might be willing to help us?" (Student 4)
	• "We can post the questionnaire on the Facebook wall." (Student 4)
Volunteering	• "Tomorrow I will go to school and ask foreign teachers to fill out the survey." (Student 1)
	• "I will call the language centers of nearby universities to see if there are foreign teachers who can help us conduct the survey." (Student 4)

Solving Problems Related to Academic Knowledge

Because the participating students were not proficient at English, they decided to first discuss the thesis content in Mandarin Chinese, and each team member was subsequently responsible for part of the translation. The finished translation was posted on Facebook and team members conducted proofreading for each other before handing in to the instructor. Thus, learning occurred in the social context and students took advantage of team member expertise. Students reconstructed knowledge by learning new knowledge through collaborating and building on their previous experience

Table 8. Examples of Student Understanding of Academic Knowledge

Communication acts	Examples
Asking for help	• "I have translated "The Overview." Please see the attachment and give me some feedback." (Student 2)
	• "Could you check the grammar for me?" (Student 4)
Making suggestions	• "You should put "s" at the end of "custom" because it is a countable noun." (Student 1)
	• "There are two verbs in your sentence. You should rephrase it." (Student 6)

	• "You can put "ing" at the end of "know" so that you don't need to rephrase your sentence." (Student 1)
Appreciating	• "Thank you for your reminder about grammar." (Student 4)
Volunteering	• "Please notify me when you finish writing. I will check the APA format." (Student 4)

CONCLUSION

Social constructivism asserts that a person constructs knowledge through the process of negotiating meanings with others (So & Brush, 2008). In this case, Facebook provided an opportunity for students to learn and reconstruct knowledge through social interaction. A person who poses a question reflects and responds to a problem and invites others to engage in the knowledge construction process. The analysis of the collaborative conversations of six EFL undergraduates on Facebook demonstrated that Facebook enables students to support each other in solving problems. By discussing, sharing, and exploring various topics on Facebook, students linked existing knowledge with new stimuli and constructed a new understanding of their experience. They developed technology skills, shared problem-solving ideas, gained academic knowledge, and finally completed the project successfully. Although this research confirmed that collaborative interaction on Facebook facilitates EFL and PBL learning, the actual extent of progress on students' English ability remains uncertain. Because the students focused on completing the project, they were not devoted to improving their English. Enhancing English ability was an additional benefit, not the learning goal for the students.

Another limitation concerns data collection. This study only stressed text communication on Facebook. However, the participating students also discussed the project through Skype, webcam conferencing, and weekly meetings. The records of other communication channels were not included and analyzed in this study. Furthermore, the paper only explored a group of six EFL undergraduates in Taiwan. The results might not be generalizable to represent the attitudes and perspectives of all EFL learners. Facebook provided a convenient avenue to engage students in discussions in this study. However, in addition to Facebook features, the instructor also played a crucial role in assisting students to complete their project. In this case, the instructor served as

a monitor and facilitator, providing timely online interventions and weekly discussions with students. Despite the increasing importance of web technology in education, teachers continue to serve as key players in the successful learning of students.

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