

# Visual communication design curriculum integrated with a mobile community interactive system

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**ABSTRACT:** Humans are social animals that use language as the basic means of transmitting information. Knowledge exchange is a valuable resource that serves as a vital basis for daily living and learning. In this study, a group chat system was applied as a cooperative learning tool, which facilitated knowledge exchange among participants and peers, and recorded their learning statuses. The participants of this study were 35 university sophomores from an introductory visual communication class. Instructors were arranged to guide participant interactions. The responses that the participants provided to the questions were recorded for assessment in this study. The participants were divided into a Line group and a Facebook group. Finally, a triangulation method was employed to verify the results of the user interaction satisfaction scale, observations and interviews, yielding qualitative and quantitative research data. According to the data analysis, cooperative learning enhanced learning outcomes; specifically, mobile group learning improved learning outcomes more considerably compared with computer group learning.

## INTRODUCTION

Using language to convey information is the most basic means of communication for humankind. Previously, pagers were used to receive or send simple texts. However, the message-transmitting process was slow and information sharing was difficult. Currently, the development of the Internet has improved the convenience of information sharing and smart mobile devices have become prevalent. Users can download widely used social network applications (mobile apps) anywhere and at any time. Consequently, mobile communities have gradually become a part of daily living. In the era of rapid network information transmission, the widespread use of smart mobile devices has enabled diverse visual and aural enjoyment [1].

Learning can be achieved through various flexible methods; among these methods, using the Internet enables people to learn by adopting diverse prospective learning methods, which potentially facilitates educational reform. People learn as they encounter questions from unknown events, in which they experience feelings of curiosity, surprise and perplexity. They first experience a state of imbalance in cognition and later use their ideas to formulate hypotheses and search for related phenomena to answer the question [2].

Teaching involves helping learners formulate ideas from processes and providing them with experience and guidance. When learning how to design, in addition to receiving experience and principles from teachers, students must be familiar with the basic theories. Conventional teaching is typically delivered orally in classes, in which students learn concepts through examinations, but cannot acquire the core concepts. Recent studies have maintained that using Facebook as a group learning tool enables students to acquire and apply knowledge, resulting in satisfactory learning and interaction processes. The widely used mobile social networking app, Line, which transmits information rapidly, is an ideal learning tool. In conventional teaching, students are typically passive learners; when they encounter questions they do not understand, they do not ask their teachers automatically, but rather seek help from their peers first.

In cooperative learning, by contrast, students learn interactively by teaching others and being taught by others. Because the development of the Internet has improved convenience in communication, new on-line community interactions have become a part of daily living. Therefore, this study applied group chat systems for teaching. Two widely used social networking apps in conjunction with the conventional theoretical basis were adopted to enable participants to conduct group discussions on questions proposed by their instructors after class.

## LITERATURE REVIEW

Visual communication design is generally defined as the process of planning and visually presenting projects with practical values. Specifically, visual communication design indicates a designing process that requires the colour and

functional appeals of objects, and the principles of practicality and aesthetics. The general and specific definitions of design typically change with time and ideological trends. Overall, designing involves visually realising expressions of needs and ideas in the form of illustrations or texts [3]. Visual communication design is a type of design process that involves processing the transmission or communication of visual messages, such as humanity, societies, psychology, aesthetics and arts, and expressing visual messages in the form of hardware or software by employing the latest technology and information. Therefore, visual communication design embodies the essence of brainpower, aesthetics and values of invention. It is a system that enables designers to change the languages of texts, symbols and shapes, and express them, extending the physical and psychological functions of designers.

Accordingly, learning processes involve a certain level of change in information; the information is combined with the minds of learners as it is gradually decoded to become logical knowledge. Among the knowledge creation approaches of knowledge communities, the concept of knowledge spiral proposed by Nonaka and Takeuchi is the most commonly accepted [4]. They indicated that knowledge is created through discussion that switches from the personal tacit layer to the explicit layer. According to this concept, they proposed the socialisation externalisation combination internalisation (SECI) model of knowledge conversion.

Virtual learning communities are knowledge communities that prioritise knowledge. They are unofficial communities that consist of people who share common interests and prioritise the sharing of values and the creation of knowledge [5]. Numerous studies have reported that virtual learning communities are typically accepted by learners because they can learn without time and spatial constraints. When learning, each learner has an individual learning objective. Although self-efficacy enables learners to assess their own abilities, collaborative learning improves teamwork and spans of thinking, as well as enables enlightenment in learners.

In the era of high-technology, interdependence among people has become increasingly intense. People must combine their abilities and intelligence to accomplish goals together. Virtual learning communities, which involve using technology mediated learning, are concerned with not only information reception and teaching strategies, but also the learning processes of learners. The psychological states of learners indirectly affect their learning outcomes [6]. Collaborative learning effectively reduces learning anxiety in students. Collaborative learning enables students to explore, think and interact intellectually. Students, then, solve problems together and discuss the goal of team cooperation, subsequently creating a fun learning environment.

Group efficacy, group performance, and group consciousness are three core concepts in studies on collaborative learning. Steiner maintained that group efficacy assesses the ability of a group to accomplish specific tasks by adding task demands to the knowledge, tools and resources possessed by the members and, then, subtracting group process loss from the sum [7]. Levine and Moreland indicated that group performance is the process and outcome of performing a task [8].

Assessing group performance involves using both subjective and objective performance indices. The subjective performance index is assessed by the members or decision makers of the group, and the objective performance index is calculated by quantifying data accurately. Summers et al stated that group consciousness is the level of the intention of a group member to remain in the group according to the member's sense of attraction, identification, and belonging [9]. The four factors that affect group consciousness are member gatherings, member similarities, rewards to members and having a leader. In collaborative learning, students exhibit strong motivations to learn through their reactions and feedbacks to questions and answers [10].

Intense interactions among students increase opportunities for students to exchange and share their knowledge and enhance group consciousness. From the perspective of learning, group efficacy affects group performance positively, and group consciousness enables group members to exchange and share knowledge with one another, improving group performance. Messages of various fields are posted on Facebook walls [11]. Using this abundant Internet resource appropriately enables group members to improve their required individual and group knowledge. Therefore, the authors applied on-line group systems to perform collaborative learning to improve learning outcomes through interactive teaching.

## METHODOLOGY

On-line group chat systems were adopted as tools for collaborative learning. A questionnaire survey was conducted to determine the prior knowledge of students on learning communities. According to the appropriateness of the questionnaire and the contents of the curriculum, predictive questions were designed by three teachers with abundant teaching experiences and a background in visual communication design, and the expert validity of the questionnaire was verified. A class was conducted for 1 hour each week, and instructors were arranged to lead the participants in the virtual learning community discussion after class. After the classes were conducted for one month, the learning outcomes were assessed using the questionnaire for user interaction satisfaction (QUIS), interviews and observations.

To determine whether different on-line group chat systems affected participants' learning motivations and attitudes, usage cognition and sense of belonging, which subsequently affected the learning outcomes, 35 university sophomores from an introductory class of visual communication were recruited in this study. All the participants had a background in designing. Because the elective class was heterogeneous, the questionnaire survey was conducted first to investigate

whether the participants possessed mobile devices before they were put into groups. According to the objective of this study and in conjunction with the learning communities and previous studies on collaborative learning, chat systems were used as teaching tools. From the learning communities, the questions and answers by each group of learners were recorded. The instructors provided appropriate and timely assistance to the participants to guide their learning.

A quasi experimental study method was adopted, and the multiple-group pre-test - post-test design was used to investigate whether the overall usability, user interaction satisfaction and learning outcomes of the Line group and Facebook group differed considerably. Literature was collected according to the bibliography on visual communication design. The experts, then, selected and arranged the repeatable focal points from the source data as the teaching materials and presented these materials in classes by using PowerPoint. Discussions were posted on Line and Facebook after classes each week for one month.

The focal points in the classes were posted for the groups as extended questions for the group members to discuss, and the group leaders integrated the discussion results as the answers to the questions. The participants in each group used the group chat boxes to discuss as they were able to share information easily in the forms of texts, pictures and videos. The members of the groups could read the shared information and interactions soon ensued. The questionnaire was employed to determine the prior knowledge of the participants regarding the learning communities and to examine their time of using the on-line groups, account registration, and knowledge on using the groups.

The questionnaire comprised 21 questions, some of which were reverse questions and were answered without discussion. To verify the validity of the learning community system in improving the learning outcomes of the participants, the course content was developed cooperatively with the instructors using materials provided. The primary course materials provided were the history of two-dimensional design in visual communication design, and examination questions were formulated from the bibliography and academic papers on visual communication design. The examination questions comprised 20 multiple-choice items, and the participants were allotted 30 minutes to answer the questions. The revised examination paper was organised into two question sets, one for the pre-test and the other for the post-test. Only the sequences of the question and answer items were rearranged.

According to cognitive psychology, students memorise information by using different modes of memories when learning. Short-term memories yield a finite amount of memory span, which lasts for approximately 20 seconds. If short-term memories are not converted into long-term memories, they disappear permanently. The time interval between the pre-test and post-test was one month, during which the participants had to assimilate the knowledge they received and convert it into long-term memories. Finally, triangulation was conducted. Triangulation involves using a minimum of two data sets simultaneously. Specifically, a multimethod is used to collect data to verify reference points or topics, improving the accuracy of studies and obtaining objective data and results [12].

The QUIS adopted in this study included a 5-point Likert scale, which is typically used in studies on social behavioural science, because it enables respondents to answer clearly and read comfortably. Participant observation focuses on participants without influencing them when an event occurs. Interactions are made with participants to obtain detailed data to further understand the participants.

In this study, participant observations were adopted to collect data, understand various phenomena and supplement hidden questions potentially overlooked when using the QUIS. When the participants were holding discussions in the learning communities, all the information and processes of the collaborative learning in each group were recorded for a final assessment. After the experiment, a semi-structured focus group interview was conducted. The semi-structured interview was an intermediate style between structured and non-structured interviews, was not required to follow the sequence of the syllabus in the interview and enabled questions to be adjusted according to situations. The interview regarded the incentives, interests and motivations for learning. The key factors were encoded, organised and analysed for collecting highly in-depth qualitative data.

## EXPERIMENT RESULTS AND ANALYSIS

The Cronbach's  $\alpha$  of the group usability scale in this study was 0.877, which was higher than the typically accepted Cronbach's  $\alpha$  of .80 for general studies [13], verifying the validity of the questionnaire.

According to the statistics on group usability shown in Table 1, 88.2% of the participants reported that Line was easy to use and 83.3% reported that Facebook was easy to use. Thus, the participants from both groups reported the virtual learning communities to be highly acceptable. The statistics on group consciousness revealed that 88.2% of the Line participants and 94.4% of the Facebook participants reported that group consciousness was critical.

Peer support and assistance, as well as satisfactory group atmospheres and interactions enabled students to combine their confidence in overcoming oncoming challenges. Based on the results, 88.2% of the Line participants and 94.4% of the Facebook participants reported satisfactory interactions with their fellow members. Both groups exhibited high proportions of positive responses to group interactions. The participants believed that favourable interactions and active help of group members created a satisfactory group atmosphere among group members. Regarding the statistics on the

convenience of knowledge communities, 94.1% of the Line participants and 88.9% of the Facebook participants confirmed that knowledge communities were convenient, indicating that the participants of both groups reported high convenience in using virtual learning communities.

Table 1: The statistics results.

	Line			Facebook		
	Yes	No	Total	Yes	No	Total
Group usability	15	2	17	15	3	18
Group consciousness	15	2	17	17	1	18
Group interactions	15	2	17	17	1	18
Knowledge communities	16	1	17	16	2	18

The aforementioned statistics revealed that all of the items exhibited favourable levels of approval. The participants of the Line and Facebook groups used the on-line group systems comprehensively. The sense of belonging facilitated by the virtual learning communities improved group consciousness among the participants. Knowing how to use the group systems enabled the participants to become part of the groups rapidly and achieve goals. Leaders had an immense effect on group consciousness. When leaders guided group members in accomplishing tasks, they demonstrated their supervisory abilities, enabling favourable usage of the virtual learning communities. Regarding group consciousness, the sense of belonging and leadership affected the intensity of the discussion among group members. When the members encountered difficulties, satisfactory group interactions and active assistance by the group members enabled the members to learn favourable learning methods.

In the final assessment of this study, 35 participants were surveyed. The participants were divided into the Facebook group (18 participants) and Line group (17 participants). Each participant was surveyed once. The QUIS adopted in this study consisted of four dimensions; namely, the overall usage reaction, cognitive walkthrough, senses of belonging to the group and learning attitudes. Each dimension comprised four to six questions, constituting 20 questions. Regarding the reliability of the QUIS, the value was as high as 0.941, which is higher than the typically acceptable value of 0.80, validating the reliability of the QUIS assessment in this study.

Interactive satisfaction surveys filled in by subjects were analysed and the average calculated from each question. By descriptive statistical analysis, the degree of satisfaction for cooperative learning under the help of virtual communities learning network platform was sought. After that, the *t*-test was performed to do analysis of covariance (ANCOVA) and help identify the satisfaction level for the two groups.

Table 2 presents the levels of satisfaction with using the system. Regarding the overall usage reaction, the overall mean of 3.73 indicated that using the chat systems as learning tools was well received by the participants. Although the mean of the Line group ( $M = 3.87$ ) was higher than that of the Facebook group ( $M = 3.60$ ), no significant difference between the two groups was observed, indicating that the participants of both groups were willing to learn, discuss and interact with peers by using the on-line groups.

Table 2: Descriptive statistics of the QUIS.

	Line		Facebook		Overall		Significance value (2-tailed)
	Mean	SD	Mean	SD	Mean	SD	
Overall usage reaction	3.87	0.37	3.6	0.73	3.73	0.55	0.183
Cognitive walkthrough	4.01	0.39	3.68	0.43	3.84	0.41	0.023*
Sense of belonging	3.91	0.58	3.56	0.65	3.73	0.61	0.105
Learning attitude	3.94	0.52	3.54	0.54	3.74	0.53	0.036*
Mean	3.93	0.40	3.59	0.52	3.76	0.52	0.042

\* $p < 0.05$

Regarding cognitive walkthrough, the overall mean of 3.84 revealed that the participants expressed a high level of satisfaction and familiarity with using the on-line groups. The mean of the Line group ( $M = 4.01$ ) was higher than that of the Facebook group ( $M = 3.68$ ), and a significant difference between the two groups was observed ( $p = 0.023$ ,  $p < 0.05$ ), indicating that Line, which is a mobile communication software, enabled faster questioning and answering compared with Facebook, and the concise interface of Line enabled its participants to focus on learning.

The overall mean for the sense of belonging was 3.73, indicating that the participants typically believed that acquiring knowledge through collaborative learning was beneficial. No significant differences between the two groups were observed. The overall mean for the learning attitude was 3.74. The mean of the Line group ( $M = 3.94$ ) was higher than that of the Facebook group ( $M = 3.54$ ), and a significant difference between the two groups was observed ( $p = 0.036$ ,  $p < 0.05$ ) on the basis that the users of mobile devices typically received information faster and were more actively engaged in the class discussion.

The analysis revealed a high overall mean for cognitive walkthrough. Messages unrelated to the knowledge communities might have appeared in the discussion in the Line and Facebook groups, disturbing the participants. The participants of the Facebook group used tablet interfaces. The tablet interface of Facebook consisted of the wall in the middle and the status bar on the right, which might have distracted the participants during discussion. However, the means for the overall usage reactions and sense of belonging were above average, which might be because the participants were passive learners who required encouragement by their peers to actually participate in the discussion.

From the perspective of each dimension, the overall mean of 3.76 was significantly high, indicating that the satisfaction of the Line and Facebook groups with collaborative learning was favourable. The means of the Line group for such satisfaction were higher than those of the Facebook groups, which might be attributed to the more concise interface of Line compared with that of Facebook.

The observation and interviews revealed that Line caused considerably less disturbance to learning; thereby, enabling improved concentration in learning by the participants and satisfactory interaction. During the experiment, the participants of both the Line and Facebook groups were passive learners, whom the instructors had to provide with timely reminders to participate in the discussion, enabling continual discussions after class. However, the virtual learning communities enabled effectively using technology to collect data. Most of the participants hoped to receive feedback from their peers, and lively text descriptions facilitated satisfactory interactions among the group members.

Some timely aid was given by the researcher, if the groups of students encountered any difficulties. In each group, peer evaluation and learning provide a good chance to learn for students and cultivate skills, which help them to solve the problems.

For the Line mobile group, the students felt interest in the beginning, and they created the group on the app immediately with all members joining in right after initial instructions. Due to it being a new programme, the students did not do everything smoothly on the first Q and A section; they worked better, if the researcher joined their conversation and provided timely aid. Some of the students were also very autonomous, an except for receiving some help from their peers, they tried to find the answers for some of the questions and shared all the information with others to update their knowledge. The conversation history on the app is a strong proof. The students work a lot of better after they get used to it. They usually find the answers and clues first from their personal interests. If they are not dealing with the topic, the researcher joined their conversation at the appropriate time to remind them. The conversation for the Line mobile group is as Figure 1a.



Figure 1: The conversation: a) for the Line mobile group; and b) for the Facebook desktop group.

The Facebook desktop group with the Web site edition of Facebook spent more time having all the members join in. The Facebook group is as convenient as the Line group since the computer or laptop is needed for the Web site edition of Facebook. The advantage held by the Facebook group was that the students were already familiar with using it. This group did not do the assignments quickly after their first class, because the students wanted to finish their daily routines first, before using the computer for discussion. They sometimes needed a friendly reminder by being tagged.

In the discussion, the group atmosphere worked quite well; even in the case of a careless loss of information for a graph, they reminded each other. Once they have adapted to the dialogue mode, the path of the discussion was sped up. A timely reminder from the researcher was still needed when the students strayed from the topics, so that good discussion could not be continued. The conversation for the Facebook desktop group is shown in Figure 1b.

In the process of the experiment, the Line mobile group and the Facebook desktop group were passive at the beginning. The researcher had to play a role of actuating force to have the discussion continued. It was also noticed that the

subjects often said: *Please post all the information collected!* This means that the virtual communities' learning network was really useful. In addition, they sometimes provided valid words on others' posts, which provided excellent feedback and was definitely helpful for creating a good learning experience.

To determine the difference in the learning outcomes between the participants using the Line mobile group and those using the Facebook desktop group before the curriculum started, a dependent *t*-test was conducted on the pre-test and post-test scores to examine whether the learning outcomes of the two groups differed considerably, because of the differences between the two learning communities. The group in which learning outcomes improved the most was then determined.

The 60.88-point mean post-test score of the Line mobile group was 9.71 points higher than its 51.17-point mean pre-test score ( $p = 0.004$ ,  $p < 0.01$ ;  $d = 0.68$ ,  $0.5 < d < 0.8$ ), indicating a moderately high actual significant value. Therefore, the Line mobile group exhibited a moderately high improvement in learning outcomes.

Table 3 indicates that the 56.67-point mean post-test score of the Facebook desktop group was 5.56 points higher than its 51.11-point mean pre-test score ( $p = 0.076$ ,  $p > 0.05$ , indicating no significant difference;  $d = 0.43$ ,  $0.2 < d < 0.5$ ), indicating a low to moderate actual significant value. This result revealed that the Facebook desktop version improved the learning outcomes only slightly.

Table 3: Learning outcomes of the two learning communities.

Group	Participants	Mean	SD	<i>t</i>	<i>p</i>	<i>d</i>
Line pre-test	17	51.17	13.4	-3.35	0.004**	0.68**
Line post-test	17	60.88	15.02			
Facebook pre-test	18	51.11	11.31	-1.89	0.076	0.43*
Facebook post-test	18	56.67	14.14			

\*\* $p < 0.01$

## CONCLUSIONS

According to the objective and questions of this study, the analysis of the results yielded the following findings:

Both the Line and Facebook groups displayed satisfactory overall usability. A system that is easy to use is more likely to increase participants' intention to use the system. The analysis of interaction satisfaction revealed that the participants could use the social networking apps comprehensively. The sense of belonging facilitated by the virtual learning communities improved the group consciousness of the participants effectively, motivating the participants to share knowledge with their peers.

The cognitive walkthrough enabled the participants to use the social networking apps without hindrance, become part of the learning communities and accomplish goals effectively. The leaders were critical to group consciousness. The sense of belonging and leadership affected the intensity of the discussion among group members. When the group members encountered difficulties, favourable group interactions and active assistance among group members facilitated satisfactory methods of learning.

The Line mobile group exhibited higher interaction satisfactions with collaborative learning than did the Facebook desktop group. This study revealed that the participants of both the Line and Facebook groups expressed satisfactory overall usage reactions. Regarding the senses of belonging, the participants of both groups indicated that collaboratively searching questions and answers enabled satisfactory group performance, subsequently improving the learning outcomes of the participants. Learning attitudes are psychological cognition and behaviours of participants toward their surroundings. Because the participants in the Line group displayed a superior cognitive walkthrough, their learning attitudes improved.

The Line mobile group system improved learning outcomes more considerably. Although both the Line and Facebook groups exhibited improvements in learning outcomes, the Line group showed a significant improvement in its learning outcomes because of its participants' learning attitudes, which were reflected in the learning behaviours and tendencies of the participants. In addition to favourable learning interfaces, the improved concentration and performance in learning was attributed to active discussion and assistance among the participants in the group.

Collaborative learning emphasises autonomous learning by students. Because the participants were situated in a virtual space, they could not see one another face-to-face like they did in conventional classrooms. Therefore, the concentration abilities of students must be improved to facilitate favourable interactions among members of learning communities, promoting the learning outcomes of students.

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