

Males are not as active as females in online discussion: Gender differences in face-to-face and online discussion strategies

Meng-Jung Tsai, Jyh-Chong Liang, Huei-Tse Hou and Chin-Chung Tsai
National Taiwan University of Science and Technology

This study examined the gender difference in students' perceived discussion strategies in face-to-face and online asynchronous contexts. A survey of 363 university students and follow-up interviews of 20 participants was conducted to examine any gender differences within each context and between the two contexts. The Discussion Strategies Scale was developed to examine students' discussion strategies for both contexts in four dimensions: comprehension, interaction, elaboration and anxiety. The results show that no gender difference was found within the face-to-face context; however, within the online asynchronous context, the females perceived themselves better than did the males regarding their elaboration strategies. Although both genders experienced less anxiety in asynchronous discussion, the males perceived themselves as having better strategies in face-to-face discussion than in asynchronous discussion and the females perceived themselves as having about the same level of sophistication in both contexts. This study provides an in-depth observation of how both genders adapt themselves to different discussion contexts. We conclude that female students adapted themselves, as strategic learners, better than the males in asynchronous learning situations in which the male students were not as active as they were in traditional face-to-face discussion contexts.

Introduction

Gender differences in the ways of knowing and communication have been explored in the literature (Aries, 1987; Goldberger, Clinchy, Belenky, & Tarule, 1987; Hall, 1987) rooted in social constructivism (Vygotsky, 1978), which regards learning as the result of the internalisation of social interaction and the construction of learning taking place when students negotiate ideas in classroom discussions. Regarding the patterns of communication, a comprehensive review (Aries, 1987) reported that men are more task-oriented, dominant, directive and hierarchical, while women are more social-emotional, expressive, supportive, facilitative, cooperative, personal and egalitarian. In addition, Hall's (1987) meta-analysis indicates that females tend to have better decoding skills than males to judge nonverbal cues and nonverbal expressions. Belenky, Clinchy, Goldberger, and Tarule (1997) further reported that most women learn best in groups and prefer collaborative work. However, all of the above studies state that these differences depend on context, and researchers need to be aware of the problems in the interpretations of these differences (Aries, 1987; Hall, 1987). The contextual effects on epistemological development have also been emphasised (Belenky et al., 1997). Along with the rapid development of digital technology, traditional learning environments have changed greatly during the past decades, including the discussion contexts for collaborative learning. Whether male and female students behave and communicate in the same way as they do in the traditional learning context when they adapt to the new learning contexts is worth investigation.

Computer-supported collaborative learning (CSCL) has gradually become one of the main streams of e-learning in which researchers have devoted great efforts to designing learning systems and instructional methods to promote online learning interactions. The gender issue has been discussed and reported as one of the factors that correlate with students' participation in the discussion forums of online courses (Yukselturk, 2010). Some CSCL curricula and pedagogical methods, which aim to facilitate a gender balance, have also been proposed by educational researchers (Prinsen, Volman, & Terwel, 2007). The research literature on gender differences regarding CSCL and computer-mediated communication (CMC) can provide a basic understanding of the gender differences in the reaction to learning with new interactive approaches by using innovative communication technology.

Mixed results have been reported in the literature regarding males' online learning with CSCL instructional approaches or CMC technology. On the one hand, some studies have indicated that males

are active learners or even dominate CMC learning environments. For example, Guiller and Durndell (2006, 2007) reported that males were more likely than females to make authoritative contributions and express disagreement in interactions. Chuang, Hwang, and Tsai (2008) found that males demonstrated better adaptability to a web-based physics online forum than females, and suggested that male users preferred being engaged with the process of discussion and making critical judgments in such a web-based physics learning context. On the other hand, Arbaugh (2000) reported that men had more difficulty interacting in an asynchronous MBA course, and the difficulty of interaction was a significant predictor of class participation. Smith-Jentsch, Scielzo, Yarbrough, and Rosopa (2008) even reported that less social support, less career support, and lower self-efficacy were shown in electronic chats with male mentors than with female mentors. They referred to the fact that males tended to shorten their expressions or communications in electronic interactions when compared to traditional face-to-face (F2F) interactions. Given that male students, in general, are dominant leaders in traditional F2F group discussions (Caspi, Chajut, & Saporta, 2008; Guiller & Durndell, 2007), the above mixed results may imply that male students might not prefer the ways of online interaction or communication for learning. However, little research has examined male students' perceptions of their communication approaches used in online learning contexts, or compared them with those used in a traditional learning environment.

As for females, some advantages regarding their learning in a CMC learning environment have been reported in several studies. For example, Guiller and Durndell (2006, 2007) and Lee (2007) found that, regarding the language use and interaction style in an online CMC learning environment, females were more likely to explicitly agree and support others and make more personal and emotional contributions than males. Although female students showed more social anxiety in F2F discussions (Pierce, 2009) and felt more anxious about using Web 2.0 applications (such as wikis, online games) (Huang, Hood, & Yoo, 2013), such a difference was not found with social networking or online video sharing tools (Huang et al., 2013). When further comparing online and F2F learning environments, one interesting conclusion was made by Caspi et al. (2008), namely that men over-proportionally spoke in F2F classroom situations, whereas women over-proportionally posted messages in web-based conferences. They suggested that either the women prefer written communication more than men do, or that women prefer written communication over spoken communication. In addition, Tsai and Tsai (2010) found that young female students had higher communicative Internet self-efficacy than male students. Taylor, Jowi, Schreier, and Bertelsen (2011) also reported that men preferred to address their goals in F2F settings, while women reported more uses of e-mail. These studies may suggest that online discussion learning environments actually provide an advantage, encouraging female students to learn more actively than in traditional learning environments. This may explain why some studies reported no gender differences existing in online CMC courses; for example, no gender differences in language use or interaction styles were found in text-based online discussion groups (Guiller & Durndell, 2007), and no gender differences were found among motivational beliefs or performance in self-regulated online learning environments (Erman & Safure, 2009).

In sum, prior studies have examined both genders' learning behaviors, motivations, attitudes and outcomes in online learning. Most of the studies compared the above variables between male and female students regarding some specific online learning environment, and reported mixed research findings. Some studies (e.g., Caspi et al., 2008; Guiller & Durndell, 2007) claimed that males are better adapters when shifting from traditional F2F learning environments because they are more dominant leaders and show more critical thinking than women in online group discussions. Others (e.g., Bostock & Lizhi, 2005; Cheng et al., 2012) indicated that female students feel more self-confident than male students in using the Internet for communication, suggesting online discussion as a potential way to encourage female students to learn actively. These studies have successfully contributed to some understanding of the interaction between both genders and online learning environments. The above literature is summarised in Table 1.

Prior research has established a foundation to understand the gender differences in behaviors of communication and group discussions in traditional classrooms and in the online learning context. However, little research has compared the challenges of or the strategies perceived by both genders when they transfer their learning from a traditional F2F learning environment to an online learning environment. Students' conceptual developments and social negotiations via group discussions are essential for successful learning in both learning environments. Therefore, this study particularly focuses on the possible different roles the Internet plays for males and females when they adapt themselves from traditional contexts to online contexts, by comparing male and female students' perceived group

discussion strategies across the two learning contexts, that is, F2F versus online asynchronous (OA) discussion strategies.

Table 1
Summary of both genders' discussion behaviours in F2F and online contexts

Context	Gender	
	Male	Female
F2F discussion	Males are more task-oriented, dominant, directive and hierarchical in verbal and nonverbal communication (Aries, 1987).	Females are more social-emotional, expressive, supportive, facilitative, cooperative, personal and egalitarian in verbal and nonverbal communication (Aries, 1987).
	Male students were dominant leaders in traditional F2F group discussions (Caspi et al., 2008; Prinsen et al., 2007; Guiller & Durdell, 2007); this difference would carry over into electronic environments (Prinsen et al., 2007).	Females tend to have better decoding skills to judge nonverbal cues and nonverbal expressions (Hall, 1987).
	Males spoke over-proportionally in F2F discussions (Caspi et al., 2008).	Females reported they learn best in groups and they prefer collaborative work (Belenky et al., 1997).
	Men preferred to address their goals in F2F settings (Taylor et al., 2011).	Females reported more social anxiety than did males (Pierce, 2009).
Online discussion	Males were more likely than females to make authoritative contributions and express disagreement in interactions (Guiller & Durdell, 2006; 2007).	Women over-proportionally posted messages in web-based conferences (Caspi et al., 2008).
	Males preferred making critical judgments in online discussion (Chuang, et al., 2008).	Women were more likely to explicitly agree and support others (Guiller & Durdell, 2006, 2007; Lee, 2007).
	Men had more difficulty interacting in an asynchronous course (Arbaugh, 2000).	Female students had higher communicative Internet self-efficacy (Tsai & Tsai, 2010).
	Lower self-efficacy was shown in electronic chats with males than with females. Males tended to shorten their expressions or communications in electronic interactions (Smith-Jentsch et al., 2008).	Females felt more self-confident than male students in using the Internet for communication (Bostock & Lizhi, 2005; Cheng et al., 2012).

Purpose

Online discussion is one of the required learning skills for all citizens of the 21st century. Given that males and females have different behaviours in both verbal and nonverbal communication, how this difference is carried into online learning situations is a question worth considering for researchers of online learning. Educators need to know the gender differences in discussion strategies so that they can design better online discussion environments for their students. Therefore, in order to understand the possible different approaches utilised by the genders when facing different group discussion contexts, this study compared male and female students' perceived discussion strategies both within and between traditional F2F and OA learning contexts. Two research questions were investigated:

RQ1: Is there any significant gender difference in students' perceived discussion strategies within the F2F context and within the OA learning context? If yes, what are the differences? and Why are there differences?

RQ2: Is there any significant difference between F2F and OA discussion strategies perceived by male and by female students, respectively? If yes, what are the differences? Why are there differences?

Method

To answer the above research questions, this study employed both quantitative and qualitative methods to explore in depth the possible gender differences in perceived discussion strategies within each discussion context and between the two contexts (F2F vs. OA). Quantitatively, a survey ($N = 363$) was conducted using the Discussion Strategies Scale (DSS) developed in this study for both types of learning contexts. Qualitatively, an in-depth follow-up interview was conducted with a sample of 20 students (10 males and 10 females) to provide further understanding and explanations of the results obtained from the survey.

Sample

This study aimed to compare students' discussion strategies in asynchronous and F2F discussion. Therefore, having had experience of both types of discussion was the criterion for the sample in this study. A total of 363 students (234 males and 129 females) from 10 classes from three technology-oriented universities in Taiwan were finally selected as the sample based on a self-reported survey. All participants, who had an average age of 22.34, were majoring in information management. All of them had completed basic computer and network courses and had basic abilities of using online discussion boards. The time spent on asynchronous discussion was between 8 and 14 hours per week on average, showing that they all had enough experience of engaging in asynchronous discussion. On the other hand, the information management courses of these three technology-oriented universities involved many F2F discussions as part of their classroom activities. For example, students are required to engage in F2F group discussion of a case-analysis learning topic. Therefore, all of the participants had enough discussion experience in both contexts and were thus suitable samples for this study.

Instrument

DSS

This study developed an instrument, the DSS, to compare students' discussion strategies in asynchronous (DSS-A) and F2F (DSS-F) discussion contexts. The DSS was developed by modifying the Online Discussion Strategies Scale (ODSS) (Tsai, 2005). The ODSS was specifically designed to evaluate students' strategies for OA discussion, and included 17 items in five subscales: reasoning, involvement, interaction, anxiety and progress. Tsai (2005) reported that the overall reliability (Cronbach's alpha) of ODSS is 0.73, ranging from 0.47 to 0.76 for the five subscales. In order to develop a more general instrument which could be applied to both discussion contexts (i.e., OA and F2F), this study, based on the above five dimensions, modified almost all items from context-specific statements to context-general statements; for example, "Typing is bothersome, so I don't like online discussion" in ODSS was reversed and stated in a more general manner as "I like this kind of discussion" in DSS. Each discussion context was specified at the top of each version of the instrument: DSS-A referred to the asynchronous online discussion context and DSS-F referred to the F2F discussion context. Besides, to build up a pool of candidate items, new items were designed based on related qualitative studies (Ellis, Goodyear, Prosser, & O'Hara, 2006; Garrison, Anderson, & Archer, 2000; Pena-Shaff & Nicholls, 2004; Smet, Keer, & Valck, 2008; Wang & Woo, 2007). Descriptions of these new items were also stated in a context-free format. Four experts in the field of educational technology had two rounds of discussion about the suitability of these new items based on the aforementioned five dimensions. Then, finally, a pool of 30 candidate items was formed and their validity and reliability were tested for both discussion contexts.

Two exploratory factor analyses of the principal component method with orthogonal (varimax) rotation were used to validate the instrument for both the OA (DSS-A) and F2F (DSS-F) discussion contexts. By using principal component analysis with varimax rotation, we were trying to reveal the internal structure that best interprets students' variance in DSS. Only the items extracted from both factor analyses were included in the final DSS to ensure that the two versions included identical items for the sake of making fair comparisons between contexts. Examination of the eigenvalue plots for both factor analyses suggested four factors for each DSS context. The results of the factor analyses (shown in Table 2) indicate that the students' responses on both the DSS-F and DSS-A questionnaires were grouped into the

following factors: comprehension, interaction, elaboration and anxiety. The original factors, reasoning, involvement, and progress proposed by Tsai (2005), were restructured as the factors of comprehension and elaboration. The labels of these new factors were determined via examining the content of the remaining items by two experts in educational technology. These factors accounted for 63.61% and 66.00% of variance in the DSS-F and DSS-A, respectively. The reliability (alpha) coefficient for the overall scales was 0.71 for both DSS-F and DSS-A; and for the subscales, it ranged from 0.66 to 0.77 in DSS-F and 0.66 to 0.71 in DSS-A. Therefore, both the DSS-F and DSS-A surveys with four factors were assumed to be adequately reliable for estimating students' discussion strategies in the F2F and asynchronous discussion contexts.

Table 2
Factor loadings and Cronbach's alpha values for DSS-F and DSS-A

DSS factor	Item	DSS-F ^b		DSS-A ^c	
		Factor loading	Cronbach's alpha	Factor loading	Cronbach's alpha
Comprehension	Comprehension 1	0.75	0.66	0.68	0.66
	Comprehension 2	0.66		0.74	
	Comprehension 3	0.67		0.72	
Interaction	Interaction 1	0.74	0.70	0.76	0.74
	Interaction 2	0.71		0.76	
	Interaction 3	0.80		0.76	
Elaboration	Elaboration 1	0.67	0.71	0.58	0.77
	Elaboration 2	0.78		0.72	
	Elaboration 3	0.77		0.86	
Anxiety ^a	Anxiety 1	0.81	0.69	0.78	0.71
	Anxiety 2	0.65		0.71	
	Anxiety 3	0.85		0.82	
Total reliability α		0.71		0.71	
Total variance explained		63.61%		66.00%	

^a All items are scored reversely in Anxiety subscale. ^b DSS-F: Discussion Strategies Scale for a F2F context. ^c DSS-A: Discussion Strategies Scale for an asynchronous online context

By the aforementioned process, a total of 12 items (Appendix) were extracted for the DSS under the following four subscales:

- Comprehension: examining the level of approaches adopted to understand or evaluate others' thinking and to express their own responses in discussion. A sample item for this subscale is "I am thinking about whether others' reasoning and opinions are logically sound or not in such a discussion."
- Interaction: investigating the extent of interactions for exchanging ideas or negotiations with others in discussion. A sample item is "I usually exchange my ideas with others as often as I can in such a discussion."
- Elaboration: assessing the level of strategies adopted to integrate all thoughts or further propose new ideas in the discussion. A sample item is "I usually rephrase others' ideas in my own words after someone has presented his/her ideas in such a discussion."
- Anxiety: examining the level of fear and nerves in a discussion context. A sample item is "I always feel nervous in such a discussion." It should be noted that the students' responses were scored in a reverse manner for this subscale, so a higher score means a lower level of anxiety.

Because of the aforementioned principle that the two versions included identical items for the sake of making fair comparisons between contexts, each factor included only three items. The number of items per factor, though relatively small, is still sufficient for further analysis (Maccallum, 1990).

Framework for the follow-up interviews

In order to further understand and explain the findings of the DSS survey, a follow-up in-depth interview was undertaken, guided by a semi-structured framework. The framework was developed based on the main findings from the DSS survey focusing on the four subscales. The questions were centred on the students' experiences regarding the four subscales of DSS and why they held such perceptions/attitudes in specific contexts. For example, regarding the comprehension subscale, a guiding question was as follows:

- In a face-to-face discussion context, how do you usually interpret and extend your thoughts?
- How about in an online asynchronous discussion?
- Could you compare the two situations and tell us what the differences are in your strategies for interpretation or extension between the two situations?
- Also, what are the possible reasons for these differences?

Similarly, the above guiding questions were also used in the interviews to explain or confirm the interviewees' perceptions of the other three subscales: interaction, elaboration and anxiety.

Procedure

Although all participants had experience with OA discussion, to ensure that they all had relevant and sufficient experience before filling out the DSS-A questionnaire, most of the participants (approximately 70%) were asked to participate in a 2-week long online discussion learning activity during the semester and engage in open-ended, asynchronous discussions of cases assigned by their instructors. In the activity, the students were asked to analyse the bottlenecks and strategies in certain corporate management contexts and to offer their thoughts and comments. Moreover, we also ensured that the other participants (approximately 30%) were capable of basic, asynchronous discussion and had experience of learning-related online discussion activities in other courses. Therefore, all the students had relevant and sufficient experience before filling out the DSS-A questionnaire. After the online discussion activities, both of the surveys (DSS-A and DSS-F) were administered to all samples in the classrooms. To further verify and explain the results of the surveys, 10 males and 10 females were then randomly selected from the samples to participate in the semi-structured interviews based on the survey results. Each sample was interviewed individually by one of two researchers with the same training.

Data analysis

In order to examine the possible gender differences in perceived discussion strategies within and between F2F and asynchronous learning contexts, independent *t* tests and paired *t* tests were used to analyse the data collected from the two versions of DSS, that is, DSS-F and DSS-A. Besides, to further verify and elaborate the results of the quantitative analysis, content analysis was conducted on their interview transcript data by two researchers with the same training. Relevant transcripts were analysed focusing on the four dimensions (comprehension, interaction, elaboration and anxiety) assessed in the DSS, and were then categorised by gender in order to find possible differences in the strategies utilised by the different genders in the different contexts.

Results

The results of the quantitative examinations within and between genders are summarised in this section along with the qualitative transcript data collected in the follow-up interviews.

Gender differences in discussion strategies within the F2F and OA learning contexts

Table 3 shows the female and male students' mean scores for the factors in the DSS-F and DSS-A, as well as the results of the *t* tests for examining the gender differences. Regarding the DSS-F, there was no significant difference between the female and male students' scores on these factors. However, with respect to the DSS-A, the female students scored significantly higher on the elaboration factor than the male students ($t = -2.07, p < .05$). This finding suggests that the female and male students' discussion strategies were similar in face-to-face situations. However in the situation of asynchronous online discussion, the female students tended to use more elaboration discussion strategy than the male students.

Table 3
T tests between genders on the sub-scores of DSS-F and DSS-A

DSS subscale	Gender	DSS-F		DSS-A	
		Mean (SD)	<i>t</i>	Mean (SD)	<i>t</i>
Comprehension	Male	3.33 (0.68)	0.58	3.22 (0.72)	-1.08
	Female	3.29 (0.59)		3.30 (0.65)	
Interaction	Male	3.53 (0.69)	-0.58	3.38 (0.77)	-1.02
	Female	3.57 (0.62)		3.47 (0.76)	
Elaboration	Male	2.86 (0.73)	-1.47	2.79 (0.75)	-2.07*
	Female	2.97 (0.68)		2.96 (0.77)	
Anxiety ^a	Male	3.11 (0.77)	0.69	3.52 (0.74)	0.94
	Female	3.06 (0.73)		3.45 (0.71)	

^a Scored reversely, so a higher score means a lower level of anxiety. * $p < .05$

Follow-up interview analyses

The transcript data of the follow-up interviews further confirmed the finding that, in asynchronous discussion, the females did elaborate their ideas more often than the males, and they were able to share information with their classmates in a clearer way. Relevant evidence is shown in the following sample transcript data:

#S006 (Female): I often express myself more clearly in online discussion situations.

#S015 (Female): I usually make a summary explicitly for my group members in online discussion situations.

As the males were more challenged to interpret or disclose their ideas clearly in online discussion situations, they tended to share information in a brief way (e.g., just sharing the websites) or to have difficulties making profound interpretations. For example:

#S002 (Male): In online discussion situations, I seldom express my thoughts because I am lazy. Also, it's not easy to understand in online discussion situations, that is, I cannot understand others' opinions very well in such a situation.

#S003 (Male): I seldom elaborate my ideas in online discussion situations because I think maybe we (via the online channel) can just attach website links to share with one another.

Furthermore, we discovered that the females seemed to have higher motivation and better strategies for integration (e.g., categorisation, summarisation, and guidance for members on the discussion of the specific topics) in asynchronous discussion. For example:

#S016 (Female): I tend to integrate and categorize their opinions and needs in online discussion situations.

#S019 (Female): I'll integrate everyone's opinions, copy and paste them in Microsoft Word, rearrange them, and post them out in online discussion situations.

On the contrary, the males seemed not to like participating in such discussions. They reflected that they seldom integrated information for further discussion:

#S011 (Male): I am not used to integrating the opinions in online discussion situations, that is, I seldom try to bring together others' opinions.

#S012 (Male): I won't integrate the opinions in online discussion situations. I seldom integrate the opinions or lead online discussions.

The above data show that, in terms of the online information sharing or interaction dimension, the males, when compared with the females, were less willing to spend time elaborating their ideas. They seemed to prefer sharing information in a more direct or less complex manner. Regarding the discussion of information integration and the promotion of diversity in the community, the females showed higher motivation and more concrete strategies, such as categorising and rearranging online opinions or arguments, than the males. This result suggests that male and female students prefer to use different approaches in OA discussions, especially with regard to the elaboration and integration strategies. Females are more actively engaged with sharing, elaborating and integrating ideas in OA discussions, providing new CSCL teaching strategies for online instructors. A mixed-gender group is, thus, suggested for a profound and effective online discussion. Furthermore, when initiating or concluding the online discussion, female members could have an important influence on the group discussion due to their strengths in elaboration strategies.

Students' discussion strategies between the F2F and OA learning contexts

Table 4 shows the results of comparisons between two types of discussion contexts in each factor of DSS by using paired *t* tests for all students, and for the male and female students. First, it was found that, compared to asynchronous contexts, overall, the students were more oriented toward using the comprehension ($t = 2.32, p < .05$), interaction ($t = 3.67, p < .05$) and elaboration strategies for F2F discussion; however, they also expressed more anxiety ($t = -10.11, p < .05$, a lower score indicating higher anxiety) in F2F than in asynchronous contexts. This finding suggests that, overall, the students had better comprehension and interaction but felt more tense in a F2F than in an asynchronous discussion. In order to understand more about the effect independently on male and on female students, paired *t* tests were carried out separately for the male and female students, the results of which are summarised in Table 4.

Table 4

Paired-t tests between DSS-F and DSS-A scores for overall, male and female students

DSS subscale	Context	Overall		Male		Female	
		Mean (SD)	Paired <i>t</i>	Mean (SD)	Paired <i>t</i>	Mean (SD)	Paired <i>t</i>
Comprehension	DSS-F	3.32 (0.65)	2.32*	3.33 (0.68)	3.14*	3.29 (0.59)	-0.40
	DSS-A	3.25 (0.69)		3.22 (0.72)		3.30 (0.65)	
Interaction	DSS-F	3.54 (0.67)	3.67*	3.52 (0.69)	3.25*	3.57 (0.62)	1.77
	DSS-A	3.41 (0.77)		3.38 (0.77)		3.46 (0.77)	
Elaboration	DSS-F	2.90 (0.72)	1.91	2.86 (0.73)	2.08*	2.97 (0.68)	0.33
	DSS-A	2.84 (0.76)		2.78 (0.74)		2.96 (0.77)	
Anxiety ^a	DSS-F	3.10 (0.75)	-10.11*	3.11 (0.77)	-8.18*	3.07 (0.72)	-5.93*
	DSS-A	3.50 (0.73)		3.53 (0.74)		3.45 (0.71)	

^a Scored reversely, so a higher score means a lower level of anxiety. * $p < .05$

The middle column of Table 4 shows the results of the paired *t* tests on the male students' discussion strategies in the F2F and OA contexts. It is clear that, for the male students, there were significant differences between DSS-F and DSS-A in all four dimensions. They scored significantly higher on DSS-F than on DSS-A regarding the comprehension ($t = 3.14, p < .05$), interaction ($t = 3.25, p < .05$) and elaboration ($t = 2.08, p < .05$) subscales, but scored significantly lower on DSS-F than on DSS-A regarding the anxiety ($t = -8.18, p < .05$, a lower score indicating higher anxiety) subscale. This suggests that the male students perceived themselves as better able to comprehend and elaborate ideas and to interact with others in traditional F2F learning contexts, although they felt less anxiety in asynchronous discussions. This may imply that male students are more used to or prefer traditional F2F classroom discussion rather than OA discussion, although they feel less anxiety in asynchronous contexts. An alternative explanation may be the fact that some of the male students might refuse to adjust or have difficulties adjusting themselves to asynchronous online discussion learning contexts. This phenomenon should be noted and explored further in order to arrive at a proper explanation.

As for the female students' discussion strategies, the paired t tests between the F2F and OA contexts are illustrated in the third column of Table 4. It shows that for the female students, there was a significant difference in the anxiety factor of DSS-F and DSS-A. They scored significantly lower on the anxiety ($t = -5.93, p < .05$, a lower score indicating higher anxiety) subscale in DSS-F than in DSS-A, indicating that they experienced significantly higher anxiety in F2F than in asynchronous contexts. However, for the female students, unlike the male students, there was no significant difference in any of the other factors of DSS-F and DSS-A. This finding suggests that, for female students, although no significant difference was found between their perceived discussion strategies for F2F and for asynchronous contexts, the perceived anxiety level in asynchronous discussion was significantly lower than that perceived in traditional F2F discussion.

Follow-up interview analyses

Based on the above quantitative data, it seems that the males and females had different perceptions of the two types of discussion. For example, the male students perceived themselves as being better able to comprehend and elaborate ideas and to interact with others in traditional F2F discussion than in online discussion, while the female students had the same perception regarding their discussion strategies in both contexts. To further verify and explain the above findings, the transcript data from the follow-up interviews were analysed and categorised by gender. Following are sample data and analyses drawn from the males' perceptions of the two discussion contexts and their reactions or strategies to cope with the two contexts:

#S007-1 (Male): In face-to-face situations, first I'll look for some information for everyone. I often listen to others' opinions. I think I can easily control the conditions in face-to-face situations. However, in online discussion situations, irrelevant conversations always occur. (Comprehension monitoring control better in F2F contexts)

#S011-1 (Male): I'm not used to integrating people's opinions through online discussion because I usually listen to and memorize what people say in face-to-face situations; however, in online situations, because I'm too lazy to read the contents, I usually update by checking with others instead of reading by myself. (Problems in online reading comprehension and integration)

#S003-1 (Male): I have less interaction in an online discussion context because sometimes I will be distracted by a phone call during the discussion process at the computer desk. However, in a face-to-face context, this situation rarely happens because I can see if everyone is joining the discussion. (Interaction with direct and efficient approaches)

#S003-2 (Male): I often express my ideas in face-to-face situations. I'll observe people's body language and quote what the other people say to express myself. However, in online discussion situations, I express my ideas less often because everyone can read through the attached websites. (Elaboration better with visual observation)

#S020-1 (Male): In a face-to-face context, I use my body language to help explain myself and I ask my peers to give examples to help clarify viewpoints. I think that I can express myself better in a face-to-face context, because I can explain more easily. However, I can't express myself clearly in online discussion. I cannot even catch others' emotions. (Interactions and elaboration rely on visual cues)

#S011-2 (Male): I can present myself well and do everything quickly in a face-to-face context, whereas in an online discussion context, I don't even know what I should do, and I doubt that my classmates can focus on the topics under discussion. (Lower self-efficacy for OA discussions)

#S002-1 (Male): I easily overact in face-to-face contexts, which makes my classmates think that I am angry or moody, but actually I am not. So I usually become anxious in face-to-face discussion contexts. (Lower anxiety of social interaction pressure in OA context)

#S007-2 (Male): In face-to-face contexts, I'll get a little nervous because everybody looks at me. I'm worried that my poor performance could embarrass me. However, in an online discussion context, because I do not have to face my classmates, it's harder for me to feel anxious. (Lower anxiety of social expectation pressure in OA context)

Based on the above transcript data, it is obvious that the male students perceive better control of comprehension monitoring in F2F than in OA contexts (e.g., #S007-1). They prefer direct and efficient communications for group discussions (e.g., #S003-1), and visual clues seem to be important for them to interact with peers in group discussions and for idea elaboration (e.g., #S003-2 and #S020-1). Some male students seem to have problems with their reading comprehension of online information (e.g., #S011-1) or show lower self-efficacy in online discussion (e.g., #S011-2). However, in online discussion, the males perceive lower levels of anxiety due to social interaction pressure as well as social expectation pressure (e.g., #S002-1 and #S007-2).

As for the female students, examples from the transcript data regarding their perceptions of the two discussion contexts are provided as follows:

#S016-1 (Female): There's no difference for me between the two situations. In both of the situations, I'll express my thoughts at the right moment. (Perceived positively for both contexts in terms of idea expression and control)

#S017-1 (Female): There's no difference for me in the two discussion contexts. In both circumstances, I usually relax myself and work with my group members in a good mood. Sometimes, we also seek online information cooperatively. (Both contexts perceived positively in terms of interactions with group members)

#S006-1 (Female): In online discussion, I probably can't catch the meanings from online texts; therefore, further communication with a phone call may be needed. (Comprehension monitoring with alternative approaches to clarify ideas in online discussion)

#S006-2 (Female): I am nervous about emotional conflicts or arguments in face-to-face contexts. While feeling pressure in a face-to-face context, I feel relaxed in online discussion contexts. (Lower anxiety due to social interaction pressure in online discussion)

#S008-1 (Female): In face-to-face contexts, I feel tense because everyone has to say something. However, in online discussion contexts, I feel more relaxed because I can leisurely recall what the other people say. (Lower anxiety due to social expectation pressure and more perceived freedom)

#S014-1 (Female): In face-to-face contexts, I feel nervous because of mental factors (pressure). However, I don't get nervous easily in online discussion contexts. (Lower anxiety due to social interaction pressure in online discussion)

#S001-1 (Female): In face-to-face contexts, everyone needs to say something. I fear being teased if I say something wrong. However, in online discussion contexts, nobody knows who I am even if I say something wrong. (Lower anxiety due to social interaction pressure in online discussion)

#S019-1 (Female): In face-to-face contexts, I have a larger change of emotions. I easily quarrel with others and get angry. However, in online discussion contexts, I will become quiet because I don't know other people's thoughts and I also feel more relaxed. (Lower anxiety due to social interaction pressure in online discussion)

The above provides evidence that female and male students have different reactions to their experiences and perceptions of the two discussion contexts. It is interesting to find that the females in general have positive attitudes toward both contexts in terms of idea expression and progress control (e.g., #S016-1) as well as in terms of interaction with group members (e.g., #S017-1). Comprehension monitoring with alternative approaches is utilised by some female students to clarify ideas in online discussion (e.g.,

#S006-1). As with the males, the female students also perceived lower levels of anxiety due to social interaction pressure (e.g., #S006-2, #S014-1, #S001-1 and #S019-1) and social expectation pressure (e.g., #S008-1 and #S001-1) in online discussion. They also perceived more freedom in thinking in online discussion (e.g., #S008-1).

Moreover, there are differences between the male and female attitudes toward the online discussion tools and their use, motivation and strategies. In the interview analysis, we found that the females were more willing to use online tools to express their ideas, and they had higher motivation and more mature strategies for cooperative discussion. On the contrary, we found that the males tended to easily control the procedures of the discussion and maintain attention in F2F situations, whereas they reported easily losing attention, and having a lower degree of participation and engagement in online discussion situations. To sum up, the overall qualitative analysis of the interview data was consistent with the findings of the quantitative analyses of this study. The interview data not only verified the findings reported in the quantitative analysis, but also contributed to a deeper understanding of why and how these gender differences occurred in the discussion contexts.

Discussion

This study examined university students' group discussion strategies in traditional F2F and OA discussions by developing an instrument, the DSS, for both contexts, with the following four factors: comprehension, interaction, elaboration and anxiety. The overall investigation shows that these university students feel less anxious in an OA context than in a traditional F2F context. However, they are still more familiar with the discussion strategies in F2F contexts such as comprehension and interaction strategies. This result seems to be consistent with most prior studies, which have found that OA situations successfully lower the social pressure caused by traditional F2F discussion (Campbell, Gibson, Hall, Richards, & Callery, 2008; Qiu & McDougall, 2013). However, while further examining the gender differences within and between groups regarding the above four dimensions of discussion strategies, this study has found some interesting results.

First, regarding the gender difference in perceived discussion strategies within each of the two contexts (i.e., the questions proposed in RQ1), only one significant difference was found between the genders. That is, the female students have better elaboration skills than the male students in asynchronous online discussions. Other than that, no other significant difference was found. Therefore, the answer for RQ1 is: In general, male and female students have about the same levels of discussion strategies in both F2F and asynchronous online contexts, except that female students have better elaboration skills than male students in asynchronous online discussion contexts. This may be explained by women's preferences for collaborative learning (Belenky et al., 1997) and advantages in nonverbal expression and decoding skills (Hall, 1987), whereas male students are more goal-oriented and may still need more visual clues obtained in F2F discussion for better idea elaboration. Some similar results regarding the online social interactions can also be observed in other studies (McSparran & Young 2001; Michailidou & Economides, 2007). In addition, a relatively more recent study has reported that young females have higher Internet self-efficacy for online communication than young males (Tsai & Tsai, 2010). The strengths of the females' self-confidence in online communication may correlate with their better online elaboration strategies.

Second, regarding the contextual difference in perceived discussion strategies within each gender (i.e., the questions proposed in RQ2), we found that males and females have different accommodation strategies for the transfer between contexts. By and large, the males were found to be more familiar with F2F contexts, while the females had about the same level of familiarity with or sophistication in both contexts, except for lower anxiety in OA contexts. OA discussion provides, for both genders, a more relaxed discussion environment with less pressure of social expression, expectations and interaction; however, sometimes, male students may find it a challenge to gain control of comprehension monitoring and to elaborate ideas for discussion. It seems that female students have positive attitudes towards both discussion contexts and are able to use alternative or develop adapted approaches to solve problems which occur in online discussion contexts, suggesting that females may be better adapters to online learning environments. This in turn suggests that the female students may be better strategic e-learners (Tsai, 2009) than the male students. Therefore, the answer to the RQ2 is: Female students are better adapters while changing from traditional F2F discussions to the OA discussion than male students, because the females have developed or are willing to develop more advanced interactive strategies to

comprehend and elaborate ideas in OA discussion. This result is consistent with some related studies (Arbaugh, 2000; Bostock & Lizhi, 2005; Cheng et al., 2012; Smith-Jentsch et al., 2008). The willingness to develop more advanced interactive strategies may also be related to women's higher self-efficacy of using the Internet as a communication tool (Tsai & Tsai, 2010). Although males tend to dominate the interaction and be more verbally active than females (Caspi et al., 2008; Guiller & Durndell, 2007; Prinsen et al., 2007; Taylor et al., 2011), Prinsen et al.'s (2007) prediction that the gender differences in communication style in F2F situations would carry over into electronic environments is not supported in this study. That is, male students are not as active as they are in traditional F2F discussion contexts.

Finally, some future research derived from the findings of this study is recommended. For example, the contextual effect may also be influenced by learning topics. Future studies can further explore the role of discussion topics in different genders' online discussion strategies. In addition, future studies could examine the correlations between Internet self-efficacies and online discussion strategies for both genders. Besides, the reliability of the questionnaires utilised in this study was adequate but not very high; this could be improved with a larger item pool, particularly if future research involves a larger sample size to justify more items. The sample in this study included college students majoring in information management. A limitation may be due to the fact that the male to female balance in the sample was almost 2:1, which could possibly influence the results. The research findings derived from the current study may be discipline dependant, as students with different academic backgrounds may utilise quite different discussion strategies. Therefore, further research could also examine the issues explored in this study by collecting data from students of various academic backgrounds or experiences.

Conclusion

This study examined the gender difference within and between the discussion strategies perceived by both genders in the F2F and OA discussion contexts. Although no significant gender difference is found in the F2F context, females are found to have better elaboration strategies for OA discussions. Female students are also found to be better adapters to the contextual transfer from F2F to OA discussions in terms of comprehension, interaction and elaboration strategies for online discussions, although OA discussion environments effectively lower both genders' discussion anxiety due to social expression, interaction and expectation pressures. The findings of this study contribute to the choices of instructional approaches for university instructors. For those students who are highly anxious about being required to take part in discussion, instructors should use the OA approach to foster discussion. On the other hand, for those students who rely heavily on interaction for learning, instructors would be better to utilise F2F discussion in the classroom. In addition, heterogeneous gender groups may be better for fruitful OA discussion. However, if the students meet both of the above conditions, then instructors should consider employing blended online learning, that is, embedding both F2F and OA discussion into a traditional classroom. Furthermore, the gender proportion in a class might be another factor influencing the choice of approach to teaching. If female students constitute the majority in a class, then OA discussion would be better used for teaching. On the other hand, if male students are dominant in a class, then F2F discussion should be considered as being more appropriate.

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Corresponding author: Meng-Jung Tsai, mjtsai99@mail.ntust.edu.tw

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Appendix

The items used in the DSS questionnaire for both DSS-F and DSS-A discussion contexts.

Guidance: Please answer each of the 12 items on a 5-point Likert scale (from 1 = *not like me at all* to 5 = *very much like me*) while considering the following two discussion contexts independently based on your own discussion experience:

Context 1 (DSS-F): Face-to-face discussion context (e.g., the group discussions in the real classroom experienced in this current course)

Context 2 (DSS-A): Asynchronous online discussion context (e.g., your former online discussion experience or the online group forums experienced in this current course)

Items:

1. I always feel nervous in such a discussion.* (Anxiety 1)
2. I hope to get responses when I ask questions in such a discussion. (Interaction 1)
3. I am afraid to have conflict with others in such a discussion.* (Anxiety 2)
4. I usually exchange my ideas with others as much as I can in such a discussion. (Interaction 2)
5. I feel shy to talk in such a discussion.* (Anxiety 3)
6. I try my best to get consensus with others for a conclusion in such a discussion. (Interaction 3)
7. I think of whether others' reasoning or opinions are logically sound in such a discussion.
(Comprehension 1)
8. I pay attention to the flow of ideas which have been presented in such a discussion. (Comprehension 2)
9. I usually remind myself of the goal of our group task in such a discussion. (Comprehension 3)
10. I am used to integrating people's ideas around the end of such a discussion. (Elaboration 1)
11. I repeat others' ideas in my own words in such a discussion. (Elaboration 2)
12. I try to propose other related issues for further discussion in such a context. (Elaboration 3)

* Items to be scored in reverse before summing a total score.