Gender Differences in Learning through Online Collaboration in a Reserved Society

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ABSTRACT

Collaboration during learning leads students to achieve high learning goals because it allows them to exchange ideas, and knowledge and assist each other during the learning process. However, in reserved Arabic societies cross gender socialization is not widespread nor is it encouraged. In this paper the effects of cross gender online collaboration was tested on a group of students working towards a common goal. A bulletin board set up that ensured student anonymity by making it compulsory to use their student numbers rather than names as identifiers resulted in a higher degree of intellectual interaction between the genders. Female students in particular showed a clear improvement in learning in comparison with those who did not participate in the board.

INTRODUCTION

Most of the work on educational collaboration relies on a basic premise that was set by Vygotsky (1962) when he indicated that children grow into the intellectual world of their parents. Through verbal interaction, parents coach their children by presenting them with goals just beyond their knowledge level and guiding them so that they could work towards these goals. This renders language as a key mode by which humans learn their culture and interact with their thought processes.

Based on this, researchers worldwide started to study the effects of verbal interaction amongst peers or students and educators in order to identify its effect on the learning process. Forman and Cazden (1986) observed that when students work together on a complex task, they assist each other in much the same way that adults assist children. Johnson and Johnson (1989) offer results that suggest that high achieving students gain much from their exposure to diverse experiences and from peer tutoring. This type of interaction is not common across genders in Arabic societies, due to social expectations. Therefore, although classrooms are typically composed of both genders, each seems to function in semi isolation which limits the amount of learning that could be achieved from peers.

With the advent of the Internet a novel mode of collaboration emerged offering new unexplored opportunities. Norman (1988) indicates that each media has "affordances" and "constraints" that would be either beneficial or counter-active to educational goals. The Internet as a mediator of information, is no exception as a complete understanding of its "affordances" and "constraints" has not as yet been achieved.

"Backward looking metaphors focus on what we can automate – how we can use new channels to send conventional forms of content more efficiently – but miss the true innovation: redefining how we communicate and educate by using new types of messages and experiences to be more effective."(Dede & Palumbo, 1991)

McNeil, Robin and Miller (2000) study online communication highlighting its features. They indicate that online communication allows students to exchange thoughts and ideas unhindered by restrictions of the time of day and where they are located. However, they point out that this type of communication lacks the non verbal communication that is only part of face to face interactions. Facial expressions and hand movements seem to add to the value of the words being communicated and these are not represented through online communication media.

Consequently, the medium has its known disadvantages and advantages. The first of the advantages of course is that this medium of communication is available anytime, anywhere. Clark (2001) indicates that the Internet offers a medium of education to many students that would not have the ability to attend typical classes. He also highlights additional advantages including that students have ample time to read other students' comments and to do research before preparing a response to others.

Affective issues were also raised by researchers including Traver et. al. (2001) who evaluated a biochemistry course that uses web technology and student collaboration and found that the main issue with respect to learning is self confidence. The students who believed their academic ability is good enough were more likely to benefit from the technology that those who do not have that self confidence. In reserved societies such as the Arab world female students do not have the confidence to benefit from their male peers due to social expectations. The research question that arises here is whether a state of anonymity offered through a Bulletin Board could be effective in overcoming this boundary and allowing students to benefit from each other in a constructive fashion without making any student uncomfortable with the communication. In this sense, the non verbally mediated communications such as facial expressions and hand movement is not desired to be part of the communicated message.

APPROACHES TO LEARNING

There are two main approaches to learning; passive approaches and active approaches. The passive approaches allow students to learn by receiving and assimilating information that is presented to them or comes up in their presence (Bouton & Garth, 1983). A particular extreme case of this type of approach is the Vicarious Learner project where students are allowed to observe other students participate in an educational dialogue Lee et al (1999).

On the other hand, the active approaches to learning are those that require a student to interact with peers, a tutor or an educational system in order to learn. These include the approaches that are based on *situated cognition* which imply that students learn best when they experience the same environment as that they are trained to interact with (Suchman, 1987). They also include those that rely on constructive approaches to learning as is proposed by Resnick (1996).

Dillenbourg et. al. (1996) offer a different classification of approaches grouping them under one of the fields: shared cognition, socio-constructivist and socio-cultural. Shared cognition is strongly related to *situated cognition* because it regards the collaborating group as part of a unit whose goal is to arrive at the solution of the problem they are facing. A bigger emphasis is therefore placed on the social context in which the experiment is set in which questions the methodology used in many experimental settings that assume a clear division between social and cognitive differences (Wertsch, 1991).

The socio-constructivist approach is based in part on Piaget (1928) even though he mainly focused on individual aspects in cognition. The basis of this approach is individual development emerges gradually through causality as a result of interaction with others and coordination of one's approaches to the reality accepted by others (Doise, 1990). Evidence showed that under certain conditions peer interaction produced superior performances on individual post-test than when students are trained individually (Blaye et al., 1991).

Last but not least, the socio-cultural approach to collaboration is partially based on the work of Vygotsky (1962, 1978) who focused on individual development in the context of social interaction. Here the basic unit of analysis is the social activity from which individual cognition abilities develop. If we contrast this approach with the Socio-constructivist approach we find that Piaget regards social interaction as a catalyst for individual learning. The person involved then carries out the internalization required for learning process. The Vygotskian approach would regard development occurring on two levels, social speech would be used to interact with others, while inner speech is used to talk with ourselves, to reflect. Inner speech would then play the role of a regulator in the process of learning. Vygotsky (1978) also defined the *zone of proximal development* as the distance between the actual level of development and the level of potential development with a tutor or more capable peers.

A RESERVED SOCIETY

Although the University of Bahrain is not a segregated institution, the major part of the student body comes from segregated high school environments. In addition to that social customs do not encourage much interaction between the two genders so not all students participate in a healthy level of intellectual interaction. Consequently, cultural boundaries hinder full-fledged collaboration. The anonymity that is possible through online Bulletin Board participation seems to offer an opportunity of interaction between students who otherwise would remain isolated from their peers of the opposite gender.

COLLABORATION LAB

A bulletin board was installed on the Internet Technology Course host server and an official thread was defined as the destination to which students would direct any posts regarding a take home quiz. The test was a challenging task that was composed of two main parts; a Macromedia Flash part and a Preprocessor Hypertext part. The first part was composed of three levels of difficulty of which the first was compulsory and the others bonus grades that would raise their total course grade.

Students were randomly assigned to different question versions so as to allow them to interact and discuss the problem without resulting in one giving the full solution to others. Each student was randomly assigned a logical question and informed of a related graph. The student would then produce an animation explaining the steps of how the graph is drawn using Macromedia Flash. The first level requites students to produce a simple animation, the second requires them to allow users to drag and drop the lines and ovals in their proper slots to teach the required graphing technique. Users cannot drop an object except in the correct place. The third level is more challenging in that it allows a user to place the dragged objects to be dropped anywhere on the screen area, and then finds a way of estimating how close a user is from getting the correct graph. Students were informed that the first level is required while levels two and three would allow them to gain bonus grades that they can use to raise their overall total.

The second part was composed of a question that was assigned to all students. It involved creating a form and inserting the output of the form into a MySQL database.

Subjects

Subject choice was made on a self volunteer basis from the 47 students taking part in either of two sections of the course to ensure that their selection is fair as the grade would counts towards their actual semester grade. Those who participated were 15 female students out of a total of 25 and 9 male students out of a total of 22.

Table 1 The Grades of Participating and non Participating Female students.

Participating Female Results	Bonus Grade	Project Grade	Total Grade
	10.00	10.50	20.50
	2.00	12.00	14.00
	2.00	12.75	14.75
		12.00	12.00
	10.00	10.00	20.00
	8.00	8.50	16.50
	8.00	9.00	17.00
	8.00	9.50	17.50
		9.00	9.00
	7.00	8.00	15.00
		9.00	9.00
		8.50	8.50
		7.75	7.75
		8.00	8.00
Non Participating Female Results	16.00	13.50	29.50
	13.00	12.38	25.38
		12.00	12.00
		9.75	9.75
		8.00	8.00
		8.85	8.85
		8.75	8.75
		12.00	12.00
		8.00	8.00
	2.00	7.00	9.00

Results

The scripts of the bulletin board were then studied and analyzed to reveal that the number of female students who used the board noticeably exceeded the number of males as 60% of the female students participated while only 40.9% of the male students participated.

Student grades in the combined project and bonus grades of female students are shown in Table 1.

The median test was run on the same student results from the first course test which was run before their exposure to the collaboration lab. Results showed no significance for the total median of the results shown above from the total median. Consequently, this implies that the median test prediction for a null hypothesis is that each of the groups shown above should show no significant difference from the total median. The total median for the total project grade is 12.00 while the number of students that scored above and below this median is shown in table 2.

As is customary with the median test, the Chi test of the above data follows to reveal a Chi value of 3.896 and $p < 0.048$ which significant. Additionally, 9 female students out of the 15 that participated attempted the second and/or third level in the Flash question with a percentage of 60%. 3 female students out of the 10 that did not participated attempted the higher levels with a percentage of 30%. The percentage of female students who attempted the question in those who were actively participating in the collaboration lab is double that those who did not participate.

6 male students out of the 9 that participated attempted the second and/or third level in the Flash question with a percentage of 66.7%. 8 male students out of the 13 that did not participate attempted the higher level questions with a percentage of 61.5%. The difference is not significant indicating that the bulletin board did not affect male students in the way it affected female students.

Another possible indicator comes from the mean grades of students, while male students who did not participate had a mean grade of 21.49 female students who did not participated had a lower mean grade of 12.63. On the other hand, while male students who participated still had a high mean grade of 21.28 female students had a slightly higher mean grade of 15.02 which indicates some benefit gained from the collaboration process.

Table 2: No of female students who scored above and below the total median

	Those who Participated	Those who did not Participate
Scored above Total Median	9	2
Scored below or equal to Total Median	6	8

DISCUSSION

There are several main points that attract attention here the first of which is the main benefit gained in this context from the Collaboration Lab as represented by a social exchange. Here results show that female students regarded the collaboration board as a positive medium through which they could communicate with each other as well as their male peers to discuss subject matter without worrying about social concerns. However, what is interesting is that the female group that participated in the collaboration board actually raised the number of grades obtained above the overall median for female students significantly. This implies that they benefited from the board whether it is from each other or from their male peers. By contrast, the male students in this group did not benefit greatly from the board and this fits well with the prediction that they already have strong collaboration tendencies during their study periods.

Another issue that is clear from the data is that more of the female students who participated in the board attempted the bonus parts than their counterparts who did not participate. This leads one to wonder whether or not the collaboration board in fact helps support student self-confidence. Yet again no difference was noticed with male students, which indicates that indeed the cause may be the collaboration offered by the online bulletin board. Last but not least the measure of mean grades seems to indicate that female students did manage to learn more by using the board than their peers who did not use the board but were not able to raise their levels enough to achieve significance.

Consequently, the board seems to primarily affect, their self confidence and in part some of the knowledge students gain while using it through learning from each other. The text of the exchanges showed several points that may have played a role in the results shown above. First of all, the increased level of self confidence can be through the exchange of supporting arguments given by students to each other. One example shows a female student who expresses her concern got almost immediate support from a male student who tried to calm her down.

Oddly enough nine days following this, the situation re-occurred between the same two students in reverse. This time it was the male students who was worried and the female student who was offering support and confidence.

This exchange is interesting because the female student who at first was not confident is now confident enough to encourage others. Take a look at the central point of concern, the question does not tell students how to solve it and only gives them a problem that they have to present in a certain way so it is natural for students to find different paths to their answers. The confidence of the female student is clear as she says "*do whatever animation you feel is correct*" and requests that the male student not listen to students while she herself is a student who did several days ago listen to this particular student when she complained. The example clearly shows a rise in the level of self confidence of this female student by being able to interact with all her peers online.

In fact, a critical issue is alleviated by this result. Some may wonder whether or not the self-selected sample is not biased. Ora (1965) found that volunteers are significantly different from the norm in among other things being insecure and introverted. Consequently, the bias seems to exist in a direction opposite to the one found here and therefore, should weaken the significance of the results found here.

Within the results examples of cross gender collaboration exist to exhibit how stronger students help weaker students regardless of their gender. This is sufficient to show that indeed collaboration does offer direct support to the learning process which is in fact the primary goal of placing the bulletin board online and here the main target is achieved by allowing cross gender collaboration.

An interesting future research path could to be search if learning differences can affect student benefit from this type of collaboration. Previous work (Albalooshi & Alkhalifa, 2002) has shown that learners that are different with respect to preferring verbal, versus graphical representation can both learn effectively through an Internet based multi-media educational system. Consequently, this purely verbal medium may in turn be only beneficial to those learners who present a preference to verbal learning but this remains to be tested.

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