STUDENTS’ PERCEIVED BARRIERS TO IN-CLASS PARTICIPATION IN A DISTRIBUTED AND GENDER SEGREGATED EDUCATIONAL ENVIRONMENT

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Abstract

Education in Saudi Arabia has always been segregated based on gender as a result of the close governmental and societal adherence to Islamic traditions. This segregation causes a problem at the level of higher education due to the shortage of female faculty throughout the country. This problem has lead to the adaptation of several techniques by which higher-level education is delivered to female students by male faculty. This paper presents a modern approach for course delivery adopted by a new Saudi University that combines old techniques with modern telecommunications technologies. This approach makes use of smart classrooms in delivering courses by male instructors to both male and female students in separate but adjacent lecture halls. One of the main goals for conducting this study was the author’s perceived low-level in-class participation by female students in one of the courses of the Masters of Health Informatics program offered by the new University. This paper aims to present the perceptions of students regarding this modern approach of education. It also seeks to determine whether the presence (listening-in) of students of the opposite gender plays a major role in limiting students’ level of in-class participation. Findings of this study show that students in general are favorable of the modern course delivery approach, and that the greater barrier to participation had more to do with the technology rather than the presence of members of the opposite gender.

Keywords: IS education, gender issues, segregation, distributed learning environment, smart classrooms, in-class participation, Saudi Arabia, health informatics.

1. INTRODUCTION

In Saudi Arabia, a developing country where more and more efforts are being made towards the transformation of the society into an information society (CITC, 2005), old traditions remain the same. The issue of segregation between the sexes when it comes to education is one of strong religious beliefs and traditional values (Almunajjed, 1997). While most other countries in the Middle East allow the integration of genders at college level education, certain countries like Kuwait have more recently reversed their position in favor of the segregated model (Del Castillo, 2003a).

Even though female school teachers at the elementary and secondary levels are in abundance, the same is not true when it comes to female resources at higher-level education. This occurred mostly as a result of old Saudi cultural values where men are considered the main breadwinners, which in turn resulted in fewer women pursuing higher education. This situation however is not restricted to Saudi Arabia, developing countries in general, in Asia and Africa, suffer from social and organizational “localism” where women are less likely to go abroad to seek more advanced degrees, and are less likely to travel outside their localities for attending work-related meetings or any other activities (Miller et al., 2006). For Saudis, this localism has created a shortage in qualified female faculty members and a big challenge in the delivery of higher education to female students, both at the undergraduate and graduate college levels.
King Saud University (KSU), established in 1956, is the oldest and largest university in the Kingdom. It currently has a total population of 70,000 students, 40% of whom are female students (Alsalman, 2007). On the other hand, based on 2-year old statistics regarding the number of educators at the same university, including demonstrators, lecturers, and faculty members, the number of educators was stated at 3009. Females account for only around 26% of this number. Percentage of female students two years ago was also indicated at slightly less than 40% of the total student population of 67,280.

Colleges having higher than the university overall percentage of female instructors include the College of Arts with 32%, College of Education with 38%, College of Pharmacy at 41%, College of Dentistry at 35%, College of Sciences at 34%, College of Applied Medical Sciences at 39%, the College of Languages and Translation with 29%, and the College of Nursing with a 100% female workforce. Colleges with lower than the overall university percentage of female instructors include the College of Food Sciences and Agriculture with only 10% of the total college body of instructors, College of Medicine at 19%, College of Administrative Sciences at 25%, and the College of Computer and Information Sciences at 22% (Table 1). Both the College of Engineering and the College of Architecture and Planning do not accept female students and likewise have a zero percentage of female instructors (http://www.ksu.edu.sa/AboutKSU/Pages/Factsandstatistics.aspx).

<table>
<thead>
<tr>
<th>College Name</th>
<th>Proportion of female instructors (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing</td>
<td>100</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>41</td>
</tr>
<tr>
<td>Applied Medical Sciences</td>
<td>39</td>
</tr>
<tr>
<td>Education</td>
<td>38</td>
</tr>
<tr>
<td>Dentistry</td>
<td>35</td>
</tr>
<tr>
<td>Science</td>
<td>34</td>
</tr>
<tr>
<td>Arts</td>
<td>32</td>
</tr>
<tr>
<td>Languages and Translation</td>
<td>29</td>
</tr>
<tr>
<td>Administrative Sciences</td>
<td>25</td>
</tr>
<tr>
<td>Computer and Information Sciences</td>
<td>22</td>
</tr>
<tr>
<td>Medicine</td>
<td>19</td>
</tr>
<tr>
<td>Food Sciences and Agriculture</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 1 – Female faculty members per college at King Saud University.

Based on recent statistics, the number of female students at KSU’s College of Computer and Information Sciences is 1,234, all belonging to the female only Information Technology Department. Male students are distributed among three different departments: Computer Engineering, Computer Science, and Information Systems, and account for a combined total of 1,322 students. Hence, the number of female students in the College of Computer and Information Sciences accounts for 48% of the total college student body, compared with an instructional workforce of only 22%. This situation of non-equal distribution between the number of female instructors and female students is common in other universities and colleges across the nation.

The high percentage of female students in IT in Saudi Arabia represents a major break from the typically low enrollment experienced by IT programs in the Netherlands, USA, Australia, and the UK (Borghans and Groot, 1999; Moffatt, 1997). This in part may have to do with the fact that for women in Saudi Arabia, IT provides an excellent job prospective in a society where not all types of roles in the labor market are available to them. Additionally, the IT profession allows women the chance to work independently from home or the ability to establish or work in an all women software development company. Finally, cost of
education is not an issue for Saudi college students as public universities and colleges are free to Saudi citizens. On top of free tuition, the government also pays college students a monthly stipend slightly above the equivalent of US $200.

This research paper will initially present a brief overview of female education in Saudi Arabia. It then introduces a newly established University that concentrates its efforts on health studies. This new University is the setting where this research study is conducted. A modern approach for education delivery within Saudi Arabia will then be presented where male and female students are both signed up for the same section of a graduate level course in a distributed learning environment.

A distributed learning environment according to Dede (1996) is one where there is an integration between face-to-face instruction and online communication between faculty and students. For this study, males students benefit from direct face-to-face instruction, while female students only interact face-to-face with the instructor on a very limited basis. Both male and female students have direct access to the benefits of modern telecommunications and distance learning technologies. Concerns with regard to the suitability of this course delivery approach to graduate students in a segregated educational environment will then be addressed, along with a view of the students’ perceived barriers to effective participation within the classroom. The paper ends with a conclusion and a look at future studies.

2. FEMALE EDUCATION DELIVERY
Boys and girls in Saudi Arabia are segregated in educational settings from the first grade of elementary school. Coeducational learning is only allowed for the pre-school age children. Women in the Saudi society have for a long time assumed the role of the housewife. Taking care of the home and raising children properly was considered to be the most important job of a woman. Men were considered the breadwinners and hence, were more likely to seek higher education and to get government scholarships for completing master’s and doctoral degrees overseas. This situation has created a greater availability of male faculty members than female ones, and hence the problem of not being able to fully meet today’s greatly expanding female college student body through female instructors alone.

Saudi Arabia applies strict educational regulations based on an interpretation of Islamic teachings where females may not be seen by strange males without their veils. A woman may be seen without her veil by her father, children, brothers, uncles, nephews, father-in-law, and son-in-law; basically, men she cannot get married to. All other men are considered strangers to her. General interaction between unrelated men and women, is typically regulated by certain protocols involving modest dress which may include the covering of the face, polite speech, and the non-exclusive interaction between a male and a female in a private closed setting without the presence of a close male relative of the woman. Women typically interact with men in the considered open shops and shopping centers. This is considered a necessity since only men are allowed to work in stores, even those selling strictly female products. Exceptions can be found in women’s only shopping malls, a new slowly growing trend within the country.

Other places of interaction between the two genders include hospitals, where male physicians may treat female patients or female physicians may treat male patients, and where both male and female staff of the hospital closely work together. Hospitals and health centers are the main places where men and women working together in the same place is accepted by society, to some extent, based on necessity. Even so, unmarried women working in hospitals may have a more difficult chance in getting married as some men in society may not be interested in getting married to a woman that interacts with “stranger” men on a daily basis as part of her job!

As far as education goes, there are enough female instructors to teach female students
up to secondary level in completely segregated schools. However, at the college level, a shortage in the number of available female faculty leads to the need of utilizing male faculty in teaching certain female courses. This is especially needed at the master’s level since according to Saudi Arabian higher education regulations these courses may not be taught by someone who does not hold a Ph.D. degree.

Interestingly enough, prior to 1990 male professors used to teach female students face-to-face. However, since that time, new methods for interaction were created to replace the face-to-face interaction method. One new method involved the use of closed-circuit television (CCTV) for transmitting a faculty’s lecture given specifically to female students while in a specially setup studio at the female student campus (Del Castillo, 2003b). In other cases, a lecture offered by a male faculty to his male students is transmitted via CCTV to female students. Yet, one more method, experienced by the author of this paper while teaching master’s level IS female students, involved teaching in a special lecture room divided by a dark one-way see-through glass, where students may view the professor, but not the other way around. The glass barrier did not reach the ceiling allowing voices to go back and forth. Generally speaking, there is no well established rule for which method is used to conduct male lead courses for female students. It mostly depends on the university, college offering the course, the campus on which the course is taught, and the available facilities or lack of within that campus.

When it comes to healthcare college education, male and female students complete the majority of their studies in segregated programs. However, face-to-face instruction between male instructors and female students is much more acceptable. Additionally, during their internship programs, students are finally exposed to training which involves a great level of interaction with other interns and physicians of the opposite gender on a daily basis.

3. Program Under Study
The Master of Health Informatics initially started offering courses in the Fall of 2005 as one of the programs offered by the College of Public Health and Health Informatics of the King Saud bin Abdulaziz University of Health Sciences (KSAU-HS). The program admits new students on a yearly bases during the Fall semester. Other programs offered by the college include the Master of System Management and Health Quality, the Master of Epidemiology and Health Statistics, and the Master of Public Health. KSAU-HS is considered to be a first of its kind within the Arab world and is part of the King Abdulaziz Medical City in the country’s capital, Riyadh. Other colleges of the university include the College of Medicine and the College of Nursing (KSAU-HS, 2007). Students admitted to the Master of Health Informatics must have a Bachelor’s degree from an accredited university in medicine, dentistry, nursing, pharmacy, radiography, laboratories, medical engineering, management of health information, or information technology, in addition to two years of experience in health-related organizations.

4. Technology In Use
In this study we report on a more modern distributed learning approach. Kitsantas and Chow (2007), describe distributed learning as an approach that combines both face-to-face interaction with telecommunications technology. It utilizes the concept of “smart classroom” (Guthrie and Navarrete, 2002) in the delivery of instruction where computer technology is explicitly used to deliver educational content to students. Computer technology in this instance is represented by an instructor workstation, and a personal computer dedicated to each student. Students’ PCs are connected through a local area network to each other and to the instructor’s workstation for direct access to any material provided by the instructor.
Male and female students are separated into two adjacent lecture halls. Each room includes a smart board and a multimedia projector that displays contents of the instructor’s workstation. The instructor enjoys direct manipulation capabilities of the system through the smart board itself. Digital markers are also provided that allow the writing and drawing on the smart board, with a duplicate copy simultaneously generated in the adjacent classroom. When needed, in case of female student’s presentations of projects, control is easily switched over with a single click of a button to the other lecture hall. Females may then use the instructor’s PC in their classroom for giving their presentations, that in turn are displayed on the smart board of the male student classroom.

Student PCs are also augmented with special software programs for conducting tutorials and quizzes. Files can be disseminated to each student selected by the faculty, or to the entire group of students, and then extracted back once students have finished their in-class quizzes or assignments. One important ingredient that is missing from the current distributed learning solution is a course management system such as blackboard or WebCT. The university administration recognizes the value of such tools and is still evaluating several tools in the hope of reaching a decision with regard to which tool to adapt in the near future.

At the interaction level, male students benefit from full face-to-face interaction. On the other hand, female students benefit from installed telecommunications technologies including two-way audio-conferencing and one-way videoconferencing, being able to view the instructor live, but not the other way around. Brief face-to-face interaction with female students was needed only a few times in the Semester. The initial meeting was at the beginning of the semester for the purpose of learning about their backgrounds. This event was first initiated by the instructor of the course through the audio system, however, female students immediately requested that this task be conducted in person, and hence invited the male instructor to enter their classroom. A few other occasions of direct face-to-face interaction were required when the female students wanted to extensively discuss the requirements of the main course project.

Of additional interest in this paper is the author’s perceived low-level in-class participation by female students in comparison with an IS project management course given several years earlier to an all-girl section, part of a Master’s of Information Systems program at King Saud University. Type of interaction for the IS project management course involved neither telecommunications technologies nor any aspects of a smart classroom. Course material was presented using an overhead projector in a classroom divided by a dark one-way see through glass.

According to relevant research, the typical level of students’ participation in in-class discussions is reported to be low. Crombie et al. (2003) reports of generally very low in-class participation levels, where 64% of the students rarely, or only occasionally, asked questions or answered questions during the class. Women in general rated less than their male counterparts in in-class discussions (Crombie et al., 2003; Younger et al., 1999; Canada and Pringle, 1995). Caspi et al. (2008) conducted a study comparing the level of participation between male and female students in a face-to-face educational setting and in an online web-based instructional environment. Their results showed that men typically over-proportionally spoke at face-to-face classes while females were more comfortable than males in posting messages through the web-based learning environment.

Even though the situation in our distributed learning environment is somewhat different since both male and female students are physically segregated, it is thought that the male factor might still have a hand in the decreased level of participation by female students in our study. This is based on the fact that male students can still hear female students speak, and female students are aware of it. This assumption can be further strengthened based on the conservative Saudi culture where women are thought of being more generally shy than males,

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especially when it comes to situations where males are present in the company of females.

5. STUDY INSTRUMENT
The study was conducted at the end of the Semester during the students’ enrollment in the Web technologies course which is offered during the second Semester of study. The course introduced the main concepts of e-business and e-commerce. Such concepts included e-business models, Internet technologies, e-business systems development, security and encryption, e-commerce payment systems, e-business marketing concepts and marketing communications, and, e-business ethical and social issues. The course also briefly covered the subjects of e-health, e-government, and e-education.

A study instrument consisting of 55 questions was developed and divided into different sections. The goal of most sections in general was to determine different aspects with regard to the students’ previous or current inter-gender educational or work interactions. Of great importance to this paper were a couple of sections that sought the determine the effect of the presence of members of the opposite gender on students’ level of in-class participation. Another section of the survey was concerned with gathering students’ level of interest in web-based distance learning systems. It is hoped that a great level of comfort by the students towards the adaptation of such tools can be used as a catalyst for pushing the college administration in the quick adoption of such technology.

6. STUDY SAMPLE
The first group of students to be admitted into the Health Informatics Master’s program consisted of $n = 25$ students, 16 female and 9 male students. Eighteen of the twenty five students held health-related degrees; five students, all female, held computing degrees, while two claimed to have other types of degrees (Table 2).

<table>
<thead>
<tr>
<th>Health</th>
<th>IT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2. Study sample educational background and gender

IT students, in accordance with the program admission requirements, had been working for a minimum of two years in the health industry, mostly within the computer centers of various hospitals. Students from a health background included physicians, dentists, pharmacists, radiologists, health educators, and others.

Interestingly, and supporting arguments made earlier regarding the lower marriage possibilities for female professionals in the health field, only 7 out of 16 (44%) of the female students are married, while all 9 male students are married (Table 3). This could also mean that less married women in general seek graduate level education than single women. A married woman, may find it more difficult to hold a career, look after the children, as well as seek a graduate-level degree.

<table>
<thead>
<tr>
<th>Married</th>
<th>Single</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 3. Marital status per gender type of the study sample.

As far as the total group of students is concerned, they can be considered to be very computer savvy with 100% of the students owning a personal computer at home and having an Internet connection. Five female students spend 1 to 2 hours per day on the Internet, 7 spend 2 to 3 hours, while 2 spend more than 3 hours per day. One female only spends less
than 1 hour per day on the Internet. Only 3 of the girls are connected through broadband (DSL) connection, and all remaining 13 female students (81%) are connecting using a modem.

With regard to male students, five spend between 1 to 2 hours per day on the Internet, one spends 2 to 3 hours per day, and two spend more than 3 hours. Only one male student, as in female students, spends less than 1 hour per day. Seven of the males students (78%) are connected through modem, while only one is connected through DSL. One other student is connected through Satellite connection. This information was collected from students through a different study instrument in the beginning of the semester.

Reasons for low bandwidth connections by the majority of students can most probably be attributed to two main causes. First, is the un-availability of DSL coverage in all areas of the city, and second, very high costs for high bandwidth subscriptions. Up until the end of 2006, a typical 256 KB DSL connection cost Saudi Riyals 400 (US $107) per month, S.R.100 of which goes to the Saudi Telecommunications Company (STC) while S.R. 300 goes to the ISP. Costs for DSL services have recently been reduced for the same bandwidth for about S.R.266 (US $70) per month which is still very high compared to many DSL subscription fees at the global level.

7. **STUDY FINDINGS**

In this section we look at the findings made through the survey instrument. We will limit the results to findings with regard to sections of the instrument that mainly deal with issues of previous and current mixed-gender experiences at school or at the work place.

7.1 **General Types of Mixed-gender Interactions**

Tables 4 through 9 help provide a good idea about the levels of previous and current interactions with members of the opposite gender at the educational or job settings.

<table>
<thead>
<tr>
<th>Did you spend at least one year of your education outside of Saudi Arabia?</th>
<th>Males M = 9</th>
<th>Females F = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Approximate Percentage</td>
<td>33%</td>
<td>67%</td>
</tr>
</tbody>
</table>

**Table 4.** Students spending at least one year of their education outside Saudi Arabia.

The figures in Table 4 affirm the suggestion earlier in the paper that more male students have the opportunity of pursuing higher-level education outside the country. Having studied outside Saudi Arabia most probably implies that the student has had a mixed-gender educational experience. This may or may not reduce the level of anxiety when speaking in the company of students from the opposite sex, even if they are not present in the same classroom and are only listening in.

<table>
<thead>
<tr>
<th>Do you have co-workers from the other gender in your current job?</th>
<th>Males M = 9</th>
<th>Females F = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Approximate Percentage</td>
<td>89%</td>
<td>11%</td>
</tr>
</tbody>
</table>

**Table 5.** Students having co-workers from the other gender in current job.

Numbers derived from Table 5 in general indicate that most students are part of an
employment culture where integration of the sexes is common. This should have a positive effect on influencing the student’s ability to feel more comfortable when speaking in front or around members of the opposite gender within the class environment.

An interesting difference can be observed between data provided in Table 6 and Table 7. Ten out of 16 females (63%) claim to interact with patients. However, only 7 of them (44%) claim to interact with patients of the opposite gender. This means that a good number of health-related jobs for females have them dealing exclusively with female patients. This is possibly a result of the fact that some women in the Saudi society specifically request health services that are provided by female healthcare providers when available. It may also reflect the desire of some female healthcare providers to only treat female patients, and hence not interacting with men who are considered strange to them. Males in this study sample who interact with patients, on the other hand, all interact with patients of the opposite gender.

<table>
<thead>
<tr>
<th>Do you interact with patients in your current job?</th>
<th>Males M=9</th>
<th>Females F = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Approximate Percentage</td>
<td>56%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Table 6. Students who interact with patients in their current job.

Eighty percent of the students participating in the study claimed to have had previous mixed-gender educational experiences with students of the opposite sex in the same educational setting such as a hospital lab or a patient’s room. This can be mainly attributed to the fact that the majority of the survey sample come from health-related backgrounds.

<table>
<thead>
<tr>
<th>Do you interact with patients from the other gender in your current job?</th>
<th>Males M = 9</th>
<th>Females F = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Approximate Percentage</td>
<td>56%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Table 7. Students interacting with patients from the other gender in their current job.

As far as receiving education from an instructor from the opposite gender, 22 out of the 25 students combined claimed to have had such experience. When looking at each gender separately, all 16 female students in the study had such experience, compared to only 6 out of 9 male students (67%) (Table 8).

<table>
<thead>
<tr>
<th>Have you ever had an instructor from the opposite gender?</th>
<th>Males M = 9</th>
<th>Females F = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Approximate Percentage</td>
<td>67%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Table 8. Students having had an instructor from the opposite gender.
16 female students (88%) had had face-to-face instruction from an instructor of the opposite gender. Seven (44%) received instruction through CCTV with instructor in the same physical building. Five received instruction through CCTV with instructor present at a different campus. Three female students were involved with instruction through dark one-way see-through glass barrier, and two had such interaction through an online/Internet environment (Figure 1).

![Figure 1. Type of interaction with instructor from opposite gender in previous educational program.](http://www.ejisdc.org)

Several questions were presented to the students to get a sense of their feelings with regard to previous courses where members of the opposite gender were present in the same classroom or educational setting.

### 7.2 General Feelings About Mixed-gender Education in Health Studies

In an attempt to get a general idea about their feelings about mixed-gender education in health studies, the following question was presented to students: “how do you feel about mixed-gender education in health studies?” For this particular question, the two upper choices on the agreement side of the five-point likert scale were different than those of other questions. We used: Agree (unconditionally), instead of strongly agree, and agree (it is a necessity) instead of a simple agree. It was important to determine the level of approval of such mixed educational programs. Given that most students realize the great shortage of female faculty members, it was interesting to know how many students are willing to take mixed-gender courses because of that fact, and how many are willing to do the same even if there are enough female faculty.

Results in Figure 2 indicate an interesting finding that female students are more willing to participate in mixed-gender health-related studies than male students are. Six female students (38% of females) agree with this mode of education unconditionally, while five of them (31%) agree on the basis of necessity. Only one male student (11%) unconditionally agrees with mixed-gender education in health studies, while two male students (22%) agree on the basis of necessity. This means that 69% of females generally agree with mixed-gender education in contrast to only 33% of the male students. Four male students (44%) strongly disagree with this form of education, while only two out of sixteen (13%) of females feel the same.
Figure 2. Feelings about mixed-gender education in health studies.

7.3 Feelings About Previous Studies with Members of the Opposite Gender Present in the Same Classroom or Educational Setting

Several statements were presented to the students to get a sense of their feelings with regard to previous courses where members of the opposite gender were present in the same classroom or educational setting.

The first statement with regard to the effect of having members of the opposite gender present in the same place is: “I believe it was detrimental to my ability to participate and speak-out freely.” (Figure 3). Only three out of fifteen (20%) female students (1 refrained from responding) agreed with this statement, and none strongly agreed with it. One male student (11%) strongly agreed with the statement while another agreed (11%). Another three females students (20%) were neutral with their feelings about this statement, and so were three of the male students (33%). Five females (33%) disagreed with the statement and four (27%) strongly disagreed with it, meaning that 60% of the females are positive about not being deterred in their ability to participate as a result of the physical presence of male students. On the other hand, only 44% of males are positive about being comfortable to freely participate and speak-out with three (33%) disagreeing and only one strongly disagreeing (11%) with the statement.

Figure 3. Having students from the opposite gender in the same classroom or educational setting (in previous programs of study) was detrimental to my ability to participate and speak-out freely.
The second statement in this section enquires about the feelings of students with regard to their previous mixed educational environment being more beneficial to their educational experience (Figure 4). A great difference between feelings of males and females is seen in the response to this statement. None of the male students strongly agreed with this statement, and only one (11%) agreed with it. On the other hand, and astounding 64% of female students (2 females refrained from responding) either agreed or strongly agreed with the statement, and hence really feeling that they had academically benefited from their mixed educational experience. Three out of fourteen (21%) females strongly agreed and six (43%) agreed with the statement. Three females (21%) were neutral in their response and so were four male students (44%). On the disagree side, 22% of male students disagreed with the statement and another 22% strongly disagreed. Females did not strongly disagree and only 14% of them disagreed with the statement.

Figure 4. Having students from the opposite gender in the same classroom or educational setting (in previous programs of study) made my educational experience more beneficial.

A third statement dealt with the idea that the mixed-gender educational environment prepared the student better for their job (Figure 5). Here again, an even more astounding result is seen with regard to the feelings of female students. Nine out of fifteen (60%) strongly agreed and another three (20%) agreed with the statement. This means that 80% of the participating female students feel having gained an advantage in their careers as a result of their mixed-gender education. On the male side, only one student strongly agreed and another agreed. Five male students (56%) were neutral, while only 2 females (13%) felt the same way. Two students, one male and one female disagreed, and no one strongly disagreed with the statement.

7.4 Feelings About Previous Studies with Members of the Opposite Gender
Listening-in Through CCTV
The first two statements of the last section were repeated again in this section to determine the feelings of students with regard to previous mixed-gender education, however, in this case of, with males and females being in different physical locations. The main mode of lecture delivery and interaction between female students and a male faculty member is through closed-circuit television and telephone lines.
Figure 5. Having students from the opposite gender in the same classroom or educational setting (in previous programs of study) prepared me better for my job.

The first statement stated that this type of educational environment was detrimental to the student’s ability to participate and speak-out freely. While no females strongly agreed, six out of the fifteen (40%) females who responded to this statement did agree with it (Figure 6). This number is double that of female students who felt a restriction on participation in the case where males were physically present as described in the previous section. Two females (13%) were neutral, five (33%) disagreed, and two (13%) strongly disagreed.

Figure 6. Having students from the opposite gender in the same class but at a different physical location (in previous programs of study) was detrimental to my ability to participate and speak-out freely.

Male students’ ability to participate in this situation were not changed much from the physically mixed educational environment. Two of the seven (29%) male students who responded to this statement strongly agreed with it, while no males agreed. Four males (57%) were neutral, and only one (14%) has agreed, with none strongly disagreeing with the statement.
The second statement in this section deals with the effect of the separated teaching environment, with males at a different physical location than females, on their educational experience being more beneficial (Figure 7). Two out of the fifteen female respondents strongly agreed with the statement, and six (40%) agreed with it. Only one female disagreed, with the remaining six (40%) being neutral. Male students voted mostly neutral with four out the responding seven (57%) making this choice. Only one male student strongly agreed, while on the disagreement side, two chose to disagree with the statement.

7.5 Barriers to Participation in Previous Courses

Students were requested to list any barriers that had prevented them from participating freely in previous courses where they were separated from students of the opposite gender by physical space (Figure 8). Four out of sixteen female students (25%) expressed their discomfort in speaking through a microphone or telephone. Six (38%) thought that the method for contacting the instructor was too time consuming. Four (25%) did not want to upset other students by interrupting the faculty; and three female students (19%) did not feel any barriers to participation. What is interesting to know is that none of the female students was apprehensive about in-class participation as a result of not wanting members of the opposite gender to hear her voice.

Male students at such an educational setting, most probably are not restricted with the need for speaking into a microphone and hence four out of the nine male participants (44%) in this study sample claim that there were no barriers to their in-class participations. Only one male student (11%) did not want to upset other students by stopping the instructor. Two male students (22%) claimed that contacting the instructor was too time consuming. One male (11%) did not want his voice to be heard, and another had some other unspecified reason.
I did not want my voice to be heard
not comfortable speaking in microphone
contacting instructor too time-consuming
I did not want to upset other participation students for stopping instructor
no barriers to

Figure 8. The greatest barriers to participation in in-class discussions in previous courses where students from the other gender are present but at a different physical location.

7.6 Barriers to Participation in Current Courses

With regard to the students’ experiences with the current course of study, and what they perceived as barriers to in-class discussions, two statements were posed to the students:

- Having students from the opposite gender listening to what I might say has restricted my in-class participation.
- Not having a microphone especially for me (PC Mic.) has been a reason for me not participating enough

Figure 9 shows an almost equal split in agreement and disagreement to statement number 1 among both male and female students. A slight shift towards the disagreement side, however, is visible through the graph for female students. Three (19%) female students strongly disagree with the statement, five (31%) disagree, and six female students (38%) agree with the statement. No females strongly agreed with the statement. Male students are evenly divided with regard to this statement. Two out of the eight (25%) respondents agree and two (25%) disagree, while one strongly agrees (12.5%) and another strongly disagrees (12.5%). Two other male students voted neutral (25%).

With regard to the second statement, female students seem to mostly agree that not having a dedicated microphone for each one of them has been a reason for low level of participation. The current classroom has only one wireless microphone that needs to be transferred back and forth in order for students to make a comment or ask a question. In the absence of visual eye contact, the instructor has no way of knowing that a female student is interested in asking a question or making a comment unless she speaks out into the available microphone. What seems to be a lengthy process of asking someone else to pass the microphone to the back of the lecture room or the front of it apparently has restricted female student participation.
According to Figure 10, ten out of the sixteen females students (62.5%) equally agree or strongly agree that not having a specialized personal microphone has restricted their ability to participate. Only three out of the 16 (19%) females disagreed with the statement. Male students were again equally distributed between agreeing and disagreeing with the second statement.

Even though male students may speak up whenever they like and are immediately heard by the instructor, they are typically requested to speak into the microphone so that female students may hear the question or comment. Some may view this as a delaying factor and hence may refrain from pausing the question or comment. As far as students’ acceptance
of the different tools used in teaching their current health informatics program including smart board technology, 89% of males expressed their agreement with the statement that the use of the technology had been beneficial to their educational experience. Only 69% of the females agreed with that statement. The remaining 31%, however, did not disagree and were neutral.

94% of females expressed that having an instructor within the same classroom for face-to-face interaction was more useful to students. 89% of males felt the same way as well. The remaining females and males voted neutral. All female students (100%) agreed that not having the instructor in the same classroom causes them to lose concentration and that based on the close proximity of the instructor, they all agreed that having the instructor visit their classroom every once in a while to discuss important issues was necessary.

Only 78% of males said that not having the instructor would cause them to lose concentration, and only 67% thought that it was necessary to have an instructor go into the room of students of the opposite gender to discuss important issues. The difference between male and female student answers with regard to this question are definitely reflective of the suffering that female students experience by not having a face-to-face interaction with the instructor. Male students, on the other hand, have not really experienced not having an instructor during the course delivery process, and hence their judgment on this matter is lacking.

8. **Conclusion**

Based on this study, it is clear that female students feel a greater desire in having face-to-face instruction, even if given by an instructor from the opposite gender. They are more willing than male students to participate in mixed-gender courses offered to both at the same physical location. They are also more cognizant of the benefits of mixed education on their educational and on-the-job experiences.

This might be considered strange coming in a conservative society which tries in many situations to restrict the interaction between the sexes, especially of those who are not related to each other. However, it is believed that the previous health-related educational experiences coupled with the employment in health organizations, where gender intermixing is the norm, have played a major role toward this direction.

It is surprisingly realized through this study that it is males who are mostly not comfortable with having females in the same educational environment, and who do not feel much of a benefit of such environments. It was additionally realized that more than cultural values, it is really technology or the improper application of it, such as in the case of the classroom microphone, that plays a major role in enabling or discouraging in-class participation in a distributed learning environment.

9. **References**

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**Biography**

Dr. Abdulrahman Mirza is currently assuming the role of Chief Information Officer at the King Abdullah Foundation for Developmental Housing Dedicated to His Parents. Prior to joining the Foundation in 2005, he was the chairman of the IS department at the College of Computer and Information Sciences, King Saud University. Dr. Mirza received a Fulbright Senior Scholar award from the US State Department during the academic year of 2002/2003. He completed his Ph.D. in Computer Science in 1995 from Illinois Institute of Technology. His M.S. in Operations Research and Management Sciences as well as his B.S. in CS were attained from George Mason University. Dr. Mirza’s current research interests include e-business, e-learning, web usability issues, and data warehousing.