Communications of the Association for Information Systems

Volume 25 Article 28

9-1-2009

The Impact of Gender and Pedagogical Factors on Female Pass Rates

Catherine Lang
Swinburne University of Technology, clang@swin.edu.au

Denny Meyer
Swinburne University of Technology

Sarah Niner
Monash University

Judy McKay
Swinburne University of Technology

Sue Lewis
Swinburne University of Technology

Recommended Citation
Lang, Catherine; Meyer, Denny; Niner, Sarah; McKay, Judy; and Lewis, Sue (2009) "The Impact of Gender and Pedagogical Factors on Female Pass Rates," *Communications of the Association for Information Systems*: Vol. 25 , Article 28.
DOI: 10.17705/1CAIS.02528
Available at: https://aisel.aisnet.org/cais/vol25/iss1/28

Communications of the Association for Information Systems

CAIS

The Impact of Gender and Pedagogical Factors on Female Pass Rates

Catherine Lang
Faculty of Information and Communication Technologies, Swinburne University of Technology
clang@swin.edu.au

Denny Meyer
Faculty of Life and Social Sciences, Swinburne University of Technology

Sarah Niner
Faculty of Arts, Monash University

Judy McKay
Faculty of Information and Communication Technologies, Swinburne University of Technology

Sue Lewis
Faculty of Life and Social Sciences, Swinburne University of Technology

Abstract:

An assessment of student achievement according to gender in core units of study of a Faculty of Information and Communication Technology program tested four hypotheses. The first of these related to the role-model effect of female academics; the second related to the advantages of formal education qualifications of academics; the third to the application of contextualized curricula, and the fourth to the use of a variety of assessment modes. Correlation and regression analysis on the data set indicated that the presence of two of these factors can significantly improve the pass rate of female students while having a benign effect on the pass rate of male students. It is suggested that information systems faculties pay close attention to gender diversity of their teaching faculty, particularly if their female student cohort is less than one in five in a unit of study. It also gives substance to the need or preference for university lecturers having education qualifications. This study needs to be replicated in other information systems faculties and schools to verify this finding.

Keywords: gender diversity, IS pedagogy, role models, student achievement

Volume 25, Article 28, pp. 305-320, September 2009

The manuscript was received 1/7/2008 and was with the authors 7 months for 3 revisions.

Communications of the Association for Information Systems

I. INTRODUCTION

The argument for increased gender diversity in the Information Systems (IS) discipline resonates strongly and is increasingly important due to the declining number of females selecting this career path. The advantages of workplace diversity have been expounded in the literature. Florida argued that a diverse workforce is integral to the growth of creativity in cities [Florida 2002]. Pless and Maak [2004] emphasized the importance of building strategies for workplace diversity in the business environment. Kvasny, Greenhill, and Trauth [2005] provided a strong argument for diversity in the academic sphere, particularly in the IS field. It has been posited that a lack of diversity in product designers resulted in spectacular design failures in the past. Margolis and Fisher presented an example of early voice-recognition software initially calibrated for the male voice only that resulted in early video-conference systems not automatically focusing on female speakers in meetings [Margolis and Fisher 2002]. It is of concern that many women are excluding themselves from the opportunity to influence and shape future IS applications in business, health, industry, and education through not being involved in the design and application stages of this industry to an equivalent extent as men [Jacktman 2007]. The apparent decline in popularity of the profession as a career path has impacted student enrolments in higher education courses in many IS schools and faculties in Australia and other western nations. Current statistics from Australia show that Information Technology (IT) careers, the generic term used, are not being considered by many young men, and by only 1 percent of young women [MMV 2004]. In total, the number of female students enrolling in higher education bachelor degree courses in IT has halved this century from 11,566 in 2001 to 6,101 in 2007 [DEST 2008].

This paper reports on findings from a Women in IT (WIT) project funded by a three-year internal grant in an Australian University that began in 2005. The aim of the project was to address the growing lack of diversity in the student population of the Faculty of Information and Communication Technologies (FICT). The WIT project drew on the multilayered approach of Carnegie Mellon University (CMU) intervention program that achieved an increase in enrolments of women in Computer Science degrees from 7 percent in 1995 to 42 percent in 2000 [Margolis and Fisher 2002]. Worldwide reporting of the dramatic improvement in the proportion of female computer science students at CMU captured the imagination of the researchers. The statistical evidence was an important element that convinced the university to fund the WIT project, while the associated publication provided a blueprint for implementing a similar program. Since 2000, publications from the same institution indicated that the more visible critical mass of female students had influenced the culture of the school and in turn attracted a more diverse cohort of male students [Blum and Frieze 2003], an outcome that further substantiated the need to implement a similar program at FICT.

A major recommendation from the CMU program was to gain an understanding of the student body before considering intervention programs, because each university has its own particular culture. Our WIT project adapted the CMU recommendation and carried out a gender study to develop a baseline snapshot of our faculty. We examine the gender distribution of academics and students in various units of study in the faculty and then report on any patterns evident in achievement levels related to gender. When analysing patterns of achievement, we investigated educational qualifications of faculty staff as well as the types of assessment used. In conducting this gender study, we provide a baseline snapshot for the faculty to use in the future to analyse if the WIT project or any other future intervention programs have impacted on student achievement and the gender diversity of the faculty.

The three-year WIT project recognized that Australian students may require different educational strategies than those employed at CMU and involved the following elements:

- A university-wide survey of first-year students to gather information about their background; the gender profile of each faculty in the university; the previous education experiences of the students and their current attitudes to IT and university in general. This aspect of the research has been reported in several papers [Lang et al. 2005, McKay et al. 2005, Lewis et al. 2006b, Lang et al. 2006, Lewis et al. 2006a].

- Longitudinal qualitative research consisting of interviews with current male and female students in FICT, yet to be published.

- The gender study reported in this paper. This baseline snapshot of the gender profile of the faculty uses a positivist approach to analyse the gender profile of student achievement in core units of study, then applies an interpretive approach to the findings. This aspect of the project is the focus of this paper and extends the

findings reported earlier [Lang et al. 2007b]. To clarify, the term “unit of study” or “unit” is used in place of “subject” or “course” to mean a topic or course of learning provided to students in one semester (e.g. “Introduction to programming” or “Business Information Systems Analysis”). A list of units of study included is in Appendix 1.

The format of the paper is as follows. Firstly, the theoretical framework that informed the gender study is presented. The research approach is then explained and includes a definition and explanation of each of the variables that were analysed. From this, we pose the four hypotheses that emerged from the data and their subsequent degree of verification. The results section is organized around each of the hypotheses and presents the finding of significant correlations between the first three variables assessed. The discussion section reports on the implications of the statistical relationship between gender of academic faculty when women in class are a significant minority, pedagogical practices, and the academic success of students. Suggestions for future practice and research are included in the conclusion, as are the limitations of this project. This research adds to the current literature in the IS and diversity arena and suggests the need for other universities to conduct similar studies to verify these initial findings.

II. THEORETICAL BACKGROUND

The gender study was informed by three strands of literature: Women in IT, educational psychology, and more general IS literature with particular focus on culture and gender relationships. A recent U.S. study critically reviewed the Women in IT literature published over the last 15 years and produced a list of assumptions which required conclusive evidence before they could be established as factors that influence female participation in IT. This list was labelled “Things we believe and expect to establish” [Cohoon and Aspray 2006 p.172]. The second on their list of 12 assumptions was:

2. Confidence, grades, and perception of grades all affect women’s participation.

According to these authors, before this assumption can be promoted to a list of known facts, a link between grades and women’s participation needs to be established. “The distribution of CSE (computer science education) grades also varies by gender according to one study. This finding must be replicated and linked to women’s retention and progression” [Cohoon and Aspray 2006 p.173]. The WIT gender study aims to contribute to the body of knowledge concerned with the distribution of grades according to gender, by conducting a gendered analysis of grades in a variety of units of study, combined with data relating to the gender of the academic staff teaching into the unit. It also contributes to theoretical understanding more generally by illuminating the assumption (point eight on the same list) that

“Same-sex peers help increase women’s entry and progression in CSE” [Cohoon and Aspray, 2006 p.173]

through relating student achievement with the gender balance in a unit.

Research in the educational psychology field has shown that self-confidence influences course and career choice in general. Researchers strongly believe in the generative capability of self-efficacy and have shown how it can be developed or created through success in tasks and repetitive experiences [Bandura 1997; Pajares 2002; Reeve 1996]. Given the nature of the IT discipline and the concepts that hardware familiarity and software mastery are necessary before addressing creativity and problem-solving activities, these findings are important. It is also believed that self-efficacy is more powerful than ability [Zimmerman 1995], another important theory when applied to women in IT. Radford argued that education can override stereotypes, [Radford 1998] yet it would appear that a complex set of factors embedded in societal stereotypes are turning women away from IT careers. Educational psychology literature informed the WIT project and the gender study particularly, and through this, we hoped to gain a greater understanding of what effect pedagogical practices had on student achievement.

Several studies in the IS literature that informed the structure of the gender study investigated the link between computer anxiety, math anxiety, communication anxiety, and attitude to computers. Vician and Davis [2003] found a relationship between computer anxiety, communication apprehension, and written communication apprehension in contemporary students. They concluded that educators “must be concerned about how to guide the development of education and training environments” [Vician and Davis 2003 p.55]. Buche, Davis, and Vician [2007] conducted research into the “effects of extended exposure to a computing-intensive environment on computer anxiety and performance” [Buche et al. 2007 p.420] and found that there was no positive correlation between exposure and anxiety. They did, however, suggest that there was need for further investigation into the effect of gender on computer anxiety and careers. While Vician and Davis did not focus particularly on aspects of gender or cultural diversity, this was the focus of Trauth’s [2002] research into "the way in which social shaping of gender and the IT profession operates at an individual level." [Trauth 2002 p.103] and concluded that "inherent IT capability and interest spans the gender continuum" [Trauth 2002 p.104]). An earlier investigation by Keeler and Anson [1995] related computer anxiety and cooperative learning environments. These researchers found that cooperative learning

environments positively improved student performance in IT classes, and appeared to help high anxiety students learn [Keeler and Anson 1995 p.388]. Drawing on the findings from these researchers, we expanded the gender study to move beyond just a gender analysis and to include a categorization of the variety of curricula and assessment in the units of study we investigated.

The theoretical framework of the WIT project was also informed by Gilligan's research that explained female reluctance to embrace some careers was complicated by notions of selfishness and responsibility, and that many women wished to avoid both [Gilligan 1982]. She writes that it is the "ethic of responsibility that is the centre of women's moral concern, anchoring the self in a world of relationships and giving rise to activities of care" [p. 132]. This creates tensions for many young women because they are so ingrained with the ethic of care rather than individual career progression [p.136]. Gilligan's research has been advanced by more recent research investigating organisational culture which reports on similar notions of a selfishness associated with IT businesses and organisations. Roldan, Soe, and Yakura posit that the organisations themselves are not gender neutral and in fact the "chilly" climate that devalues female skills contributes to the female lack of attraction towards IT careers [Roldan et al. 2004 p.108]. Beekhuyzen, Nielsen, and Von Hellens [2003], explored the way that professional women working in the IT industry discussed the nature of their work. Their research continues to seek a better understanding of the way women help "configure the institutional realm of IT work" [Beekhuyzen et al. 2003] and suggest strategies that include greater mentoring opportunities. According to other Australian researchers, society has labelled IT as male, [Wajcman 2000] and this has extended to IT environments in schools, universities, and the workforce being considered as unattractive to women. Jewell and Maltby reported that females rated the IT field to be of medium difficulty (Art being the lowest in difficulty and Law the highest) and the lowest in people involvement [Jewell and Maltby 2001 p.315]. These authors remarked that both boys and girls in their survey perceived IT as a "sedentary, perhaps isolated, occupation and surmised that this is a plus for the majority of males" [Jewell and Maltby 2001 p.315], indicating that while the perceived isolated nature of the career path is a deterrent for many women, it is an encouraging factor for some men and is what attracts them to the discipline. More women than men believe that to succeed in IT, a particular gift or talent is required [Jewell and Maltby 2001]. In another study, [Pearl et al. 2002] the individualism in the culture associated with IT was analysed. These researchers found that the IT culture expected long hours of work and valued competition while devaluing skills of communication because they are seen as female and natural to women [Pearl et al. 2002]. It was posited that "It is better to be a technical person who is assertive and competitive than a woman in IT" [Roldan et al. 2004 p.110], implying that feminine traits and skills were valued much less than the technical.

It appears that a perception permeates contemporary Australian society that IT is not an acceptable career option for young women, a concept borne out by the dramatic downturn of female enrolments in this discipline in our own university and countrywide [DCITA 2006; DEST 2006; DEST 2008]. This perception appears to differ between cultures, a difference noted in many universities in Australia where Asian female students enrol in this discipline in significantly larger numbers than Australian female students [von Hellens et al. 1997]. A project commissioned by the Victorian government to better understand the factors that were inhibiting uptake of IT careers found that most students, both female and male, considered IT as hardware focussed rather than involved in social communication. It found that a binary state of mind existed in students in reference to IT jobs. They were perceived as technical, not creative; solitary, not team oriented [MMV, 2001]. It is of critical importance therefore to maximise the learning environments for our students and pay particular attention to any gendered patterns in success. The WIT gender study provided a deeper understanding of our faculty's gender profiles and informed the development of strategies to maximise the diversity of our student body.

III. METHOD

The gender study drew predominantly on existing data and resources within the university. Results spreadsheets, which provide student achievement results in each assessment item in their unit of study as well as the final exam, are submitted by faculty at the end of each semester. These spreadsheets provided us with primary data that was largely quantitative in nature. The WIT study used these spreadsheets to categorize and analyse core units of under-graduate degree courses. Qualitative research methods of inductive coding for description and inference and data reduction methods were employed as recommended by Miles and Huberman [1994]. This involved three steps, the first was to classify the undergraduate units of study as either as Information Systems (IS) or Computer Science (CS) according to the management unit that delivered the units of study within the Faculty (inductive coding using categorical variables). In our faculty of ICT, these were the two main teaching units with the majority of student enrolments. The second step involved sorting the results spreadsheets (removing student number and name) according to student gender, adding the third categorical variable of gender and employing data reduction methods. The final part of this categorization process involved sorting grades attained by students according to gender and degree (either CS, IS or Other) to gain an understanding of student achievement and determine if there were any patterns evident. In our university pass grades [P] are in the range of [50-100] and fail grades are reported as N [not pass].

Table 1. Gender Achievement Summary

Unit Name	Degree Classification	Total # students	% Female g1	Fail Rate all students %	Fail rate female %	Female Role model g2	Context curricula p1	Varied Assess p2	Educn Quals of Acad p3
Information Systems 1	IS	505	44	20	23	Y	N	N	Y
Software Engineering 1	IS	234	9	17	20	N	N	Y	N
Computer Science Programming 1	IS	296	9	27	44	N	N	N	N
Computer Science Programming 2	CS	310	7	31	43	N	N	N	N
Information Systems Programming 1	CS	90	20	37	28	Y	N	N	Y
Database 1	CS	374	13	26	28	N	Y	N	N
Human IS study	IS	187	14	29	12	Y	Y	Y	Y
Information Systems Programming 2	IS	172	17	31	35	N	N	Y	N
Information Systems Project	IS	122	30	2	2	N	Y	N	N
Information Systems Ethics	CS	246	17	3	3	Y	Y	Y	N
Information Systems 1 [new]	CS	587	37	11	9	Y	Y	Y	Y
Database 1 [new]	IS	306	17	24	25	N	N	N	N
Information Systems Technology [new]	IS	65	22	9	25	N	no data	Y	N
Information Systems Management [new]	IS	83	19	10	0	Y	Y	Y	Y

Indicators g2, p1, p2, p3 are either present or absent.

The second stage of the analysis involved a more in-depth look at the types of assessment used in each unit of study. The four researchers in the team worked collaboratively and drew on their experiences from the fields of education, gender studies and information systems to determine the naming and grouping of pedagogical variables. The naming of assessment types of continuous and formative, performance based and summative, closed and open were decided by the team using qualitative methodology. There was a degree of personal knowledge involved since two of the researchers worked within the faculty. More elusive information was attained via communication to students of assessment requirements for each unit available on the content management system used by the university, as well as from the unit information summaries provided to students at the start of each semester. The categorization was also informed by reference to the recognized gendered preferences of some assessment types reported in the literature, such as individual or group assignments, written or practical assessment, contextualization of the curriculum as well as proportion of results reliant on exams [Murphy and Whitelegg 2006; Keeler and Anson 1995]. Two researchers participated in the initial determination and categorization process. The complete team discussed, evaluated and ratified the final classification. Consensus was reached in all cases.

Table 1 provides summary information on the 14 units of study analysed to test the hypotheses. The unit names have been simplified for clarity of interpretation. Ten units of study delivered in 2005 and four delivered in 2006 were

Communications of the Association for Information Systems

analysed. In 2006, the faculty implemented new core units of study that covered enhanced content; these are indicated as new. The variables in this table and analysed in the gender study are explained in detail in the next section.

The Variables of Interest

The variables of interest to the gender study grew out of the theoretical framework presented in last section and an initial analysis of some of the units of study. They were grouped for purpose of analysis into categories of gender [g], pedagogy [p] and sequence using inductive coding methods [Miles and Huberman 1994]. The ability to perform statistical analysis on the study results was confined to the gender and pedagogical categories or variables, because the sequencing factors, reported in an earlier publication [Lang et al. 2007a], did not provide enough differentiation (the units of study were either in first year of study or not) to be included in the second level analysis reported in this paper.

Gender Variables

Two variables were classified as gender related. The first "critical mass" [g1] indicated whether there was more than 25 percent representation of females in the unit. This variable was perceived to be important, because it appeared to determine whether a masculine culture existed in a unit, perhaps the "clubhouse" environment, or "chilly climate" that is reported in the women in computing literature [Margolis and Fisher 2002; Wajcman 2000; Roldan et al. 2004]. The second gender variable was named "role model" [g2] and indicated whether there was a female academic in the lecturing staff of the unit.

While there is no definitive study that verified a critical mass of 25 percent, it was adopted for this analysis based on research reported by Valian [1999]. According to several experiments quoted by Valian, the visibility of a minority is located around the one in four proportion, and "... being in a minority increases a woman's likelihood of being judged in terms of her difference from the male majority, rather than in terms of her actual performance"[Valian 1999 p.140]. Investigation of the impact of these variables provided more information for the question raised by Cohoon and Aspray, in their list assumptions, that: "Computing culture is masculine. Whether it has to be masculine, and whether the culture is a cause or a consequence of its gender composition, are different questions" [Cohoon and Aspray 2006 p. 171]. The presence or absence of a female academic, the second gender variable, was also reported for each unit as a measure of same gender role modeling in learning environments [Rayman and Brett 1995; Trauth et al. 2002; Corneliussen 2004; Lang 2003].

Pedagogical Variables

When examining student results three variables, informed by the literature [Vician and Davis 2003; Buche et al. 2007; Trauth 2002] were classified as pedagogy related because they appeared to affect the outcomes of students and were influenced by curriculum content and assessment methods. These variables were labelled "Contextualized curriculum [p1]," "Varied Assessment [p2]," and the third and final one was "Formal Academic Qualifications [p3]." To determine if the curriculum was contextualized, the types of case-study examples were categorized. Particular note was made in relation to the case studies to determine if they specifically favoured the interests of one gender over another e.g. car-racing for males or shopping for females. This categorization was subjectively applied after analysing content posted on the learning management site of the unit. Two researchers were initially involved in this categorization process and results were discussed between the researchers to clarify the presence or absence of this factor.

The second pedagogical variable, varied assessment [p2] was ascertained when a mixture of open and closed assessment, summative and formative, and a mix of continuous and performance based activities were present in the unit. The following classification system was used in this study to categorize the types of assessment across the units of study.

- **Continuous and Formative:** Group or individual research that involved student activity continually over a period of time. It also included assessment based on participation such as attendance, attentiveness and discussion in tutorials and hurdle requirements. Continuous assessment can also be formative. Some assignments and tests were formative, meaning that students could learn along the way e.g. a hurdle test in which they had several opportunities to learn from their mistakes, or a mid-semester test where the correct answers were discussed in tutorials.
- **Performance and Summative:** Tests and examinations that involved a performance-based event. These were considered summative where the correct or ideal solution was not provided for students.

- **Closed:** Closed assessment required only a predetermined correct answer such as multiple choice questions (usually marks were for right answers but in some cases marks were deducted for wrong answers).
- **Open:** was defined as that which encompassed an opportunity for the student to display specific knowledge about a topic by such means as an essay, short written answer, or case study analysis.

It is acknowledged that some of these definitions overlap. Both continuous and performance based assessment could be open, such as assignments that required the student to produce computer programming code, or closed such as diagrams and schemas using fixed techniques and tools that primarily have only one correct answer.

In terms of good or bad pedagogy, much of the self-efficacy literature reports that students learn tasks better in small chunks and that they need a firm confidence in their self-efficacy to mount and sustain the required effort to learn new and perhaps difficult tasks and concepts [Bandura 1997]. Each unit of study was analysed with this conclusion in mind and categorized according to the predominant assessment practices, whether it was continuous and formative throughout the semester or performance based and summative at the end of semester. Where possible the examination delivered to students at the end of the unit of study was also analysed to determine the proportion of open and closed questioning. Research indicates that boys outperform girls on closed question types like multiple choice but girls outperformed boys on open essay questions and short free-written responses. Furthermore, the performance of boys was improved relative to girls when multiple-choice formats replaced written tests [Murphy and Whitelegg 2006]

The final pedagogical variable is whether or not the academic with prime responsibility of coordination of the unit of study held formal education qualifications [p3]. This factor was included during the analysis phase to provide another lens to investigate anomalies in student results according to gender. Due to privacy restraints, the only factors we could investigate were gender and qualifications held by the academic, both of which were in the public domain. This was reported as either being present or not (YES or NO). An informed assumption was made that formal education qualifications enhances an academic's ability to structure units of study and assessment tasks to enhance and develop student education [Vician and Davis 2003].

Hypotheses

In the process of establishing the gender profile it was noted that a number of variables, when present in a particular combination, appeared to affect student achievement according to gender (Lang et al. 2007b). A statistical analysis of these variables found that four in particular had an effect on student outcomes. These are the presence of female role models in the unit of study, whether academics teaching into the unit held formal education qualifications, the use of contextualized curriculum and variety in assessment practices. These provided the basis for the hypotheses to be tested in this study.

- **H1**: The effect of a female role model in the academic teaching staff impacts positively on female pass rates
- **H2**: The effect of academic educational qualifications impacts positively on female pass rates
- **H3**: The effect of contextualized curricula impacts positively on female pass rates
- **H4**: The effect of varied assessment practices impacts positively on female pass rates

These hypotheses were tested using correlation analysis and moderated regression analysis as indicated below. The variables were labelled and measured as indicated in Table 2.

Table 2. Variable Definitions

Variable	Variable Name	Variable Measurement	Hypothesis test
Female role model in the academic teaching staff	g2	1=present, 0=absent	H1
Academic educational qualifications	p3	1=present, 0=absent	H2
Contextualized curricula	p1	1=present, 0=absent	H3
Varied assessment practices	p2	1=present, 0=absent	H4
Female participation in class	%Female	Ratio	H1-H4
Female Failure Rate	FailFemale%	Ratio	H1-H4
Male Failure Rate	FailMale%	Ratio	H1-H4

IV. RESULTS

As can be seen in Table 3, there are significant correlations between female failure rates, the presence or absence of a female role model amongst the academic staff teaching into the unit [g2] and the existence of a contextualized curriculum [p1]. These correlations indicate that when these elements are all present in a unit it can be concluded that females perform better and fewer fail. However, despite a significant correlation between male and female failure rates the correlations of male failure rates with a female role model and curriculum context were not significant. These results give some support for H1 and H3. However, the correlations between female failure rates and academic educational qualifications [p3] and varied assessment practices [p2] are not significant, providing no support for H2 or H4. It is noted that there is a very strong correlation between the presence of a female role model [g2] and an academic educational qualification [p3] making it difficult for the first and second hypotheses to be tested independently.

Table 3. Descriptive Statistics and Pearson Correlations [p<.01, * p<.05]**

	Fail Female%	Fail Male%	Class size	% Female	g2	p1	p2	p3
Mean	21.2	19.6	255	19.6	.43	.46	.50	.36
StdDev	14.4	11.7	156	10.7	.51	.52	.52	.50
Correlations								
FailFemale%	1.00	.65*	.12	-.42	-.54*	-.77*	-.46	-.37
FailMale%	.65*	1.00	.02	-.40	-.02	-.54	-.34	.20
Class size	.12	.02	1.00	.41	.16	-.02	-.20	.17
g2	-.54*	-.02	.16	.46	1.00	.38	.29	.86**
p1	-.77**	-.54	-.02	.19	.38	1.00	.38	.22
p2	-.46	-.34	-.20	-.04	.29	.38	1.00	.15
p3	-.37	.20	.17	.52	.86**	.22	.15	1.00

Table 4 explains the eight moderated regression analyses that have been performed. In these analyses, the moderation effect is the interaction (product) for the female participation rate and the linear effect. These regression analyses incorporate as independent variables the female participation rate for each class, each of the hypothesized predictor variables [g2, p1, p2, and p3] in turn, as linear and moderation effects. The dependent variable is female failure rates for Table 5 and male failure rates for Table 6. A significant linear effect indicates that the variable has a significant impact when female participation is (statistically) controlled. A significant moderation effect indicates a significant difference in the coefficient for female participation for the two levels, absence [0] and presence [1] of the predictor variables [g2, p1, p2, and p3].

Table 4. Description of Moderated Regression Analysis

Hypotheses Tested	Dependent Variable Table 5	Dependent Variable Table 6	Independent Variables		
			Female Participation	Linear Effect	Moderation Effect
H1	FailFemale%	FailMale%	%Female	g2	g2*%Female
H2	FailFemale%	FailMale%	%Female	p3	p3*%Female
H3	FailFemale%	FailMale%	%Female	p1	p1*%Female
H4	FailFemale%	FailMale%	%Female	p2	p2*%Female

The second column of Table 5 (below) and Figure 1 suggest that female failure rates decline by 1.36 percent on average when the percentage of females in the class increases. However, this effect occurs only when there is no female role model in the academic staff teaching into the unit [g2=0]. When there is a female role model there is on average a non-significant increase in the female failure rate for each additional 1% increase in female participation.

This finding has several implications, one being that the effect of low female participation in units of study may be offset by ensuring that there is a female role model in the academic staff delivering lectures, tutoring or coordinating the unit. This result provides some support for the first hypothesis in that this regression equation explains 61 percent of the variation in female failure rates.

Table 5. Regression Coefficients for Female Failure Rates [* p<.05, ** p<.01]

Predictor	Female Role Model [g2*]	Educational Qualification [p3]	Contextualised Curriculum [p1*]	Assessment Variation [p2]
% females	-1.36*	-1.43*	-.37	-.72
Linear effect	-11.37	-6.45	-20.52**	-13.07
Moderation effect	1.67*	1.64	-.04	.45
R-Square	61.1%	46.5%	67.2%	42.3%

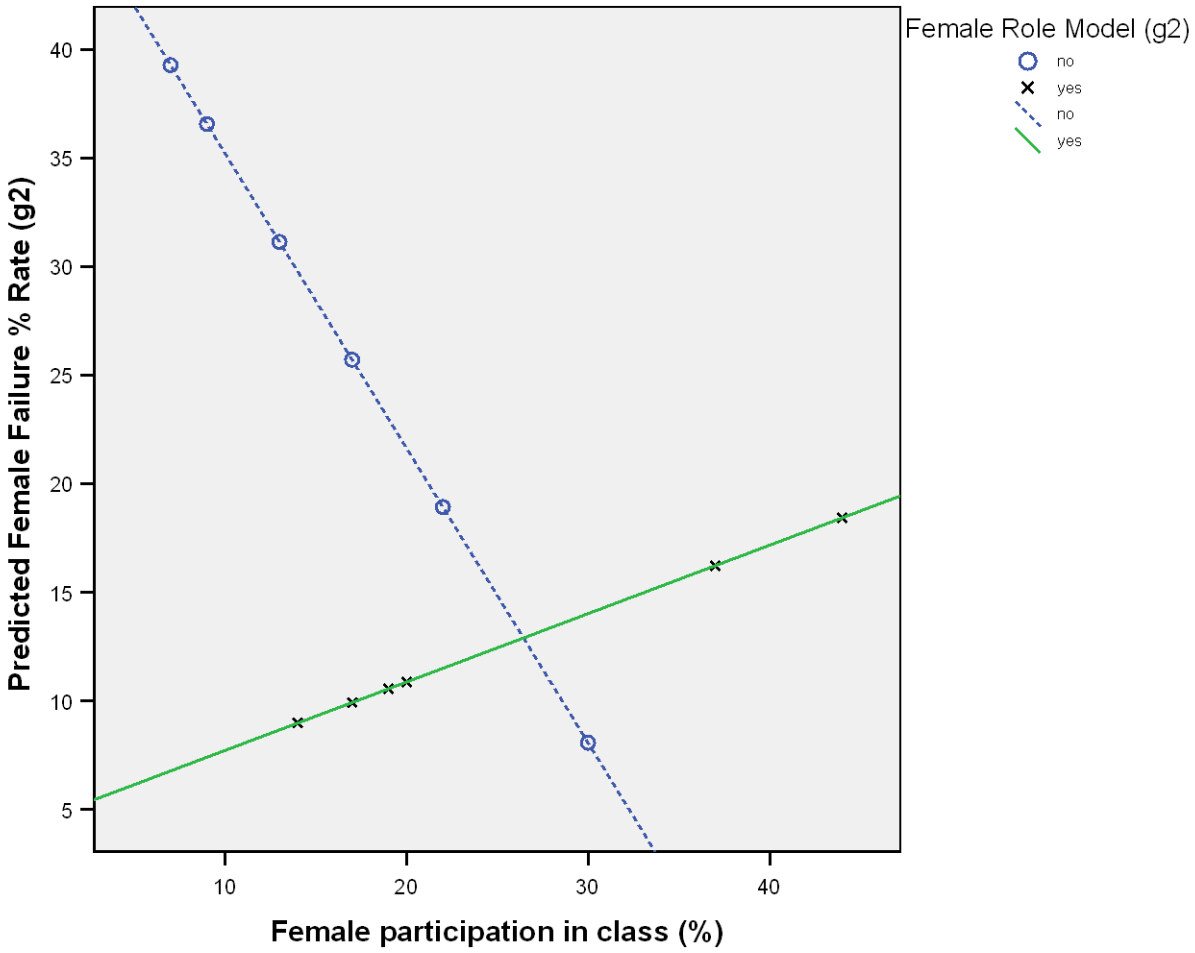

Figure 1. Predicted Relationship between Female Failure Rates and Female Participation with Moderation Due to the Presence of a Female Role Model

The third column of Table 5 and Figure 2 suggest a similar relationship for educational qualification [p3], although the moderation effect is not quite significant [p = .053] and only 46.5 percent of the variation in female failure rates is explained by this equation. This result provides support for the second hypothesis, however, the confounding of the female role model and educational qualification variables explained previously makes this only a provisional result. In this dataset it is impossible to separate these two effects.

The fourth column of Table 5 and Figure 3 suggest that the presence of a contextualized curriculum also has an effect on female failure rates; however, there is no moderation effect in this case by the female participation variable. Contextualized curriculum appears to reduce female failure rates by a similar amount regardless of female participation levels. This means that there is only partial support for the third hypothesis. The last column of Table 5 shows no significant effects indicating that there is no support for the fourth hypothesis.

The analysis so far has looked only at failure rates for females, finding support for the idea that a female role model and academic educational qualifications reduces failure rates, especially when female participation rates are low. In addition it has been found that a contextualized curriculum reduces failure rates by a similar amount at all participation rates. The next analysis completes the hypothesis testing by determining whether these positive effects for females are obtained without having a negative impact on males. Table 6 indicates that none of these effects are significant in the case of male failure rates, suggesting that male students will not be adversely affected by having female role models with educational qualification. Nor will they be adversely affected by a contextualized curriculum or varied assessment.

Table 6. Regression Coefficients for Male Failure Rates [* p<.05]				
Predictor	Female Role Model [g2]	Educational Qualification [p3]	Curriculum Context [p1]	Assessment Variation [p2]
% females	-1.081	-1.129	-.153	-.466
Linear effect	5.392	12.854	-9.982	-7.906
Moderation effect	.839	.619	-.510	.056
R-Square	30.1%	44.1%	43.5%	28.3%

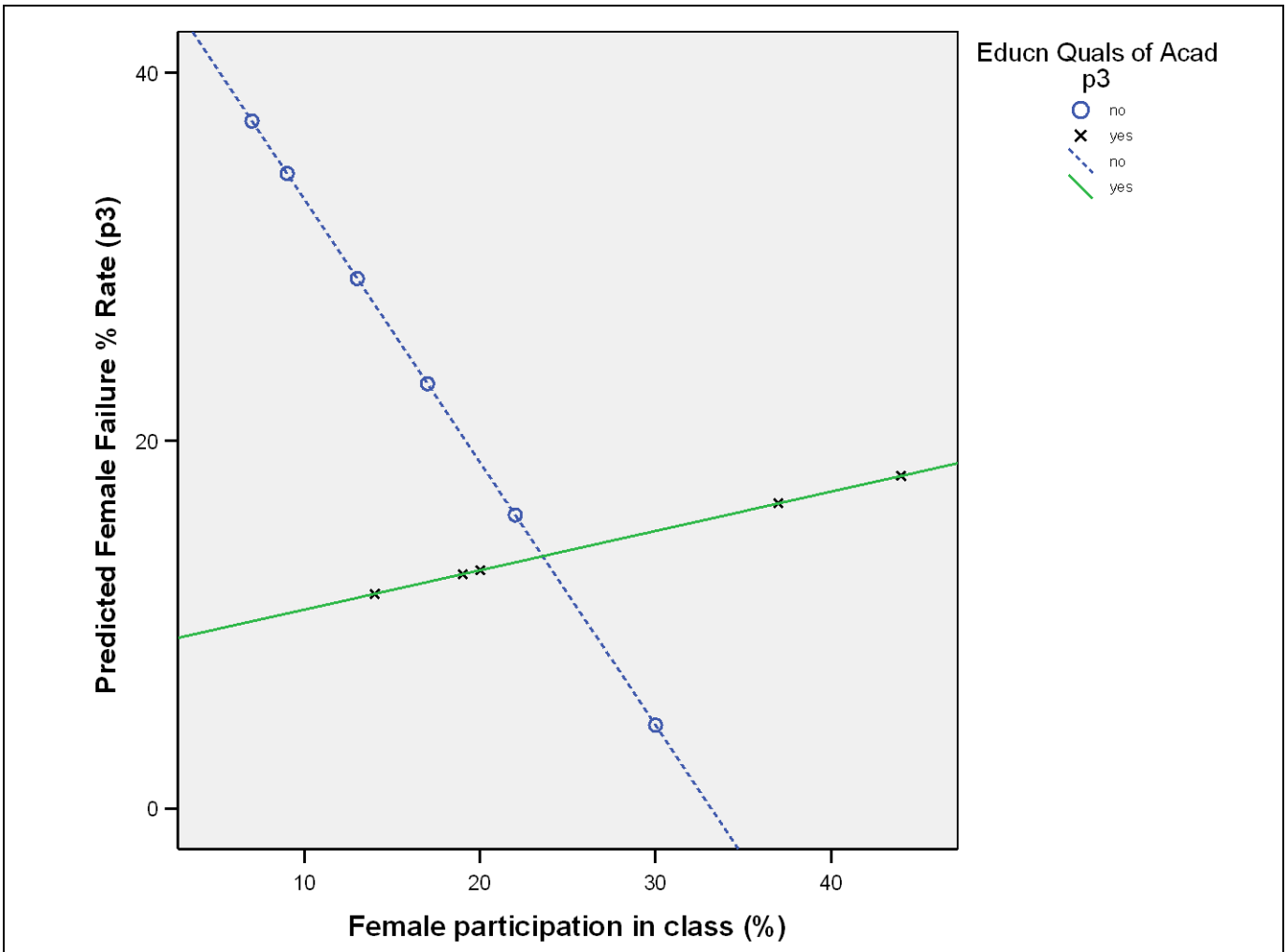

Figure 2. Predicted Relationship between Female Failure Rates and Female Participation with Moderation Due to Academic Educational Qualification

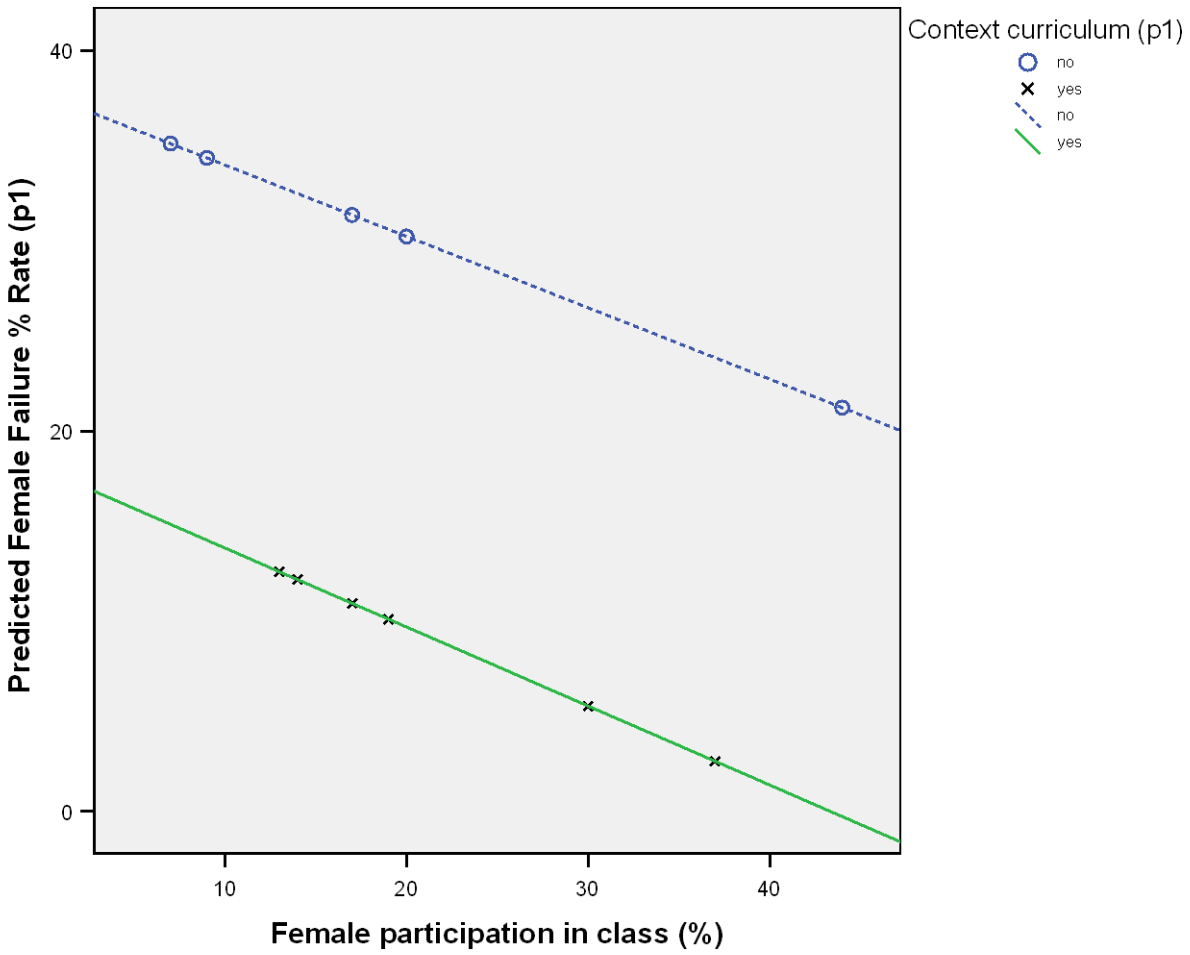

Figure 3. Predicted Relationship between Female Failure Rates and Female Participation with Moderation Due To Contextualized Curriculum

In conclusion, these results provide support for the first two hypotheses. There is only partial support for the third hypothesis in that, although curriculum context has a significant effect for females and not for males, there is no moderation effect by the female participation variable. No support was found for the fourth hypothesis that the effect of varied assessment practices impacts positively on female pass rates.

V. DISCUSSION

This statistical analysis of outcomes from the gender study shows that certain combinations of variables in a unit combine to create a learning environment that enhances female student success rates when they are less than one in four of the student body, and have a benign effect on the failure rates of male students. Furthermore, when there was no critical mass of female students [g1], no female role model in the unit [g2], combined with an academic who had no formal education qualifications [p3], there was a less-than-optimal learning environment for all students and a greater-than-average fail rate for female students.

Statistical analysis of this data set has proven that the failure rate of female students is significantly lower when there is a critical mass of female students in the student body; however this is only evident when there is no female role model in the academic teaching staff. The presence of a female in the teaching faculty appears to improve the pass rates of female students, even when they are in the minority. For example female failure rates in Computer Science Programming 1 and Computer Science Programming 2 were over 40 percent. These units of study were delivered by male academics who had no formal education qualifications. The Information Systems Programming unit also had a considerable overall failure rate of 36 percent, yet the female academic held formal educational qualifications. In this unit, the female failure rate was reduced to 28 percent: 8 percent less than the overall failure rate (see Table 1).

It would appear from the results of the WIT gender study that a contextualized curriculum [p1] and variety in assessment modes [p2] enables all students to achieve their potential, as shown in the descriptive results in the units of study of Information Systems Project, Information Systems Ethics and Information Systems Management (refer to Table 1), each of which had extremely low failure rates overall. However, statistical analysis of this data set found no significant correlation between these two elements because we were unable to separate the elements of formal educational qualifications of academic staff and significant cohort of female students. Good pedagogical practices would indicate that a variety in assessment types should be employed to benefit all students and all learning types. The advantage of mixed assessment types, shown through the variable p2 in Table 4, is most prominent in the units of study, Information Systems Project, Information Systems Ethics, Information Systems Management, Introduction to Information Systems 1, and Information Systems 1 (new). In the latter two units of study, p2 was the only variable to change from 2005 to 2006 (Table 1). The result was to produce a solid improvement in achievement for all students (a failure rate of 20 percent reduced to 11 percent).

As noted, due to privacy restraints the only factors we were able to ascertain from teaching faculty were gender and qualifications held. Of the 13 academic conveners (some units of study had two listed), four were female, and nine were male. Of the 43 tutors recorded, only 21 percent were female, which approximately reflects the gender proportions of the student body. Further analysis of qualifications listed for staff showed that they were divergent according to gender. There were four female tutors, of which three held postgraduate education qualifications (75 percent), one held a Ph.D. and two, Masters in Science/IT qualifications. Of the nine males, only one held a postgraduate education qualification. Eight had science undergraduate degrees (88 percent), and one an arts degree. Two held Ph.D.s in other fields, and three had Masters in Science/IT qualifications. This analysis of qualifications introduced yet another variable into the study. Overall, the male academics in this data set were not as academically qualified as their female colleagues, most markedly in the area of formal education qualifications. The other major difference was in the disciplines of the undergraduate qualifications held by teaching faculty, with nearly all of the males drawn from the sciences, the females from the arts. These disciplines have different pedagogical foundations, which in itself could influence teaching practices in a unit (see for example work on different communication climates in the computer science curricula [Barker et al. 2002]). The pathway by which the different genders have come to teaching positions in our faculty may or may not be typical of those in other IT areas. Primarily the difference appears to be centred on whether the tutor or teacher had a background mainly in education or whether he/she was a subject matter specialist. In this investigation, the undergraduate programming units of study had the highest failure rates, and these were delivered by skilled programmers who did not hold any formal educational qualifications. From these results, it would appear that the process of appointing teaching faculty and tutors to the introductory programming units of study of study needs review.

The results of the statistical analysis of the variables in the WIT gender study imply that a unit with a contextualized curriculum combined with a varied assessment portfolio allows all students to display their learning to a greater extent than when these variables are absent. The major gender differentiations in student achievement are evident in units of study that had closed or summative assessment only and where the critical mass of females was less than 25 percent.The findings from the units Information Systems Project, Information Systems Ethics and Information Systems Management indicate that all students perform better when assessed by open, continuous methods such as assignment rather than performance-based methods such as exam. An assumption from this finding may be that the quality of learning is increased when this type of assessment is used, which may result in longer-term benefits for all in the educational environment.

The implication from these results are that specific policies may be necessary to ensure a gender mix in academics tutoring or teaching into units of study where there is less than a critical mass of female students. Academic leaders need to take a more active role in monitoring the gender mix within units of study. When it is apparent that the student cohort is predominantly male, female academics, lecturers, or tutors should be encouraged to become active in the unit to ameliorate negative effects on female student achievement. Other tentative prescriptions for practice could include regular professional development for all academics to ensure that they are aware of more than just current policy but also to promote active reflection of gender awareness to build trust and inclusion in the classroom [Pless and Maak 2004]. Educational policy-makers need to encourage all practicing academics to undertake a tertiary teaching and learning qualification to complement their subject specific qualifications. Many Australian universities are providing faculty with access to further qualifications such as graduate certificates in learning and teaching; however this is not a mandatory requirement for all staff. It is noted that in this study it was not possible to separate gender from the presence of educational qualifications held by teaching faculty. In such a male-dominated discipline, teaching qualifications may be more achievable that a greater number of female academics.

VI. CONCLUSIONS

In conclusion we present the limitations of this study, implications to research, implications to practice and a concluding summary.

Limitations

There are limitations to this gender study due to the small sample size of the data set; however, the finding that female failure rates significantly decrease in direct proportion to whether there is a critical mass of female students in the unit is significant. It was insufficiently wide-ranging and therefore, lacking power to prove any significant association between female failure rates and assessment variation. The study was too small to separate the gender of academic teaching faculty from educational qualifications held, because most female academics also held educational qualifications. Consequently, there was an inability to assume causality due to the small size of this case study, as well as an inability to generalize from it.

Implications for Research

This study needs to be replicated in other institutions to verify the robustness of the findings. The analysis supports the importance of contextualized curriculum for female students. Given that there was no significant relationships found for male failure rates, it suggests that males will not be adversely affected if changes were introduced in order reduce female failure rate. Areas of future research that could inform these findings would be to conduct a larger study across several IS faculties in different universities and different countries to examine this relationship further, or at the least a longitudinal study in the same faculty. Additional support is required for a broader study to logically build on the conclusions of this study.

Implications for Practice

The quality of pedagogy which affects all student performance consisted of three factors in this study: Firstly, a contextualized or "real-world" curriculum as opposed to an abstract or applied one; secondly, the application of varied assessment techniques; and lastly, whether the academics in the unit held formal education qualifications. The study found that the two lowest performing units where students received fails more than any other mark (around one-third) were 2005 first-year programming units. These units had the lowest female participation rates (around 8 percent) and were almost exclusively taught by male staff with no formal education qualifications. It was apparent that in this masculine environment females clearly performed worse than males. These units also had high levels (80 percent and 70 percent) of performance-based assessment and a relatively abstract curriculum. All these factors combined to contribute to the low performance of students and especially that of females.

The statistical analysis showed that a female role model in the academic staff ameliorated the negative relationship between a lack of critical mass and female failure rates, suggesting that a female role model may reduce problems caused by low female participation rates. However, this effect could also be due to the strong correlation in our faculty between female role models and academic educational qualifications. Perhaps higher levels of educational qualifications and gender awareness training for all faculty could improve student results. The findings of the WIT gender study contributes to the body of knowledge listed by Cohoon and Aspray [2006] by adding positive findings to the assumption that same-sex peers increase women's achievement in IT units of study, and adds to this by implying that same-sex teaching faculty also increases women's achievement.

Summary

This research tested four hypotheses and found that two were proven, one partially proven and no evidence to support the fourth. There is a significant correlation between the elements of contextualized curriculum and the presence of a female academic role model on reducing the female failure rates in a unit. When these elements are present, the female failure rate is lower than when they are absent. At the same time, there is no adverse effect on male student failure rates, indicating that any change in curriculum and staff profile, while benefiting female students, would be benign to the male student cohort. Change implementation to alleviate this element (less than 25 percent of women in a unit) is strongly connected to recruiting more female students into IS, already a priority in most IS faculties. However, the significant finding from our research is that if there is not a critical mass of female students in a unit, the negative impact of this element can be ameliorated by the presence of a female role model in the academic staff teaching the unit, a change that may be more readily implemented in some faculties, depending on the gender mix of academics and tutors.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control,* New York, W.H. Freeman & Company.

Barker, L. J., K. Garvin-Doxas, and M. Jackson. (2002). "Defensive Climate in the Computer Science Classroom," *33rd SIGCSE Technical Symposium on Computer Science Education.* Cincinnati, Kentucky, ACM.

Beekhuyzen, J., S. Nielsen, and L. Von Hellens. (2003). "Challenging Dualisms in Female Perceptions of IT Work," IN Spencer, S. (Ed.) *AusWIT 2003.* Hobart Tasmania, University of South Australia.

Blum, L. and C. Frieze. (2003). "As the Culture of Computing Evolves, Similarity Can Be the Difference."

Buche, M. W., L. R. Davis, and C. Vician. (2007). "A Longitudinal Investigation of the Effects of Computer Anxiety on Performance in a Computing-Intensive Environment," *Journal of Information Systems Education* 18**,** 415-423.

Cohoon, J. M. and W. Aspray. (2006). "A Critical Review of the Research on Women's Participation in Postsecondary Computing Education," In Aspray, J. M. C. A. W. (Ed.) *Women and Information Technology: Research on Underrepresentation.* Cambridge, The MIT Press.

Corneliussen, H. (2004). "I Don't Understand Computer Programming, Because I'm a Woman! Negotiating Gendered Positions in a Norwegian Discourse of Computing," In K Morgan, J. S., C. A. Brebbia and A. Voiskounsky (Ed.) *Human Perspectives in the Internet Society: Culture, Psychology and Gender.* Cadiz, Spain, WIT Press.

DCITA (2006). Overview of the Australian ICT industry. http://www.dcita.gov.au/__data/assets/pdf_file/10451/DCITA_Website_Overview_Aust_ICT_Ind_160206_Rev.pdf. (current July 26, 2009)

DEST. (2006). Department of Education, Science and Training Statistical publications. http://www.dest.gov.au/sectors/higher_education/publications_resources/profiles/students_2005_selected_higher_education_statistics.htm. current July 26, 2009)

DEST. (2008). Students enrolled in Bachelors Pass, Information Technology courses. IN 2001-2006, F. O. E. B. G. H. E. S. (Ed.), Higher Education Statistics. (current July 26, 2009)

Florida, R. (2002). *The Rise of the Creative Class and How It Is Transforming Work, Leisure, Community and Everyday Life,* New York, NY, Basic Books.

Gilligan, C. (1982). *In a Different Voice,* Cambridge, Massachusetts, USA, Harvard University Press.

Jacktman, C. (2007). International Women's Day Breakfast Keynote. Australian Computing Society Vice President.

Jewell, H. and J. R. Maltby. (2001). "Female Involvement in Information Technology Degrees: Perception, Expectation and Enrolment," In Southern Cross University, C. H. (Ed.) *ACIS 2001.* Coffs Harbour, Southern Cross University.

Keeler, C. M. and R. Anson. (1995). "An Assessment of Cooperative Learning Used for Basic Computer Skills Instruction in the College Classroom," *Journal of Educational Computing Research* 12**,** pp. 379-418.

Kvasny, L., A. Greenhill, and E. M. Trauth. (2005). "Giving Voice to Feminist Projects in MIS Research," *International Journal of Technology and Human Interaction* 1**,** pp.1-18.

Lang, C. (2003). "Flaws and Gaps in the Women in Computing Literature," In Spencer, S. (Ed.) *AusWIT 2003 Participation, Progress and Potential.* Hobart, Australia, University of South Australia.

Lang, C., S. Lewis, and J. Mckay. (2005). "IT Courses: The Re-Emergence of IT as a 'Boys' Subject Area," *Victorian Information Technology Teachers Association,.* Melbourne Australia, VITTA.

Lang, C., S. Lewis, and J. Mckay. (2006). "Declining Popularity Increases Lack of Diversity in the ICT Discipline: Extending the Discourse of the Discipline," *17th Australasian Conference on Information Systems, .* Adelaide

Lang, C., S. Lewis, and J. Mckay. (2007a). "Seven Factors that Influence Student Achievement," In Dundee, U. O. (Ed.) *ITiCSE.* Dundee, Scotland, ACM.

Lang, C., J. Mckay, and S. Lewis. (2007b). “Seven Factors that Influence ICT Student Achievement.” *12th Annual ITiCSE Conference on Innovation and Technology in Computer Science Education* University of Dundee, Scotland ACM-SIGCSE.

Lewis, S., C. Lang, and J. Mckay. (2006a). “Women ICT Students: The Paradox of Invisibility and Visibility,” In Fisher, J. (Ed.) *10th Australian Women in IT Conference: "partICipaTion one year on"* Adelaide , South Australia

Lewis, S., J. Mckay, and C. Lang. (2006b). “The Next Wave of Gender Projects in IT Curriculum and Teaching at Universities,” *Australasian Computing Education Conference (ACE2006).* Hobart, Australia, CRPIT.

Margolis, J. and A. Fisher. (2002). *Unlocking the Clubhouse: Women in Computing,* Cambridge, Massachusetts, USA, The MIT Press.

Mckay, J., C. Lang, and S. Lewis. (2005). “Geeks, Girls and IT Courses: Patterns of Participation,” *20th Annual International Conference on Informatics Education & Research (ICIER).* Las Vegas, United States.

Miles, M. B. and A. M. Huberman. (1994). *Qualitative Data Analysis: An Expanded Sourcebook,* USA, Sage Publications Inc.

MMV (2001) Reality Bytes: an in depth analysis of attitudes about technology and career skills. Melbourne, State Government Victoria.

MMV (2004). “ Attitudes to ICT Careers and Study among 17- to 19-year-old Victorians,” In Victoria, S. O. (Ed.) Melbourne, Department of Infrastructure.

Murphy, P. F. and E. Whitelegg. (2006). “ Girls and Physics: Continuing Barriers to 'Belonging,'” *Curriculum Journal, Volume 17, Issue 3 September 2006 , pages 281 - 305,* 17**,** 281-305.

Pajares, F. (2002). *Overview of Self-Efficacy*. Emory University.

Pearl, A., M. Pollack, E. Riskin, B. Thomas, E. Wolf, and A. Wu. (2002). “Becoming a Computer Scientist,” *SIGCSE Bulletin Inroads Special Issue Women and Computing* 34**,** 135-144.

Pless, N. M. and T. Maak. (2004). “Building an Inclusive Diversity Culture: Principles, Processes and Practice ,” *Journal of Business Ethics* 54**,** pp. 129-147.

Radford, J. E. (1998). *Gender and Choice in Education and Occupation,* London, Routledge.

Rayman, P. and B. Brett. (1995). “Women Science Majors: What Makes a Difference in Persistence after Graduation?” *Journal of Higher Education* 66**,** 388 - 415.

Reeve, J. (1996). *Motivating Others: Nurturing Inner Motivational Resources,* Boston, MA, Allyn & Bacon.

Roldan, M., L. Soe, and E. Yakura. (2004). “Perceptions of Chilly IT Organisational Contexts and Their Effect on the Retention and Promotion of Women,” In ACM (Ed.) *Proceedings of the 2004 SIGMIS conference on Computer Personnel Research: Careers, Culture, and Ethics in a Networked Environment.* Tucson, Arizona, USA.

Trauth, E. M. (2002). “Odd Girl Out: An Individual Differences Perspective on Women in the IT Profession ,” *Information Technology & People* 15**,** 98-118.

Trauth, E. M., S. H. Neilsen, andL. A. Von Hellens. (2002). “Explaining the IT Gender Gap: Australian Stories for the New Millenium ,” *Journal of Research and Practice in Information Technology* 35**,** 7-20.

Valian, V. (1999). *Why So Slow? The Advancement of Women,* Cambridge, Massachusetts, The MIT Press.

Vician, C. and L. R. Davis. (2003). “Investigating Computer Anxiety and Communication Apprehension as Performance Antecedents in a Computing-Intensive Learning Environment,” *Journal of Computer Information Systems***,** pp.51-57.

Von Hellens, L., S. H. Nielsen, A. Greenhill, and R. Pringle. (1997). “Gender and Cultural Influences in IT Education,” In AIS (Ed.) *Pacific Asia Conference on Information Systems (PACIS).* AIS Electronic Library (AISeL).

Wajcman, J. (2000). “Reflections on Gender and Technology Studies: In What State Is the Art?” *Social Studies of Science* 30**,** 447-464.

Zimmerman, B. J. (1995). “Self-Efficacy and Educational Development ,” In Bandura, A. (Ed.) *Self-Efficacy in Changing Societies.* USA, Cambridge University Press.

APPENDIX 1:

UNITS ANALYSED, LEVEL, CLASSIFICATION, STUDENT NUMBERS, FEMALE %

YEAR	Title	Level of most students	Degree Area	#enrol	Female %
2005	Information Systems 1	1st Year	IS	505	44
2006	Information Systems 1 [new]	1st Year	IS	587	37
2006	Information Systems Technology	1st Year	IS	65	22
2005	Software Engineering 1	1st Year	CS	234	9
2005	Computer Science Programming 1	1st Year	CS	296	9
2005	Computer Science Programming 2	1st Year	CS	310	7
2005	Information Systems Programming 1	1st Year	IS	90	20
2005	Database 1	2nd Year	IS	374	13
2006	Database 1 [new]	1st Year	IS	306	17
2005	Human Information Systems Study	2nd Year	CS	187	14
2005	Information Systems Programming 2	2nd Year	CS	172	17
2005	Information Systems Project	3rd Year	IS	122	30
2005	Information Systems Ethics	3rd Year	IS	246	17
2006	Information Systems Management	3rd Year	IS	83	19

ABOUT THE AUTHORS

Dr Catherine Lang is a senior lecturer in the faculty of Information and Communication Technology at Swinburne University, Melbourne (currently on secondment to Swinburne's Professional Learning Unit). She has been researching women in IT since 1996 and completed a research Masters degree analysing cross-cultural differences in female IT enrolments in 1999. In 2007, she completed her Ph.D. at the University of Melbourne investigating factors that influence student course and career-choice with a particular focus on girls and IT. Catherine is the ACM-W Australian Ambassador for Women in Computing, as well as a founding member and ex-officio board member of the Victorian ICT for Women Network. In 2008, she received an Australian Research Council (ARC) Grant to investigate programs to encourage secondary school students to consider IT courses and careers. She is active in the national and international women in ICT arena.

Dr Denny Meyer is a senior lecturer in the faculty of Life and Social Science at Swinburne University, Melbourne. She has co-authored two books and has published close to 100 articles in a variety of refereed journals and books. She is an applied statistician, working in areas such as education, management, tourism, mineral processing, advertising, agriculture, and social research.

Dr Sara Niner is an Honorary Research Associate in the Arts Faculty at Monash University in Melbourne, Australia. She is the editor of '*To Resist is to Win: the Autobiography of Xanana Gusmão with selected letters and speeches' (2000)*. Her new book 'XANANA: Leader of the Struggle for Independent Timor-Leste' will soon be published by Australian Scholarly Publishing. Sara was research assistant to the WICT project in 2006.

Dr Judy McKay is professor and head of Information Systems and director of RISO (Research into IS in Organisations) in the faculty of Information and Communication Technologies and is the current chair of academic board at Swinburne University of Technology in Melbourne, Australia. She is the author of IS textbooks and her areas on interest from both a teaching and research perspective are in the fields of problem analysis, action research, design science, and a range of topics in information systems management. She was part of a successful strategic initiative fund grant to study the reasons behind the low participation rates of females in ICT courses, and works actively to encourage females to enter the ICT profession.

Dr Sue Lewis was employed as a senior lecturer in the faculty of Life and Social Sciences and the third member of the WICT research team that initiated the gender study reported in this paper.

Communications of the Association for Information Systems

ISSN: 1529-3181