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## ARE COMPUTER SIMULATIONS SEXIST?

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### ABSTRACT

Ten statements were presented to 161 junior and senior level business administration students. The subjects responded to the statements in terms of five possible reactions ranging from agree strongly to disagree strongly. The respondents were involved in one or more computer based classroom simulations. It is the conclusion of this study that from the results of the analysis of the data there appears to be significant differences in the reactions to computer based simulations on the part of women versus men students. The ultimate intent of this research is two fold: first, to bring to the attention of the association and others interested in the measurement of the effectiveness of simulations the fact that the participants' sex has an effect on respondent perceptions to the exercise and second, to encourage others in the field to pursue similar research in order to add to our understanding of this heretofore neglected area of research.

### INTRODUCTION

Those who are involved closely on a day to day basis with the operations of schools of management and business administration, whether they are conducting classes or in the various administrative and support areas, are very much aware of the increasing number of women who are entering business administration programs and classes. Fifteen or less years ago the typical professor of business subjects would see one or perhaps two women among the almost exclusively male membership of the class. During the past five years a radical change in the number of women in business classes has taken place. It is generally conceded that this change in the student body is not an isolated regional or institutional phenomenon nor is it a temporary departure from "normal". The magnitude of the changing composition of the student body in business programs most vividly illustrated by statistics taken from the National Center for Educational Statistics. According to this source 828k women were awarded bachelors degrees in business in the 1967-8 academic year. In the most recent copy of the National Center's data book 28,211 women were awarded business degrees in the 1975-6 academic year [15]. Thus in the relatively short time span of eight years the number of women receiving bachelor degrees in business has increased 240%. During the same time span the number of male business degree recipients increased from 85,271 to 115,225 or an increase of 35%. An alternate way of looking at the statistics is the total increase in business bachelor degree recipients during the same eight year period shows women constituted 40% of the total increase. At the Masters level the statistical change on a percentage basis is quite impressive. In 1961-8 a total of 665 women were awarded Masters degrees in business. Eight years later the total for the 1915-6 academic year was 1959, a sizable 646% increase [15].

Thus in terms of numbers and rates of change relevant to women in business schools it appears appropriate to examine some of the tools and techniques used in business education as these affect the learning processes of women students. The philosophical foundations for such a study can be traced to an increasing concern that there seems to be some as yet

undefined barriers to the entrance of women into most of the science oriented academic fields. Reflecting this concern are a number of studies which attempt to identify existing academic barriers which limit the entrance of women to certain disciplines [8;4]. Indeed the issue has become relevant enough that the prestigious National Science Foundation commissioned a series of ten studies exclusively devoted to determining and discussing the nature of academic barriers for women in the sciences [16]. Other studies seek to investigate the problem in terms of the situation existing in certain specific disciplines. Thus Fennema and Sherman conclude their report with the observation that the stereotyping of mathematics as a male domain has a subtle but powerful effect on women who may be interested in that field [3]. Shapley [12] and Cobb [2] approach the issue from the direction that the problem is more one of social and cultural bias than anything inherent in the educational process. A number of researchers begin their thesis from a more philosophically advanced position in that they assume that what biases exist have been there for a while and the main thrust of the research should take the form of identifying prescriptive steps to alleviate what Greenberg refers to as: "anxiety sources" [6]. Similarly Troutman suggests a series of remedial methodologies designed to lessen potential sources of failure [14].

These concerns are relevant to those interested in the classroom use of computer based simulations since such techniques are essentially mathematically based and thus derived to a greater extent than other business educational techniques from the scientific disciplines. Since it appears the literature generally concedes that there are anti-female biases existing in the various scientific disciplines, then it is reasonable to assume that similar biases may have insinuated themselves into simulation techniques and methodologies. As such, it is the philosophical position of this paper that, even though simulation requires little or no mathematical expertise on the part of the participant, it is nevertheless possible that something inherent in the design of simulations acts as a force which lessens its effectiveness as a learning device for our women students. Even if this assumption is not strong enough for the purist or the professional skeptic, another justification for this research such as is undertaken by the authors is the increasing number of studies which seek to examine the educational process in terms of how it meets the needs, both intellectually and emotionally, of women students [5;10]. Thus Nihlen seeks to identify peculiarly female learning styles and from this analyzes the styles in terms of college performance [9]. Keller carries a similar study further by suggesting a list of attitudinal changes requires of institutions higher education if they are to meet the expectation and requirements of both men and women students [7].

More specifically and at the same time more closely related to the research in this paper is the work of Saunders 'who attempts to analyze the role of the teacher, texts, and classroom techniques in the development of male and female students [11]. The significant change which is represented by these studies is a swing by educational researchers to a consideration of the

## Experiential Learning Enters the Eighties, Volume 7, 1980

separate educational needs of women and men students rather than lumping everyone into a single category. Of significant interest is the observation of Tidball that educators need to do more thinking about the classroom and study environments they create for all students especially women students [13]. Thus there is a double justification for this study. Because of the links of computer simulation to the scientific disciplines there just might be in simulation design and techniques an unintentional bias which works against the educational needs of women students. Obviously this should not exist, but before anything can be done about it the nature and source of such weaknesses must be determined. In addition, as the number of women participants in business classroom simulations increases, demand will be made to ensure that the business curriculum which has developed over fifty or so years of predominantly male enrollment, meets the educational needs of the modern women business student. For more on this particular trend of research the reader is directed to Astin and Hirsch [1].

### PURPOSE

It is the intent of this paper to analyze the responses to a questionnaire in terms of the sex of the respondent. The questions all pertain to the respondents' experiences in a classroom computer based simulation. The 24 statements were designed to elicit from the respondent his or her reactions to computer simulations in terms of personal educational goals. While the immediate purpose of this paper is to enlighten the reader to areas where there are significant differentials in the responses by men and women the more lasting purpose is to encourage that same reader to embark on similar research in this fairly new area of computer simulation effectiveness analysis. This new direction could also lead researchers to examine not only the nature of simulations as they affect the perceptions of men and women students but in addition to analyze the administrative techniques which have been developed or 'have evolved during the extended use of simulations as these techniques affect male versus female perceptions.

A more distant goal of this research is to identify those factors which may increase the sexist nature of simulations and which at the same time decrease the overall effectiveness of the simulation. Knowing this it will be possible to modify existing simulations and more importantly develop new simulations which can compensate for any such sexually based biases. From a strictly self serving viewpoint it will be infinitely better for the field of computer simulation if such analyses of potential bias are done within the organization and before it becomes necessary to defend our position, tools, techniques, and even some equipment in the face of hostile attacks from outsiders who may have far less understanding of our professional goals and objectives. Without some internally generated data to counter charges of sexism, the association would be reduced to responses ranging from incoherent mumblings to excessive apologies for unknown errors and limitations.

### METHODOLOGY

The research instrument was administered to 161 students enrolled in the business program of Slippery Rock State College in the Spring of 1979. All the respondents had been exposed to at least one classroom simulation. Of the 161, 109 were men and 52 were women. The questionnaire was divided into two sections. The first part consisted of 24 statements which were designed to elicit the students' reactions to the simulation experience. The statements were carefully designed and pretested. To reduce the inevitable bias of automatic responses the statements were randomly

staggered in terms

of positive and negative positions. The second part of the questionnaire requested the usual demographic data. For the purposes of this report only the variable "sex" will be used. The responses were recorded by the students on a data processing scanning sheet. The scanner automatically created tabulating cards. The analytical processing used the familiar SF55 to create the desired cross tabulations. For the purposes of this paper only those statements on the questionnaire which exhibit significant response differentials will be presented.

### ANALYSIS

From a total number of 24 statements contained in the survey the authors have selected ten which indicate areas of significant differences between the two respondent groups. These statements and the responses are believed to be closely related to student perceptions of the use of computer simulations in the classroom. The ten statements have been grouped into three general categories. The first grouping contains four statements which are more closely related to the personal reactions of the respondents. Statement one sought to determine the respondents' reactions to the general academic usefulness of the simulation. Table I reveals female respondents were twice as likely as male respondents to agree moderately (29% to 14%). Conversely males tended to disagree (69% to 51%) with the statement.

TABLE I				
Statement: "Our simulation was more entertaining than it was educational."				
	Males		Females	
	n.	%	n.	%
Agree Strongly	1	1	0	0
Agree Moderately	15	14	14	27
Uncertain	17	16	11	22
Disagree Moderately	58	53	22	43
Disagree Strongly	18	16	4	8
	109	100	51	100

Statement two was designed to determine the respondents' perception of the learning value of the simulation. The statement is based on the rationale that the basic purpose of simulation is to enhance if not improve the learning process. Statement two is in many respects the opposite of statement one. It would be reasonable to expect some degree of response similarity. In many respects this statement could be a step in the direction of answering the general question as to whether female students benefit more, less or the same as male students in using the simulation as an important learning device.

TABLE II				
Statement: "The simulation helped me to better understand the basic principles of the course."				
	Males		Females	
	n.	%	n.	%
Agree Strongly	23	21	7	13
Agree Moderately	60	55	23	44
Uncertain	13	12	0	0
Disagree Moderately	10	9	16	31
Disagree Strongly	3	3	6	12
	109	100	52	100

In terms of positive responses the male response rate

## Experiential Learning Enters the Eighties, Volume 7, 1980

76%) exceeds the female rate 58%). Conversely, on the negative side an overwhelming percentage (42%) of females react negatively to the academic usefulness of simulations, whereas only 12% of males reacted negatively. It is interesting to note the zero uncertain female response rate. It is obviously not true that a majority females reject the statement and to some extent simulations, but the existence of a significant minority (42%) is of relevance to those concerned about the effectiveness of classroom simulations. The authors find the results of statement two disturbing and indicative of needed additional research. In a similar direction statement three seeks to determine how two groups perceive simulation as an integrative vehicle. Since all of the three simulations used in the survey involved upper level students (95% juniors and seniors) some of the objectives of the exercises were to impress upon the students the close degree of interrelationship which exist among business courses are the decision making aspects of simulations.

TABLE III

Statement: "The simulation brought together material P I had learned in several business courses."

	Males		Females	
	n.	%	n.	%
Agree Strongly	20	18	6	12
Agree Moderately	62	57	23	44
! Uncertain	9	8	5	10
Disagree Moderately	13	12	12	23
Disagree Strongly	<u>5</u>	<u>5</u>	<u>6</u>	<u>12</u>
	109		52	

Table III reveals that 34% of the female respondents disagreed while only 11% of the males disagreed. On the positive side of the analysis a similar percentage Disparity exists. Evidently a significant one third minority the female students did not perceive the simulation as achieving the integrative goals set for The simulation There is a certain opinion that holds that simulation techniques are too complex for a significant number of students who as a result of their confusion spend most of their time scrambling to keep up with the mechanics and as a result do not learn very much in terms of academic material.

TABLE IV

Statement "I didn't really understand what was going on"

	Males		Females	
	n.	%	n.	%
Agree Strongly	14	13	13	25
Agree Moderately	47	43	26	50
Uncertain	6	6	2	14
Disagree Moderately	28	26	7	13
Disagree Strongly	<u>14</u>	<u>13</u>	<u>4</u>	<u>8</u>
	109		52	

Table four answers some of the fears but does not necessarily dispel them in that 56% of the males admitted to at Least some degree of confusion while 15% of the females felt similarly. Of relevance is the low uncertain response rate. A somewhat larger uncertain was anticipated by the researchers but evidently the participants are quite certain of the feelings. It might be hypothesized that the males were just as confused but being more ego involved were more reluctant to admit a certain degree of personal inadequacy. For the purposes of this research the results of Table IV

indicate that female students perceive greater comprehension difficulties than did male students. The next step for pursuing additional research would be to attempt to determine in detail the nature and if possible the source of the difficulties thus perceived. Concluding this section the four statements taken as a whole indicate that in terms of the students' perceptions of the individual benefits to be derived from a classroom computer based simulation there appear to be some significant differences in the degree to which female students perceive simulations. Concomitantly, considerable additional research in this area is imperative.

The second group of statements in this report attempts to investigate the perceptions of the respondents in terms of the nature of the exercise, that is, the statements are not designed to elicit personal and perhaps more emotional reactions. In this second group two statements will be analyzed in conjunction with one another. The general purpose was to determine the degree to which the simulation participants perceived the experience as one which would contribute to their greater understanding of the business world. In the survey instrument the two statements were separated by five other statements to avoid automatic responses. Part of the reason for their inclusion was to act as a check on the reliability of the answers to the general question of to what extent the participants perceived the simulation as being realistic as opposed to being a theoretical exercise devoid of relationship to the real world.

TABLE V

Statement: "The decisions we had to make in the simulation were too theoretical to be professionally useful"

	Males		Females	
	n.	%	n.	%
Agree Strongly	1	1	0	0
Agree Moderately	17	16	5	9
Uncertain	36	33	30	54
Disagree Moderately	44	4	15	27
Disagree Strongly	<u>10</u>	<u>9</u>	<u>5</u>	<u>9</u>
	108		52	

TABLE VI

Statement; "The simulation added a lot of realism to the class."

	Males		Females	
	n.	%	n.	%
Agree Strongly	18	17	10	19
Agree Moderately	63	58	20	38
Uncertain	17	15	17	33
Disagree Moderately	8	7	5	10
Disagree Strongly	<u>3</u>	<u>3</u>	<u>0</u>	<u>0</u>
	109		52	

The response rate for statement five shows female respondents as less likely (9% to 17%) to agree with the statement. On the other side the females were less likely by 36% to 50% to disagree with the statement. The difference lies in the large uncertain female response rate. In the case of each of the groups the high uncertain response rate may be due to the students inability to operationalize the term "professionally useful". Perhaps such a term implies some prior knowledge of the business world. The second statement in this period (number six in the analysis) was deliberately stated in the positive form so as to contrast with

## Experiential Learning Enters the Eighties, Volume 7, 1980

the negativistic tone of statement five. In Table VI the uncertain response rate, similar to the case in Table V, is quite a bit higher for females than for males. The positive response rate of 15% for males far exceeded the 51% positive response rate for females. While the degree of response is more intense in statement six than in statement five the two statements tend to support each other in terms of the affect that sex was on the response rates. The females are less likely to react positively to the general issue of "realism" and "agree of theoreticalness". It might be claimed that this response pattern could be attributed to something unique in a particular simulation but the reader is reminded that the respondents were drawn from three classes using three different simulations. For this reason conclusions drawn from the responses are more inclusive than if the survey covered just one simulation.

TABLE VII

Statement: "Student performance on a simulation has nothing to do with a student's understanding of the material in the course"				
	Males		Females	
	n.	%	n.	%
Agree Strongly	18	16	4	7
Agree Moderately	13	12	20	38
Uncertain	23	21	11	21
Disagree Moderately	44	41	13	25
Disagree Strongly	<u>11</u>	<u>10</u>	<u>4</u>	<u>8</u>
	109		52	

The research new moves into the second part of the second section of the report. At this point three statements will be analyzed more or less together. In statement VII, females were significantly more likely to think the simulation performance has little to do with the degree of understanding the student had achieved of the course material (45% to 28%). This is relevant in that it might indicate female students were not netting out of the simulation exercises the degree of course material the male participants were getting. This leads to the critical question of: Could it be possible that simulation was not meeting the academic needs of the female students? If the answer to this question is yes then the world of computer simulation may have some difficulty in evolving an answer which is both socially and academically acceptable. The authors of this research are quite aware of the importance of the results derived from Table VII and plan to pursue some additional clarifying research in this direction.

TABLE VIII

Statement: "I feel the class in general did not take the simulation seriously enough"				
	Males		Females	
	n.	%	n.	%
Agree Strongly	8	7	0	0
Agree Moderately	15	11	6	12
Uncertain	33	30	8	15
Disagree Moderately	38	35	28	54
Disagree Strongly	<u>12</u>	<u>11</u>	<u>10</u>	<u>19</u>
	109		52	

In general the total responses presented in Table VIII are quite favorable. Although the previous statements indicate the female respondents had some serious reservations about

the use and effectiveness of simulations, table YIN shows they believe much more strongly than the males (15% to ~46%) that the class approached the simulation exercises in a serious frame of mind. Could it be women are more serious students, at least those in the business programs? Could it be that the degree of seriousness perceived was really a case of great expectations with the responses in Table VII more related to excessive or unrealistic expectations which were not fulfilled?

TABLE IX

Statement: "Simulations generate a lot of interaction between the students and the instructor."				
	Males		Females	
	n.	%	n.	%
Agree Strongly	25	23	8	15
Agree Moderately	59	54	114	21
Uncertain	8	7	10	19
Disagree Moderately	16	15	11	33
Disagree Strongly	<u>1</u>	<u>1</u>	<u>3</u>	<u>6</u>
	109		52	

In a similar direction Table IX investigates students' perceptions of the simulation experience in terms of its usefulness as a facilitator of student-faculty interaction. Here, again, there appears to be a divergence between the sexes with male students agreeing 11% of the time with the statement while females agreed only 6% of the time. In Table IX the women students just did not perceive the simulation in the same terms as did the male students. It is possible the women students desire or require a higher degree of student-instructor interaction to enhance the learning process while the males prefer a more formal and distant classroom arrangement. In all probability such speculations lie far outside the expertise of simulation effectiveness analysis and belong better in the realm of the educational psychologist.

TABLE X

Statement: "I feel business course instructors should make extensive use of simulations."				
	Males		Females	
	n.	%	n.	%
Agree Strongly	19	11	13	25
Agree Moderately	41	143	8	15
Uncertain	32	29	24	46
Disagree Moderately	8	1	1	13
Disagree Strongly	<u>3</u>	<u>3</u>	<u>0</u>	<u>0</u>
	109		52	

As a final contribution to this research the authors believe it is useful and appropriate to conclude the study with an investigation as to how students feel about the use of classroom simulations. In the light of previous analyses it could be easily hypothesized that female students should be less enthusiastic about the use of classroom simulations. From Table X the high negative response rate for females did not materialize. In fact, the negative response rates do not really vary significantly between the two groups. As expected there was a high "uncertain" female response rate. The source of the uncertainties are fairly well documented by the material presented in Tables I through IX. However, both sexes have a significantly large and somewhat similar uncertain response rate. Of interest to this point is the effect that multiple exposures to simulations might have on the attitudes of either group to statement nine.

# Experiential Learning Enters the Eighties, Volume 7, 1980

## CONCLUSIONS

This has been an exploratory study. There is a slowly increasing awareness on the part of responsible faculty members in schools of management and business that it is possible some of the pedagogical techniques and approaches which have been developed from decades of predominantly male enrollment may need some degree of modification to accommodate the increasing ranks of women in colleges of business. Specifically, in terms of the use of computer based classroom simulations, the purpose of this report was to determine the existence and extent of differences in the way in which men and women perceive simulation exercises.

From the data presented in this report the inescapable conclusion is that there does seem to be significant sex based differences. Whether these have a significant impact either favorable or unfavorable on the individual student is beyond the scope of this study. Future research in this area will be pursued by the authors. The exact directions of such research is as yet unclear. However, it does appear from the results of the preliminary investigation that the specific topic area of students' perceptions of computer based simulations as these are affected by gender warrants additional investigatory attention. This being so the authors of this research invite you to join us in this particular intellectual pursuit. The results will undoubtedly enrich our understanding of both the needs of our students and the effectiveness of computer based simulations.

Where the results of this type of research will lead in terms of immediate and long range effects on computer based simulations cannot be determined at this early stage in the research. But the pursuit of learning and understanding cannot fail to impel the continuation of and the direction of the research as outlined in this paper. The ultimate intent is, as always, to ensure that our teaching techniques and tools are indeed meeting the academic and intellectual needs of all of the classroom population.

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