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ABSTRACT

Although a number of female students in the entry-level of tertiary education has increased substantially in recent years, the proportion of incoming females in the fields of science and technology is low. Government and non-government organizations encourage females to enter tertiary level education for career development. However, judging by women's participation in the scientific community, it seems that for incoming female students some of the disciplines are not attractive and rewarding enough to seek advanced training. Consequently, some departments seem to be relatively feminized whereas others are masculinized. This paper investigates the career preferences of male and female students within the disciplines of social sciences, business, law, agriculture and humanities. After assessing the position of science the researchers identify the relatively feminized science and relatively masculinized science fields. (ASK)

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Gender Differences in Science Career Choice

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Although the number of female students in the entry-level of tertiary education has increased substantially in recent years, the proportion of incoming females in the fields of Science and Technology is low. Government and non government organizations encourage females to enter tertiary level education for career development. However, judging by women's participation in the scientific community, it seems that for incoming female students some of the disciplines are not attractive and rewarding enough to seek advanced training. Consequently, some departments seem to be relatively feminized whereas other are masculinized. This paper tries to investigate the career preference of male and female students for the disciplines in Social Sciences, Business, Science, Law , Agriculture and Humanities. After assessing the position of Science we tried to identify the relatively feminized Science and relatively masculinized Science fields.

1. Introduction

On the basis of women's participation in the scientific community, we presume that some fields are relatively highly feminized and some are masculinized. In fact, as noted by Nolan (1994), there are fields which are relatively highly feminized. For instance, in early part of this century, in the United States, Statistics, Botany, Microbiology, and Clinical Physiology were considered as feminine Sciences. The employment figures have also showed that Nutrition and Statistics were highly feminized fields. Ironically, at that time, only 10 per cent of the employed statisticians were women, Nolan(1994).

Regardless of gender Science is an important component of education. Undoubtedly the entry of females to Science may bring about fruitful changes in scientific and technological practice. However, we presume that for incoming female students, unlike the males, some of the disciplines are not attractive to seek advanced training. However, except statements like the one above no detailed research on gender difference in career preference in Science.

Clearly, examining career choice of male and female students is the way to assess gender difference in the attractiveness and the motivation to work as professional of their field of interest. In other words, it indicates interest difference in the two sexes in the quality of working life. With this in mind this paper tries to evaluate the career preference of female and male students of Lesotho and Ethiopia.

2. The Data

Unlike any country in Africa, Lesotho has the highest female participation rate in tertiary education. National University of Lesotho is the only university in the Lesotho. The subjects of this study were incoming applicants to the National University of Lesotho. There were about 1726 applicants in 1999 out of which 95 applicants chose the same field as first and second choice. Some, however, did not specify their second choice and hence are not included in this study. As a result a total of 1631, 813

female and 818 male, applicants are included in the study. These applicants were asked to rank the two most liked among Science, Social Science, Business, Education, Law, Humanities and Agriculture. Social Science includes Economics, Political Science and Public Administration, Sociology and Demography. Business includes Accounting, Management and Marketing. Humanities include African Language and Literature, Development Studies, English Language and Literature, French Language and Literature, History, Human Geography, Philosophy and Theology.

In order to have insight deep into which fields of Science are relatively feminized and which are relatively masculinized we need data on the preference among the Science fields. Since such data are not available in the National University of Lesotho, data were collected from Addis Ababa University, Ethiopia. A total of 666 of which 611 male and 55 female first year students are included in the study. These students were asked to rank the fields of Architecture, Biology, Chemistry, Engineering, Geology, Mathematics, Pharmacy, Physics and Statistics according to their order of preference, from 1 to 9, from the most liked to the least wanted as their future career. All these students have taken a one year, freshman level, course which are prerequisite to join anyone of the above fields.

It is important to note that the data generated from the National University of Lesotho and the Addis Ababa University are students actual choice for placement. Therefore, it is hoped that the study result would reflect the gender difference in the attractiveness and motivation to work as professional in the field of the applicants choice..

3. Methods

The nature of the data dictated us to use nonparametric statistical methods (Gibbons,1971; Hollander,1973 and Daniel,1978). On the first data set the chi-square test of homogeneity and technique of partitioning of chi-square is employed. Moreover, descriptive methods of paired comparisons (Agresti, 1990, p. 370) was used. On the second data set, a nonparametric analog of the parametric two way analysis of variance by ranks was employed . Following Friedman analysis of variance Page's test of ordered alternative was applied.

4. Results

4.1 Science Versus Other Fields of Study

The summary statistics on applicants preference as future career is given in Table 1.

Table 1: Summary of Applicants Choice at the National University of Lesotho

Sex	Choice	Field						
		Agricultur e	Busines s	Education	Humanities	Law	Science	Social Science
Female	First	10	108	155	122	119	113	186
	Secon d	15	102	138	169	105	76	208
Male	First	31	96	60	97	144	168	222
	Secon d	32	92	99	106	138	113	237

It is of interest to assess the homogeneity of males` and females` preference in the seven fields displayed in Table 1. The hypotheses of interest are

H_{00} : All the seven fields in the study are homogeneously attractive to both sexes

H_{10} : The seven fields are not homogeneously attractive to both sexes.

The value of chi-square on the basis of first choice is 72.596. The chi square test based on six degrees of freedom leads to the rejection of the null hypothesis. Therefore, we need to gain some insight into the source of rejection. Using the technique of partitioning of chi-square Agriculture, Education and Science have been found to be the source of rejecting the null hypothesis. Detail analysis of data on these three fields showed that a significant majority of males prefer Science and Agriculture and a significant majority of females prefer education as future career.

The value of chi-square on the basis of second choice is 41.120. When we compare with the theoretical chi-square distribution with six degrees of freedom the data did not support the null hypothesis. Now, again, applying the same technique Humanities and Science were found to be the sources of rejection. This implies that as a second choice, except for these two subjects, the fields homogeneously attract females and males.

A clear picture on the comparison of fields' attractiveness can be obtained by paired comparison. Table 2 and Table 3 display the pair comparison of fields for females and males preference , respectively. The entries represent the proportion that the field in the row is preferred to the field in the column.

Table 2: Paired Comparison for Females' Preference

Field	Agricultur e	Busines s	Education	Humanities	Law	Science	Social Science
Agriculture		**	0.44	**	*	0.44	**
Business	**		0.50	**	0.50	0.43	0.54
Education	0.55	0.50		0.59	0.50	0.12	0.50
Humanities	**	**	0.41		0.48	0.43	0.36
Law	*	0.50	0.50	0.52		0.50	0.57
Science	0.55	0.57	0.88	0.57	0.50		0.58
Social Science	**	0.46	0.50	0.64	0.43	0.41	

** less than five applicants rate the pair * no applicant rate the pair

Table 3: Paired Comparison for Males' Preference

Field	Agricultur e	Busines s	Education	Humanities	Law	Science	Social Science
Agriculture		**	0.45	0.50	**	0.45	0.53
Business	**		**	0.50	0.50	0.47	0.54
Education	0.55	0.50		0.46	0.52	0.07	0.33
Humanities	0.50	0.50	0.50		0.49	**	0.40
Law	**	0.50	0.50	0.51		0.50	0.52
Science	0.52	0.53	0.93	**	0.50		0.59
Social Science	0.47	0.46	0.68	0.60	0.48	0.41	

** less than five applicants rate the pair

In Table 2 the remarkable result is that 88 percent of females preferred Science to Education. Table 3 showed that males have some how equalized preference to all pairs except that 93 percent preferred Science to Education.

4.2 Preference Within Science Fields

The rank average of each field in the two sexes is displayed in Table 4.

Table 4: Rank Average

Sex	Field								
	Biol	Chem	Geol	Math	Phys	Stat	Arch	Engn	Phar
Male	6.06	6.32	6.09	4.27	5.87	5.38	4.48	2.05	4.48
Female	5.47	6.04	5.89	5.44	7.65	3.81	3.87	3.20	3.62

4.2.1 Female

We test the hypothesis that all the fields are equally attractive against the alternative hypothesis that at least one field is more (or less) favoured to others. That is,

H_0 : All fields are equally attractive

H_1 : At least one field is different from the others.

The value of Friedman test statistic on the basis of our data is 125.731. The Chi square test based on eight degrees of freedom leads to rejection of the null hypothesis. Therefore, a significant difference seems to exist in the degrees of attractiveness of the fields. Since the hypothesis of being equally attractive of the fields is not found to be tenable, we may ask which of the pairs of fields are different. This can be answered by applying a multiple comparison test. Table 6 displays multiple comparison statistic to be compared with $Z_{\alpha/k(k-1)}$, where is the overall level of significance for all tests and k is the number of fields considered, which is 9 here.

Table 6: Comparison of Pairs of Fields for Female Students

Field	Bio	Chem	Geol	Math	Phys	Stat	Arch	Engn	Phar
Biol	-	1.079	0.801	0.070	* 4.178	* 3.168	* 3.063	* 4.352	* 3.552
Chem		-	0.279	1.149	* 3.099	* 4.248	* 4.143	* 5.432	* 4.631
Geol			-	0.870	* 3.337	* 3.969	* 3.865	* 5.153	* 4.352
Math				-	* 4.248	* 3.099	* 2.993	* 4.283	* 3.482
Phys					-	* 7.347	* 7.242	* 8.531	* 7.730
Stat						-	0.104	1.184	0.383
Phar							-	0.776	0.487
Engn								-	0.801
Arch									-

* significant at 10% level of significance

From the Table above Biology, Chemistry and Geology, and Mathematics, Statistics, Architecture and pharmacy have no significant difference at 10% level of significance. But the remaining pairs of fields have shown a significant difference at the specified level of significance. Hence, it is again meaningful to apply Page's test in order to assess the order of attractiveness of the fields. The fields are arranged on the basis of the rank averages and the hypothesis of interest, now, is

H_{01} : All fields are equally attractive

H_{11} : The fields are preferred in the following order

$$*_{Engn} \leq *_{Phar} \leq *_{Stat} \leq *_{Arch} \leq *_{Math} \leq *_{Biol} \leq *_{Geol} \leq *_{Chem} \leq *_{Phys}$$

where, $*_X$ is the rank order of field X.

Under our hypothesis H_{01} , Page's test statistic is distributed as standard normal for a sufficiently large number of observation. The computed Z-value is found to be 10.605. This result favours the alternative hypothesis.

4.2.2 Male

Similarly, to test the hypothesis

H_{02} : All fields are equally attractive

H_{12} : At least one field is different from the others.

The Friedman test statistic is found to be 1200.416. This figure is again highly significant when compared with tabulated chi-square with eight degrees of freedom. Since we rejected H_0 we want to know specifically which fields are different from others. Table 7 presents statistics to be compared with $Z_{/k(k-1)}$.

Table 7: Comparison of Pairs of Fields for Male Students

Field	Bio	Chem	Geol	Math	Phys	Stat	Arch	Engn	Phar
Biol	-	1.609	0.136	* 11.459	1.243	* 4.376	* 10.111	* 25.634	* 10.122
Chem		-	1.473	* 13.068	2.852	* 5.985	* 11.720	* 27.242	* 11.730
Geol			-	* 11.595	1.379	* 4.512	* 10.247	* 25.769	* 10.258
Math				-	* 10.216	* 7.083	1.346	* 14.175	1.337
Phys					-	* 3.134	* 8.868	* 24.391	* 8.879
Stat						-	* 5.735	* 21.257	* 5.745
Phar							-	* 15.522	0.010
Engn								-	* 15.512
Arch									-

* significant at 10% level of significance

From Table 7, out of 36 possible pairs 27 pairs are different. It is quite reasonable to apply an ordered alternative test. Using Table 4 as a guide the hypothesis of interest become:

H_{03} : All fields are equally attractive against

H_{13} : The fields are preferred in the following order

$$*_{Engn} \leq *_{Math} \leq *_{Phar} \leq *_{Arch} \leq *_{Stat} \leq *_{Phys} \leq *_{Biol} \leq *_{Geol} \leq *_{Chem}$$

where, $*_X$ is the rank order of field X.

Under the null hypothesis H_{03} , the computed Page's test statistic for a large number of observations is found to be 32.371. Therefore, we reject H_{03} in favour of H_{13} . That is, we conclude that the fields attractiveness are ordered as specified by the alternative hypothesis, H_{13} .

From the results of multiple comparison and Page's tests the preference rank of the fields in the two sexes is summarized in Table 8.

Table 8:The Rank of the Fields as Obtained in the Study

Sex	Field								
	Biol	Chem	Geo l	Math	Phy s	Sta t	Arc h	Engn	Pha r
Male	7.5	7.5	7.5	3	7.5	5	3	1	3
Female	6.5	6.5	6.5	6.5	9	2.5	2.5	2.5	2.5

5. Discussion

The purpose of this study was to examine gender difference in career choice. The result of the study depicts that males and females interest to join the fields of Business, Humanities, Law and Social Science is similar. But the proportion of females who preferred to join Science and Agriculture is significantly less than that of males. On the other hand the proportion of females who preferred to join Humanities is greater than that of males.

In the pair comparison Education is found to be the least preferred field by both sexes. Though the proportion of females who chose Science as their future care is very low, the pairwise comparison showed that females prefer Science to any other subject at the rate of over 50 percent.

Within Science fields the first four relatively masculinized fields are Engineering, Mathematics, Architecture and Pharmacy in this order. Relatively speaking Mathematics seems masculinized field and Statistics is a feminized. Physics is the least attractive career for females. For males Physics is equally attractive as other basic Sciences: Biology and Chemistry.

In general, it has been observed that a significantly low proportion of few female applicants choose Science as their future career. However, regardless of their magnitude females tend to prefer Science, when Science is paired with any other field. Within Science fields Physics is the least attractive field for females. Statistics and Mathematics are found to be, in a relatively speaking, the most preferred feminine and masculine fields, respectively. Apart this, females choice of career is some how similar to that of males. There is perhaps nothing surprising about this. Because career is a course of professional life or employment which affords opportunity for progress or advancement in the world; and hence career choice is a reflection of the job market and social status accorded to the field professionals, Zewotir (1996). In fact, it is an irony why the rate of change of females taking Science as their future career is slow.

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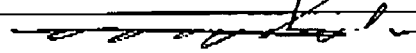
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