

## Is the G.C.E. (AL) Bio Science stream a dead end to many? An analysis of educational opportunity in the Bio Science stream

S. Rupasinghe<sup>1</sup>

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### Abstract

The Biological Science (Bio Science) stream had remained very popular and competitive among the subject streams offered at the General Certificate of Education, Advanced Level, as it paves the way for admission to some of the prestigious faculties in the universities. There was a clear swing towards the Science streams during the period following the 1972 curricular reforms, through which Science and Maths came to be taught in all secondary schools that had grades up to G.C.E., OL. However the trend has changed in recent years with student numbers enrolling for Science decreasing by about 16 per cent between years 1986 and 1996. This swing away from Science had been partly attributed to the highly selective and restrictive admission policies followed by the faculties concerned in the universities, amidst an increasing demand for places.

The objective of this paper, therefore, is to analyse the trends prevailing in the Bio Science stream during the period, 1990 to 2000. It was revealed from the study that the number eligible for admission to universities had increased during the period concerned. However, the percentage admitted had remained low despite variations from year to year. All relevant faculties – Medicine, Science, Agriculture, Veterinary Science and Dental have followed very restrictive admission policies and the percentage of admissions had remained constant despite increasing pressure during the relevant period. It was also revealed that nearly 75 per cent of eligible candidates have been annually shut off from universities. Even though a large number of females qualify for admission, the probability of a female being admitted remains at 0.23.

The question at stake is whether faculties will

democratize their admission to a certain extent or remain exclusive amidst the current growing demand.

### Introduction

The establishment of the Ceylon Medical School in 1870, followed by the Ceylon University College in 1921, and the subsequent amalgamation of the two institutions to form the University of Ceylon in 1942, provided the long awaited opportunity for university education in Bio Science in Ceylon. This was the much-desired breakthrough after a long period of continuous agitation for higher education. Education in Bio Science became very attractive as it paved the way for lucrative professional occupations, which were in great demand due to the recognition of these institutions in Britain.

The opportunities provided for higher education in Bio Science resulted in doctors being the most sought after profession. This fact is supported by a resume of several studies on occupational aspirations of secondary school students, spanning a period of about 50 years – Green T.L. (1952), Jayasuriya J.E. (1961), Muthulingam S. (1973), Jayaweera S. (1973 and 1976), Wansinghe J. (1982), Rupasinghe S. (1990) and Jayaweera S. and Rupasinghe S. (1998). Doctor and engineer occupied the top ranks until about the 1970s. Since then the aspirations of secondary school students have taken a slight turn with professions like teacher, nurse and accountant emerging as popular career options and at present, teaching and nursing appear to be close preferences along with medicine for future careers, specially among female students. Table 1 gives a summary of vocational aspirations of students according to major research studies conducted during the period 1952 to 1998.

1. Professor, Faculty of Education, University of Colombo.

**Table 1**  
**Vocational aspirations of secondary school students – Ranks of major occupations according to research studies (1952-1998)**

Researcher	Green		Jayasuriya	Muthulingam	Jayaweera		Wanasinghe		Rupasinghe				Jayaweera & Rupasinghe	
Year	1952		1961		1973	1976	1982		1990				1998	
Sample	SSC		OL high IQ	Age 15-17	OL		Science		OL		AL		OL	
Gender	M	F			F	F	M	F	T	F	T	F	T	F
<b>Occupation</b>														
Doctor	1	1	2	1	2	1	2	1	2	2	1	2	2	3
Engineer	2	3	1	4	8	5	1	5	3	7	4	6	5	6
Teacher	3	2	3	6	1	2	6	2	1	1	2	1	1	1
Accountant	-	-	-	-	6	8	-	-	4	5	3	4	9	9
Nurse	-	-	-	-	3	3	-	-	6	3	-	-	4	2
Clerk	-	-	-	-	4	6	4	3	5	4	5	3	8	5
Police Inspector	6	7	-	8	10	7	-	-	-	-	-	-	7	4

M – Male Sample      F – Female Sample      T – Total Sample  
 SSC – Senior School Certificate  
 OL – Ordinary Level;      IQ – Intelligence quotient

Despite the slight shift in vocational aspirations of students, the Bio Science stream at the upper secondary level in schools, even today, attracts a considerable number of students in areas where opportunity for G.C.E (AL) Science is available. This can be attributed to the fact that Bio Science stream leads the way to enter the Faculties of Medicine in the national universities.

Related to the above discussion, changes have also occurred in enrolment at the G.C.E. (AL) and a distinct shift away from the Science stream has taken place at the secondary school level in recent years. Table 2 below depicts the situation.

School Census data in Table 2 reveals that there had been a gradual swing towards Science up to 1986, mainly attributed to the Curriculum Reforms of 1972 by which steps were taken to teach

Science and Maths oriented courses. But after 1986 a gradual shrinking of the Science stream had taken place at the Advanced Level up to year 2000, after which a slight positive change is witnessed.

It is pertinent to find out the reasons for this swing away from Science. Discussions with Science teachers from secondary schools reveals that this is due to the frustration the students undergo in the Bio Science stream by failing to get admission to Science-based courses in universities, particularly Medicine.

The objective of this paper, therefore, is to analyze the prevailing situation in the Bio Science stream regarding opportunity for admission to national universities and highlight the changes that have taken place in secondary school enrolment for Science over the period 1990-2000.

**Table 2**  
**Enrolment in G.C.E. (AL) Streams (1981-2000) Percentages**

Subject Stream	1981	1986	1989	1992	1996	1997	2000
Science	30.4	37.0	31.0	25.6	21.1	21.1	22.6
Arts	39.2	37.6	42.5	45.0	50.8	52.6	49.4
Commerce	30.4	25.4	26.5	29.4	28.1	26.2	28.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AL student enrolment in thousands	201	132	188	185	215	227	402

Source: School Census Reports, Ministry of Education

### Methods

The collection of data for this study was carried out mainly by using document analysis. List of documents perused are given below.

- School census reports of the Ministry of Education.
- Statistical hand books of the University Grants Commission.
- Research reports of the Centre for Women's Research.
- Statistical hand books of the Department of Examinations.

### Opportunity for admission to Science based faculties from the Bio Science stream

Table 3 gives the total number of G.C.E. AL students qualifying for University admission during the period 1990 to 2000 with numbers qualifying from Bio and Physical Science streams worked out as percentages, calculated out of the total number qualifying. The data in Table 3 shows that more students have qualified from the Bio stream compared with the Physical Science stream over the entire period concerned. For instance, 13.5% more students have qualified from the Bio stream in relation to the Physical Science stream in 1990, and the figure had fluctuated between 12.6 and 8.8% during the subsequent years. The difference stands at 8.5% in 2000. Meanwhile over the same period the percentages qualifying in both streams had decreased, by 7.1% in the Bio stream compared to the 2.1% in the Physical Science stream. Two trends in the number of students qualifying from AL Bio Science stream for university admission can be recognized as given below:

1. The actual number qualifying had increased over the decade under review from 7985 to 10,470, but this number as a percentage of the total number qualifying for university admission has declined to 14.2% in year 2000 from 21.3% in 1990.
2. The number qualifying in Bio Science has been considerably higher than the number qualifying in Physical Science - a difference of approximately 6215 in 2000 compared to 5068 in 1990.

A comparison with the Arts stream reveals that in Arts both the number qualifying and percentages have increased dramatically over the same period. The number had risen by 25831 while the percentage had swelled to 56.4% in year 2000 from 42.8% in 1990. The comparative increase in the number for Bio Science had been only 2485.

Table 4, depicts the position from another aspect - *i.e.* the percentage of students admitted out of the qualified number of students in the Bio Science stream with comparable figures for the Physical Sciences. From the data it is quite clear that in the Bio Science stream only around 27% could get into a University while 73% had been turned down in year 2000. Number qualifying and number admitted to the University has fluctuated, but has left or shut out around 7600-8200 students annually during the last four years. This figure appears to be high when compared with the Physical Science stream where the percentage of admissions have remained steady over the last four years and stands at 61.6% in 2000 leaving out only 38.4% 1600 students.

The difference in opportunity for admission to a university between Bio and Physical streams remain very distinct. Bio Science has offered less opportunity for a large number who have qualified and who have demanded a place in a university. This has been the case specially regarding the field of Medicine, the aspiration of many students who select the Bio stream.

Table 5 gives the distribution of students who had been admitted from AL Bio Science to the different Faculties in the universities. The figures are given as numbers and percentages calculated from the total number who had qualified from Bio Science in the relevant years.

A perusal of Table 5 indicates that the Medical Faculties, the most sought after, admits only 881 students or 8.4% of the 10,470 students who have qualified in 2000. The figure approximately corresponds to 31% of the 2835 admitted for the same year. Over the period concerned, the Medical Faculties of the universities have confined their admission to between 7.4 and 11.1% out of the total number qualifying.

**Table 3**  
**Number qualifying for university admissions by subject stream – comparison of Bio/Physical Science and Arts (1990-2000)**

G.C.E. (AL) Year	Academic Year	Total Number Qualifying from AL	Qualifying in Bio Science		Qualifying in Physical Science		Qualifying in Arts	
			Number	Percentage	Number	Percentage	Number	Percentage
1999	2000-01	73,561	10,470	14.2	4225	5.7	41845	56.4
1998	1999-00	73,442	12,088	16.4	3905	5.3	43119	58.7
1997	1998-99	73,570	11,132	15.1	3526	4.8	39147	53.2
1995	1996-97	70,382	11,081	15.7	3916	5.6	34582	49.1
1994	1995-96	56,703	10,516	18.5	3609	6.0	25484	44.9
1993	1994-95	59,292	12,508	21.0	5018	8.4	25828	43.6
1992	1993-94	55,144	8,914	16.2	3795	6.8	25464	46.2
1991	1992-93	50,362	8,076	16.0	4472	8.8	21078	41.8
1990	1991-92	42,454	7,916	18.6	3349	7.8	19008	44.7
1989	1990-91	37,354	7,985	21.3	2917	7.8	16014	42.8

Source: University Statistical Hand Books, University Grants Commission  
 Data for 1996 not included.

**Table 4**  
Admissions in the Bio Science – Qualified Vs Admitted

Academic year	No. qualifying for Bio Science	No. Admitted	Percentage admitted	Comparable percentage for Physical Science
2000-2001	10,470	2835	27.0	61.6
1999-2000	12,088	2766	22.8	67.2
1998-1999	11,132	2862	25.7	69.8
1996-1997	11,081	2790	25.1	59.4
1995-1996	10,516	2176	20.6	56.8
1994-1995	12,508	2041	16.3	40.2
1993-1994	8,914	1923	21.5	48.1
1992-1993	8,076	1944	24.0	39.9
1991-1992	7,916	2373	29.9	61.2
1990-1991	7,985	2501	31.3	68.0

Source: University Statistical Hand Books, University Grants Commission  
Data for 1997-1998 not included.

**Table 5**  
Admissions in the different faculties from the Bio Stream: number and percentage out of those qualifying from AL Bio Science

Academic year	Medicine		Agriculture		Biology		Dental	Vet
	n	%	n	%	n	%	n	%
2000-2001	881	8.4	721	6.8	1070	10.2	163	1.5
1999-2000	896	7.4	646	5.3	1042	8.6	182	1.5
1998-1999	893	8.0	670	6.0	1139	10.2	160	1.4
1997-1998	867	-	684	-	765	-	178	-
1996-1997	859	7.7	673	6.0	867	7.8	169	1.5
1995-1996	877	8.3	273	2.5	880	8.3	146	1.3
1994-1995	863	6.8	269	2.1	768	6.1	135	1.6
1993-1994	769	8.6	335	3.8	678	7.6	141	1.5
1992-1993	791	9.8	325	4.0	686	8.5	142	1.7
1991-1992	882	11.1	396	5.0	911	11.5	184	2.3
1990-1991	860	10.7	479	5.9	983	12.3	179	2.2

Source: University Statistical Hand Books, University Grants Commission  
n = number of students

Bio Science offers a little more places (10.2%), while Agriculture (6.8%) and Dental and Vet (1.5%) fall behind Medicine. Even though the percentages fluctuate the patterns remains the same.

**Gender difference in admissions**

Table 6 depicts the situation regarding female students. Here again the greater percentage who qualify in Bio Science appear to be female – approximately 59.2% of the total qualifying in 2000, but when the admitted category is taken into consideration a fewer number of females get into the universities, the figure being 24.3% of the females who have qualified. On the other hand even though a lesser number of males qualify, their percentage of admission appears to be higher than that of girls. This in other words conveys that a large number of females, compared to males are shut out from the University

despite the fact that more females qualify for admission.

This situation was earlier analysed by Indraratne and Kotahachchi (1993) by examining admissions during the period 1981-82 to 1990-91 and attributed it to the differences in achievement between males and females – the raw aggregate marks scored by the two groups. During the period concerned, out of the qualified, 29.18% of the males had entered, and they concluded that even though a larger number of females qualify by achieving the minimum mark, they fail to get admission due to their inability to clear the cut off point.

Jayaweera and Rupasinghe (1996) explored this situation further by examining the UGC data for 1993 – 1994 admissions. Here the admissions were calculated taking into consideration the number applying for admission instead of the number qualifying and the data is presented in Table 7.

**Table 6**  
**Numbers of females and males admitted out of those qualifying**

Academic year	Total qualifying Bio Science	Females qualifying	% of females qualifying	Females admitted	% of females admitted	% of males admitted
2000-2001	10,470	6199	59.2	1509	24.3	31.0
1999-2000	12,088	7081	58.6	1461	20.6	26.0
1998-1999	11,132	6499	58.3	1501	23.1	29.4
1996-1997	11,081	6259	56.4	1383	22.1	29.2
1995-1996	10,516	5903	56.1	1001	16.9	25.4
1994-1995	12,508	7275	58.1	1020	14.0	19.5
1993-1994	8,914	4863	54.6	842	17.3	21.5
1992-1993	8,076	4412	54.6	894	20.2	24.0
1991-1992	7,916	4443	56.1	1195	26.9	29.9
1990-1991	7,985	4374	54.6	1241	28.3	31.3

Source: University Statistical Hand Books, University Grants Commission

Column 6 – Percentage of females admitted out of total number of females qualifying

Column 7 – Percentage of males admitted out of total number of males qualifying

Data for 1997-1998 not included.

**Table 7**  
1993-1994 Admissions – Bio Science

Gender	Number applying	Number admitted	Percentage admitted
Male	2139	1331	62.23
Female	2399	1103	45.97
Total	4538	2434	53.66

Source: University Grants Commission Admissions Data Records

The researchers attributed this difference to the raw aggregate marks scored by the two groups, which in turn is a direct result of their performance in the subjects.

The percentage of A and B grades scored by the males and females in the five subjects are given in Table 8.

Jayaweera and Rupasinghe also analysed the distribution of aggregate marks of students who failed to get selected in 1993-1994. The data is given in Table 9.

Out of the 2104 who failed to get admitted among applicants (Table 9) 61.6% were female and their overall performance in terms of the raw aggregate mark was poor.

#### Impact of the District Quota System on merit

It would be pertinent at this point to examine the impact the District Quota System (operative since 1974) on admissions to universities with reference to the Bio Science stream.

During the admission year 1993-94 the original cut off mark for Medicine from the Colombo District before vacancies were filled had been 271 while it was 210 for Moneragala. Accordingly 189 students were selected from Colombo District while only 12 students were selected from Moneragala for Faculties of Medicine in the

universities. Within the gap of 61 marks between the two cut off points for Moneragala and Colombo (range between 210 and 271) there were 662 eligible candidates in the Colombo District who would not be considered for selection for Medicine. Out of this 359 or 54.2% were female. Such situations very often resulted in frustration among students, who were aspiring to join the Faculties of Medicine, as well as their parents.

During the same academic year the cut off mark for Jaffna in Medicine had been 266 and this left out 247 students in Jaffna District who would not be selected for Medicine but had scored an aggregate mark of over 210, the cut off mark for Moneragala.

Similarly between the cut off mark for Colombo and Jaffna (271 and 266 respectively) there were 42 students in the Colombo District who had surpassed Jaffna cut off point but remained below the Colombo cut off point.

However, with a cut off mark as low as 210, Moneragala could send only 12 students to the Medical Faculty compared with 201 from Colombo and 41 from Jaffna (UGC Hand Book - 1995).

A status similar to Colombo and Jaffna exists in other high achieving and heavily populated districts also. For instance, in 1993-94, 229 students from Kandy, 222 from Galle, 293 from Matara and 184 from Gampaha could not get themselves considered for selection despite their high aggregate marks. This really diminishes the hopes of even high achievers in the Bio Science stream.

#### Situation at collegiate level

The significant changes that had occurred in the enrolment for Science at G.C.E. (AL) between 1991 and 2001 is given in detail, district by district, in Table 10. From 1991 to 1997, except for the districts of Mannar, Trincomalee and Moneragala, all the other districts had undergone negative changes in the percentages enrolled for Science, out of the total enrolments for AL in each district. In contrast between 1997 and 2000 all districts



**Table 8**  
**A and B Grades scored by students selected for admissions,**  
**Bio Science Stream – 1993-1994**

Subject	Percentage of A and B grades		
	Male	Female	% Gender Difference (M – F)
Physics	28.84	16.88	+ 12.0
Zoology	19.09	16.77	+2.32
Chemistry	57.62	58.39	-00.77
Botany	63.79	71.08	-7.29
Agriculture	90.62	76.39	+14.23

Source: University Grants Commission data records M= Male; F=Female

**Table 9**  
**Distribution of aggregate marks according to gender of students who were not selected**

Aggregate marks	Male		Female		Total	
	Number	%	Number	%	Number	%
240-243	31	42.5	42	57.5	73	100.0
220-239	335	39.4	516	60.6	851	100.0
200-219	268	37.3	451	62.7	719	100.0
180-199	174	37.7	287	62.3	461	100.0
Total	808	38.4	1296	61.6	2104	100.0

Source: University Grants Commission Admission data records

**Table 10**  
**Enrolment in the Science stream as a percentage of the total enrolment at AL in each district – percentages**

District	1991	1997	2000
Colombo	38.6	33.0	35.5
Gampaha	30.1	21.4	23.6
Kalutara	28.5	21.8	22.1
Kandy	27.2	21.8	22.1
Matale	19.6	17.6	16.8
Nuwara Eliya	17.5	12.4	13.1
Galle	28.5	27.0	27.0
Matara	24.5	20.3	25.1
Hambantota	27.0	19.8	25.4
Jaffna	33.3	24.6	24.8
Mannar	15.3	16.5	42.5
Batticaloa	22.5	20.3	21.5
Ampara	26.4	20.8	20.9
Trincomalee	18.0	19.2	16.1
Kurunegala	20.0	15.5	18.4
Puttalam	22.6	16.3	19.4
Anuradhapura	22.0	17.0	19.1
Polonnaruwa	16.8	14.7	14.6
Badulla	23.5	14.6	17.5
Moneragala	14.2	14.7	14.7
Ratnapura	23.3	17.2	18.5
Kegalle	23.6	18.7	20.7
Sri Lanka	26.6	21.2	22.5

Student Numbers	<u>1991</u>	<u>1997</u>	<u>2000</u>
Grade/Year 12	19,466	20,224	51,558
Grade/Year 13		15,617	23,754
Grade/Year 13 Repeat	30,257	12,378	15,174
Sri Lanka	<u>46,723</u>	<u>48,219</u>	<u>90,786</u>

Source: School Census Reports – Ministry of Education

except Matale, Galle, Trincomalee, Polonnaruwa and Moneragala have recorded positive changes.

Student numbers given at the bottom of the Table shows that grade 12 Science enrolment has swelled from 20,224 in 1997 to 51,858 in 2000, an increase of 31634 which is a 150% increase. These students are expected to sit the G.C.E AL in 2002 April. The total AL Science student increase from 1997 to 2000 has been 42,567, an 88% increase over the period. The sudden increase in student enrolment numbers will exert additional pressure on university admissions by generating more competition for the limited number of places available in the Science oriented faculties.

A gender wise breakdown of G.C.E. (AL) Science enrolment reveals that at grade 12, 47.5% are females and out of the total AL Science enrolment 46.7% are females (42,430 out of 90,786).

This phenomenal increase in enrolment between 1997 and 2000 may be attributed to two factors: (1) the gradually increasing percentage qualifying for AL from OL. Among school candidates, only 19.4% qualified in 1995 where as in 1998 the percentage increased to 37.4% (2). The enrolment of a double batch for grade 12 in 2000 in order to meet new University Academic Year Calendar dates.

### Conclusions

The review of data presented in the preceding sections leads us to the following conclusions.

1. Within the Science stream at collegiate level a large number of students qualify for admission in Bio Science. In recent years approximately around 14-15% of the total number of students qualifying (all streams) belonged to the Bio Science stream. Numerically their strength had been between 10,000 and 12,000.
2. In each cohort of students seeking admission to universities in Bio Science annually, around
3. All five University Faculties that are taking in students from Bio Science have followed very restrictive policies in the admission of students. During the last three academic years Medicine has restricted itself to 8%. Science 9.6%, Agriculture 6% and Vet & Dental 1.5% of the total qualifying in the Bio Science stream.
4. Even though, a large percentage of female students qualify for admission in Bio Science, their chances of getting into a University Faculty of their choice is very slim. The probability of qualifying for females is 0.59, but the probability of getting admitted is 0.23. Previous research on this aspect also confirms the current situation.
5. The District Quota System which was introduced in 1974, as a measure of social justice in compensating for the obvious regional disparities in education, especially Science, also acts as a barrier for some of the high achieving students in more developed and populated districts. If the District Quota System is abolished, chances that students from areas such as Moneragala will have, to enter the University, will be meagre.
6. The sudden upward trend in the enrolment of students at collegiate level in recent years will definitely have a bearing on university admissions. If the universities fail to democratise, their admission policies or explore alternative and diversified opportunities, the situation could generate more competition resulting in frustration among a large student population for whom the doors of the universities will remain closed.

75% of them had been shut out due to non-availability of places in university faculties. Numerically this had been about 7000 to 8000 students. Therefore the probability of a Bio Science student getting selected to the university, based on figures for the last three academic years, is 0.25, compared to Physical Science, which is 0.66.

7. Finally, considering the above facts it would be pertinent to raise the question – will the G.C.E. AL Bio Science stream lead the majority of the students along a blind alley? Will it be a dead end for a large number of students who aspire to join the most prestigious faculties of national universities?

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