

University Students' Perception of Essential Mathematics and Elementary Statistics as Degree-Certification Requirement for Humanities: A Comparative Study of the National University of Lesotho and the University of Ibadan

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Abstract: *As a swift response to the continuous debate on curricular review, the study examined the perception of selected university students' to the core/compulsory nature of mathematics and statistics in the faculty of arts/humanities. Using the cross-section survey research design, 609 participants with age range of 17 and 57 years ($X=34.71$; $SD=6.3$) were randomly drawn from the National University of Lesotho, Southern Africa and the University of Ibadan, Nigeria. The Students' Perception to Numerical Programmes (SPONPS) was used while the ANOVA and the frequency counts using percentage were the statistical methods utilized at the alpha level of 0.05. Critical in the findings was that while 99.0% of the participants indicated that mathematics, and, or statistics is not directly related to their disciplines [$F(2,609)=3.23$; $P<0.05$], 16.3 % and 20.9% reseasoned that generally, both courses are useful. Arising from the findings, a typological paradigm was therefore suggested for adaptation particularly at the NUL.*

Keyword: *University Students, Essential Mathematics, Elementary Statistics, Humanities*

BACKGROUND

For a long time, the debate for and, or against the curricular inclusion of numerical programmes and, or otherwise (its exclusion) across some African Universities and Faculties is often a heated discussion with much confusions and unusual conjectures. Such discussions most times may have individuals at different divide with little or no recourse to the critical issues favoring either curricular necessities/review and, or University senate rules. The tactics often adopted for curricular review and, or modification, are also some times prolonged that its virtues may be misunderstood on the long run. On the other hand, learners for whom the programmes are being redesigned may not be that privileged as some of the review suggestions would have become implementable after senate due debate and approval which may span some extra months and, or years. Such debated curricula are Mathematics and Elementary Statistics, two University core- programmes in the Faculty of Humanities, the National University of Lesotho. The central focus of these curricular bothers however, on the age-long debate suggesting a re-appreciation of senate rule that should redesign and package differentially such core programmes, especially as they affect students from the Faculty of Humanities in particular, but, Faculties other than the sciences in general.

In Gagnon and Maccini (2007) study that examine teacher perceptions of (a) definition of Mathematics (otherwise, Statistics); (b) familiarity with course topics; (c) effectiveness of methods courses; (d) preparation to use and frequency of use of effective instructional strategies; and (e) factors contributing to the use of effective instructional strategies among special learners(i.e. the physically challenged), it found that the number of methods and courses taken by teachers uniquely and significantly contributed to the number of effective instructional approaches that both general and Special Educators reported using. It further found that significantly, more Special Educators than general educators reported the use of specific empirically validated instructional practices in the enhancement of learners' potentials. Although Gagnon and Maccini investigative outcome was quite outstanding, and others like it

(Charalambous & Pitta-Pantazi, 2007; Connery, 2007), the salient dimension of the inclusion of mathematics and elementary statistics as part of curricular requirement especially for students in either the Faculties of Arts and, or Humanities was not discussed.

Having either, or both the mathematics and, or elementary statistics obviously without much equivocation, however has a lot of merits especially for learners. Generally, the knowledge of numerical programmes such as mathematics and statistics can boost learners prowess and, or dexterity technically, creatively as in perception, conception, reasoning, thinking and abstractions. Supporting the argument for the relevance of numerical programmes Faircloth (2007) and in particular, Myers (2007) provided insight into the often “why” question of mathematics and, or statistics as it were. According to Myers, mathematics facilitates learning comprehensively. Elaborating further, Myers said that the ability to ask relatively simple questions (why are there 360 degrees in a circle?, why is the sum of the measures of the interior angles of a triangle 180 degrees?, why is it that only certain shapes of tiles are used in kitchens and bathrooms?, what does the measure of an angle have to do with soccer ball) usually leads to wonderfully interesting and interrelated directions.

Numerical Programmes in the Faculties of Arts/Humanities

Within global context, though with little exceptions, the programmes that epitomize the Arts and, or Humanities Faculties among others, though not exhaustive, has the English Language as a strong prerequisite admission condition as against numerical qualification (University of Manitoba, 2007; National University of Lesotho, 2007abc, University of Ibadan, 2007). For instance at the University of Ibadan, the admission requirements among others states that admission through UME which is conducted by the Joint Admission Matriculation Board (JAMB) for 100 level courses (i.e. first Year Programmes) is available to all the Faculties. The General Entry Requirement is that candidates have credits in five relevant subjects at one sitting or six relevant subjects at two sittings. A Credit Pass in English Language is compulsory for all while a Credit Pass in Mathematics is also compulsory for those seeking admission to Science based Faculties, but a Pass in Mathematics shall be allowed in the case of Faculty of the Social Sciences for all courses except Economics where a credit in Mathematics is compulsory. Candidates seeking Admission to the Faculties of Arts, Law and Education for Arts based Teaching subjects need not pass Mathematics except for the Departments of Guidance and Counseling and Educational Management where a Credit Pass is compulsory.

In the Myers (2007) position, and which further reinforces University entry matriculation requirements as it were, mathematics was perceived as a good foundational and very crucial subject for a large number of careers in sciences, engineering, medicine, technology and business. According to Myers, the applications of mathematics in those fields constitute much more than just possessing skills. The notion that either mathematics and, or elementary statistics (otherwise, both) should therefore constitute a mandatory graduation requirement seems a misnomer in the purely humanities and, or arts programmes adjudged from Myers’ perspective. If comparatively, the argument sounds logical and reasonable, and that if neither the mathematics nor elementary statistics are matriculation requirements, it could therefore be a knotty issue compelling learners’ registration with a prerequisite pass mark for graduation.

Administrative Procedure and Core Courses

Generally, though with regular modification in terms of programmes creation for inclusion and, or exclusion, some of the programmes in the Faculties of Arts (otherwise, Humanities) are: History, Theology and Religious Studies, English Language, Communication and Language Arts, Linguistics, Philosophy and Theatre Arts. A quick reference point here could be that of the Faculty of Arts, University of Ibadan, Nigeria. Sometimes, but with acceptable modification by consensus and Senate wisdom, others as Modern European Languages, French and Cultural Studies also get independent autonomy to run as separate units and, or departments. A very common phenomenon however is that in the faculties of humanities and, or arts, mathematics nor mathematical programmes (and also statistics) are neither taken as core and, or compulsory matriculation courses nor graduation programme for certification (University of Ibadan, 2007 and University of Manitoba, 2007). Though a vital requirement is the English Language, others may include Religious knowledge (Christian or Islamic in some institutions as the University of Ibadan), Government, Literature-in-English, Arabic, French, Fine Arts and Social Studies without recourse to mathematics. Thus, in consequence, and if after university matriculation and screening therefore, and that mathematics (and statistics) as a subject/subjects became the emphasis and a graduation requirement, that decision may be the outcome of administrative fiat in one or two universities and may not be the vogue elsewhere.

The Study and Setting

The primary aim of the study was to investigate the perception of university students on two curricular (i.e. mathematics and elementary statistics) as core/compulsory graduation courses for Degree certification. This study

was motivated considering the age-long debate across Faculties at the National University of Lesotho where this has been the vogue. The argument in particular presently affects the Faculty of Humanities where in specific terms, the composition of course programmes that are maintained by the different Departments/Units are not science-related but students in the Faculty are mandatorily expected to register and secure a minimum performance grade of 50% and, or above in both mathematics and elementary statistics for Degree certification. Although the debate unequivocally affects other Faculties within the university, the present study compares the perception of students in two African Universities that have similar Faculty background on the relevance of their compulsory registration on mathematics and elementary statistics. The two Universities are the National University, Lesotho, Southern Africa and the University of Ibadan, Nigeria, West Africa.

The settings of the study were the University of Ibadan, Nigeria and the National University of Lesotho, Lesotho. The University of Ibadan began as a university college and affiliated then to London in 1948. The university is made up of several faculties, institutes, and the college of Medicine while it is located within the ancient city of Ibadan, Oyo State, Nigeria and in West Africa. While the university of Ibadan has close to 30,000 and, or above students population, the Faculty of Arts which is the focus of the present study is an outstanding faculty having several Departments and programmes among which are History, Philosophy, Religious Studies, English Language, Communication and Language Arts, Modern European Languages, Linguistics, Theatre Arts and archaeology and anthropology. All academic Departments/Units at the Faculty of Arts and the University of Ibadan generally, as other universities in Nigeria, usually earn accreditation from the National University Commission (NUC). The NUC is the national regulatory body of programmes/facilities in Nigerian Universities.

The National University of Lesotho on the other hand is in Southern part of Africa. The National University of Lesotho (NUL) is situated in Roma, 35 kilometers away from Maseru, the capital of Lesotho, on the site of the former Pius XII College. Though her origin dates back to history and as far back as 1945 with a Catholic University College founded in Roma by the Roman Catholic hierarchy of South Africa, the NUL is an autonomous institution granting its own degrees and governed by Council with her senate attending academic matters. NUL equally boasts of several faculties but few institutes and a students population of about 10,000. Prominent in its faculties is the Faculty of Humanities which is the second focus of the present study. In NUL presently, students at the Faculty of Humanities offer both the mathematics (Maths 1330) and the elementary statistics (Stat 1381) as core/compulsory courses for degree certification. In the 2005/2006 academic session the university generally witnessed an unfathomed deficient academic performance with students' results and in particular, in mathematics 1330 and elementary statistics 1381. What is prominent in the discussion now is the wit needed to convince otherwise the administrative fiat that has enshrined the two curricular while making them compulsory in a non-science based faculty.

METHODS

Participants and procedure

The cross-sectional survey research design was utilized in the study to compare students' opinion across years of study and departments/units affiliation. Using the slightly modified cluster version of academic year (i.e. first, second, third and fourth years of study or simply, 100, 200, 300 and 400 levels) as well as whether baccalaureate and, or graduate programme depending on the institution and environment, 609 participants, following the simple random format, made up the study sample in a non-equivalent research type. While 86 were the participants contributed from the National University of Lesotho, 523 were got from the University of Ibadan, Nigeria. While the participants' social status and religious affiliations were not considered relevant, their age range however was between 17 and 57 years and a Mean age of 34.71 (SD=6.3) was observed.

Questionnaire Administration

Research proctors were particularly used in the administration of the copies of questionnaire at the University of Ibadan, Nigeria and students representatives at the National University of Lesotho for the study. The proctors were briefed on the purpose of the study during training while emphasizing that the scale does not attract any wrong nor right response while participation was optional. Although the Students' Perception to Numerical Programme Scale (SPONPS) had the entire sub-sections administered to participants at the University of Ibadan, only sub-section 'D' was administered to participants at the National University of Lesotho.

Measures

The Students' Perception to Numerical Programme Scale [SPONPS] was the research instrument used in the study. Designed by the researchers, the SPONPS was constructed as a swift response to the argument on the stalemate on

continuous Faculty of Arts and, or Humanities students' participation and, or (otherwise) in Mathematics 1330 and Elementary Statistics 1381 at the NUL. The SPONPS has sub-sections A, B, C and D with 9, 7, 8 and 5 items respectively. In sub-section 'A' the participants were expected to provide reasons germane to their choice of programmes and, or career selection in the Faculty of Arts/Humanities while in sub-section 'B' react to the usefulness of Mathematics and Elementary Statistics to their University Programmes. The participants were expected to state their likely decision, should both curricular becomes compulsory for degree certification (sub-section 'C') but in sub-section 'D' they were expected to simply rate the usefulness of essential mathematics and elementary statistics as well as making a choice should an opportunity to drop one of the courses offers.

Though the SPONPS was screened through experts' judgment for face and content validity, it however had its response format for sub-sections A, B and C in the 2-Likert modified point version while in sub-section 'D' in the 5-point scale. Following the odd and even paradigm, the coefficient reliability (r) of 0.85 (sub-section 'A'); 0.75 (sub-section 'B') and 0.78 (sub-section 'C') were observed.

Data Analysis

One-way Analysis of Variance (ANOVA) and the descriptive statistics of percentages at the alpha levels of 0.05 were the computational methods adopted.

Results and Discussion

Essentially, the findings showed among others that majority of the students (97.3%) who participated in the study offered to pursue courses in the Faculty of Arts/Humanities due to their perceived knowledge that such university programmes involving mathematics and, or statistics would not be in the curricular. While 94.3% of the participants reasoned that if they had the slighted information that either mathematics and, or statistics was needed for their Degree certification, they would have considered application elsewhere; they were unanimous when they disagreed that mathematics (100.0%) and statistics (99.0%) were either related to their programme or very useful to university course of their enrollment/registration (tables I, II and III, appendix). Only 1.3% of the participants however perceived favorably the usefulness of both mathematics and statistics to the programmes in the Faculty of Arts/Humanities.

Responding to the item-statement that requested the participants' likely reaction assuming if either and, or both of the courses were made compulsory, 86.2% said that they would definitely be in for some kind of problem while only 13.8% (table III, Q5) felt otherwise. Using the directional item-statements as reflected on section 'D' (items 1 and 2) and as shown in the appendix, where participants generally were requested to rate the usefulness of mathematics in a continuum, the findings indicated that it was not statistically significant (tables IV and V) even though some obvious discrepancies in terms of Mean-score differences were observed. Figures I to III also show the graphical summary where bar charts were used. What the phenomenon meant is that asking learners the usefulness of both mathematics and, or statistics is different from asking the same question in relation to their area of studies. Thus without much equivocation, the implication is that while both courses may be relevant and useful generally, in specific term, such relevance may not be directly hinged to their disciplines and future aspirations.

However, when the observed data were subjected to the use of the ANOVA, it showed that there was main statistical effects with $[F(8,514)=3.54; P<0.05]$ while it is not statistically significant at the level of the participants $[F(2,522)=3.23; P<0.05]$; undergraduate level $[F(8,608)=10.84; P>0.05]$ and university level $[F(2,514)=17.11; P>0.05]$ respectively. It was never the less statistically significant at the gender level $[F(2,522)=5.71; P<0.05]$ as summarized in table

VI.

SUGGESTED PARADIGM AND DISCUSSION

Using the information as indicated from the findings in the study, it may be reasonable to suggest a university-wide curricular review particularly at the National University of Lesotho. In adopting the index of university core/compulsory programmes, critical university courses and, or programmes across disciplines and perhaps, the faculties, could be screened through the academic board committee. For instance, in the early part of the 1990s, the University of Ibadan redesigned and packaged her programmes when the university senate discovered that the university matriculants were performing poorly in their grammatical expression across the various disciplines. That was when the General Studies (GES) was introduced. The GES has four sub-categories which are science and mankind, culture and society, general English and the vocational programme. As at today, and as it is presently the

case with the University of Ibadan, Nigeria, students (otherwise, university matriculants), depending on their respective disciplines, are mandatorily expected to register for the GES designated courses.

For the National university of Lesotho, rather than requesting students to compulsorily select, register and obtain a university minimum pass mark in mathematics and statistics, the suggestion is on programme repackaging. Such courses like mathematics (M1330) and statistics (ST 1381) for instance, could be clustered (otherwise, submerged) along with other courses such as logics (i.e. Department of Philosophy) and family studies/culture (as in Social Anthropology and Sociology Department). This paradigm, which may be taken as the first suggested paradigm could be tagged Culture and Society. A second paradigm within the suggestion could combine general knowledge involving English Language, hero studies (as in History Department), Moral education (as in Theology and Religious Studies Department). Third, a programme that may be tagged science and mankind could involve selected programmes in the sciences generally. The fourth paradigm would be in the vocational area; and may include courses in Engineering/Technology Department, business studies, Agricultural science (as in Business Administration and Economics Departments and technology and Agriculture Departments). In this paradigmatic design, the departments and, or faculties to which the learners belong would therefore determine what cluster the learner would register for. For example, it would be expected that the paradigms would have learners from science-based disciplines to offer added programmes from the humanities and social science-based sub-categories for their degree certification.

One paramount and interesting dimension in the suggested paradigm is its ability to enhance learners' knowledge generally, across university available programmes. Learners for instance who would have moved across the faculties for registration in the general programmes should, at the end of their university careers, have the basic knowledge available in other disciplines other than their matriculation programmes. Humanities- and social science-based learners may have some information germane to raising for instance, the poultry farms, aeronautics and automobile even though such basic knowledge may be shallow. Those from the science-based matriculation courses would equally have some faint ideas and, or knowledge about African Philosophers, heroes and heroines due from their exposure to differential programmes packaged in culture and society.

Importantly, learners would get value for their money and efforts as well as become more and better fulfilled. They would acquire needed information germane to their personal and collective advancement and which of course, would impact on the national growth in less stressful way. In consequence therefore, rather than been afraid of mathematics and, or statistics, both programmes would be taught and learnt with the expected ease.

The excesses of young academics and, or otherwise, which may be likely, to personalize faculty responsibilities would have overall become diversified as mathematics may now be submerged and taught along with related programmes as suggested in the paradigms in science and mankind, culture and society and, or family programmes. The self esteem of both learners and academic facilitators could therefore get boosted as knowledge would be shared symbiotically and interdependently. A study booklet for general studies (GES) to be reflected in culture and society, science and mankind for instance, may get academic facilitators to bring to bear their different perspective and experiences across faculties and departments as well as individual disciplines for chapters' development in such programmes just as it is presently the case at the University of Ibadan, Nigeria. To bring these suggestions to bear, the National university of Lesotho should be willing to provide the necessary logistics in terms of funding and the morale to prompt the development of new curricula and which, may then become part of a new vision and understanding

CONCLUSION

While the study essentially has examined participants' perception and reactions to the continuous administrative decision for compulsory registration with university minimum pass mark for certification in mathematics (1330) and statistics (1381) at the NUL in particular, the paper argues for the relevance and adaptation of a typological paradigm to be known as General Studies (GES). The suggested typology (i.e. four typologies) if tried, has the potential for stress reduction both on the part of the academic facilitators (i.e. Lecturers) and the students generally. As part of the intended content of the typology, the arrangement being envisioned should provide the basis for :(a) Science and Mankind (course combination are basic mathematics, basic physics, chemistry, chemistry, etc and which is **typology one**); (b) Use of English (general knowledge of English, that is **typology two**); (c) Culture and Ethics(basic information on logics-Philosophy, moral studies-Theology, family studies-Social works ,etc, that is **typology three**) and, (d) Vocational studies (basic courses in agriculture science, economics, accounts, etc-**typology four**). In consequence therefore, and as reflected in the suggested typologies, the students, depending on their area of speciality (otherwise, faculties) could combine any two or three of the four typologies from which a minimum

university pass mark could be obtained for certification. In the merit of this analogy, statistics (otherwise, statistics 1381as in NUL) may then be subsumed and taught under university programme in ‘Research methodology’.

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APPENDIX

Section [A]: Reasons for Career selection in the Faculty of Arts/Humanities

Table I: Faculty of Arts/Humanities Participants’ Career Choice Reasons Distribution

s/n	Type of Item Statements	Agree	Disagree
1	I am very good in science-related subjects	7(1.3%)	516(98.7%)
2	I like mathematics	17(3.3%)	506(96.7%)
3	I hate anything like literary subjects (e.g. English Language, literature-in-English, etc)	0 (0.0%)	523(100.0%)
4	All subjects involving calculation (mathematics, physics, statistics, accounts, etc) are detested	511(97.7%)	12(2.3%)
5	The Faculty of Arts has disciplines as history, communication and Language Arts, English Language, Philosophy, theatre arts and some other expressive programmes and I think that is Where somebody like me belong.	501(95.8%)	22(4.2%)
6	I prefer one of the courses there considering my background which is purely Art/humanities-based from High (Secondary) School subjects	519(99.2%)	4(0.8%)
7	Because of my future career ambition	497(95.0%)	26(5.0%)
8	I have always loved to be here in this Faculty	499(95.4%)	24(4.6%)
9	Because I know that I won’t have to offer any science-related subject nor mathematics	509(97.3%)	14(2.7%)

Section [B] : Usefulness of Either Mathematics and, or Statistics to Programmes in the Faculty of Arts

Table II: Mathematics/Statistics Usefulness Distribution

s/n	Item-Statement	Agree	Disagree
1	Mathematics is very useful to my course only	0 (0.0%)	523(100.0%)
2	It is only statistics that is directly related to my programme	5(1.0%)	518(99.0%)
3	Statistics and Mathematics are very useful to my programme	0(0.0%)	523(100.0%)
4	Both mathematics and statistics are not useful to courses in the Faculty of Arts in any way	516(98.7%)	7(1.3%)
5	Information in my course does not need any quantification	457(87.4%)	66(12.6%)
6	They are neither related nor useful in any way to my area of specialty	518(99.0%)	5(1.0%)
7	It could be, if it is only to enhance knowledge but not directly relevant even after University career	377(72.1%)	146(27.9%)

Section [C]: If either or both Mathematics and Statistics are Compulsory for Certification what would you do?

Table III: Participants' Reaction to Mathematics/Statistics Distribution

s/n	Item-Statement	Agree	Disagree
1	I should not have applied in the first instance	493(94.3%)	30(5.7%)
2	I don't think that will bother me at all	17(3.3%)	506(96.7%)
3	Well that will be alright	21(4.0%)	502(96.0%)
4	That could create confusion	489(93.5%)	34(6.5%)
5	I will definitely be in for some kind of trouble if that is the case	451(86.2%)	72(13.8%)
6	I don't know if I will manage	471(90.1%)	52(9.9%)
7	That will give me joy as I usually like to calculate	19(3.6%)	504(96.4%)
8	My efforts and desires would be frustrated	458(87.6%)	65(12.4%)

Section [D]

1. Please rate the usefulness of Essential Mathematics (M1330) on a scale of 1-5:
[1=Very Useful] [2 = Useful] [3=Not Sure] [4=Useless] [5= Very Useless]
2. Please rate the usefulness of Elementary Statistics & Probability (ST1381) on a scale of 1-5:
[1=Very Useful] [2 = Useful] [3=Not Sure] [4=Useless] [5= Very Useless]
3. Given the choice to drop one, which one would you drop? [M1330] [ST1381]
4. Do you have any comments to make about Essential Mathematics?

5. Do you have any comments to make about Elementary Statistics & Probability?

Table IV:ANOVA Comparison of Participants' Response to Usefulness of Mathematics

n=609	<u>variance between schools</u>	
X=Mean Scores	F-score	Sig.

University of Ibadan	N	very		not		very			
		useful	useful	sure	useless	useless	useless		
100 Level	83	14.3	16.1	11.9	45.8	64.7			
200 Level	154	19.2	20.5	9.7	54.3	59.0			
300 Level	125	10.1	8.5	3.8	55.4	41.2			
400 Level	114	23.5	9.1	1.0	48.8	62.7			
Postgraduate	47	29.2	12.6	6.9	57.2	41.5	4.09		P>0.05
NUL									
First Year	0	0	0	0	0	0			
second Year	59	9.1	12.2	8.6	50.0	54.4			
Third Year	9	11.9	0.0	9.6	47.8	51.6			
Fourth Year	7	4.8	13.5	7.8	35.8	53.8			
Postgraduate	17	9.7	3.8	4.4	41.3	49.7			
Unspecified	4	1.2	0.0	0.0	24.5	39.1	1.67		P>0.05

Table V :ANOVA Comparison of Participants' Response to Usefulness of Statistics

University of Ibadan	N	n=609 X=Mean Scores					<u>variance between schools</u>		
		very		not		very		F-score	Sig.
		No useful	useful	sure	useless	useless			
100 Level	83	5.11	7.27	11.9	43.8	48.74			
200 Level	154	1.40	11.11	4.3	51.7	34.30			
300 Level	125	0.00	03.54	13.7	36.4	49.20			
400 Level	114	13.70	9.30	24.7	31.5	44.60			
Postgraduate	47	9.10	3.50	9.1	37.8	50.10	5.23	P>0.05	
NUL									
First Year	7	20.9	26.7	9.3	17.4	24.4			
second Year	59	11.3	9.4	5.7	32.1	36.7			
Third Year	9	9.5	5.8	9.3	15.4	44.7			
Fourth Year	7	19.4	3.3	7.1	41.1	48.9			
Postgraduate	17	10.0	0.0	12.3	37.5	55.3			
Unspecified	4	6.7	1.5	0.8	9.4	13.9	2.6	P>0.05	

Table VI:Analysis of Variance (ANOVA) Comparing Outcome Details of Participants

Source of Variation	Sum of Square	df	Mean Square	F	P
Main effects	150.081	8	18.76	3.54	<0.00
Participants	34.214	2	17.11	3.23	<0.00
Gender	60.521	2	30.26	5.71	<0.00
Graduate Students	34.214	2	17.11	3.23	<0.00
Undergraduate Students	9.722	1	9.722	1.83	ns
Universities(U.I.& NUL)	34.214	2	17.11	3.23	ns
Explained	150.081	8	18.76	3.54	
Residual	53117.563	10022.18	5.30		
Total	53267.644				

F (2, 607) =3.23; P<0.05

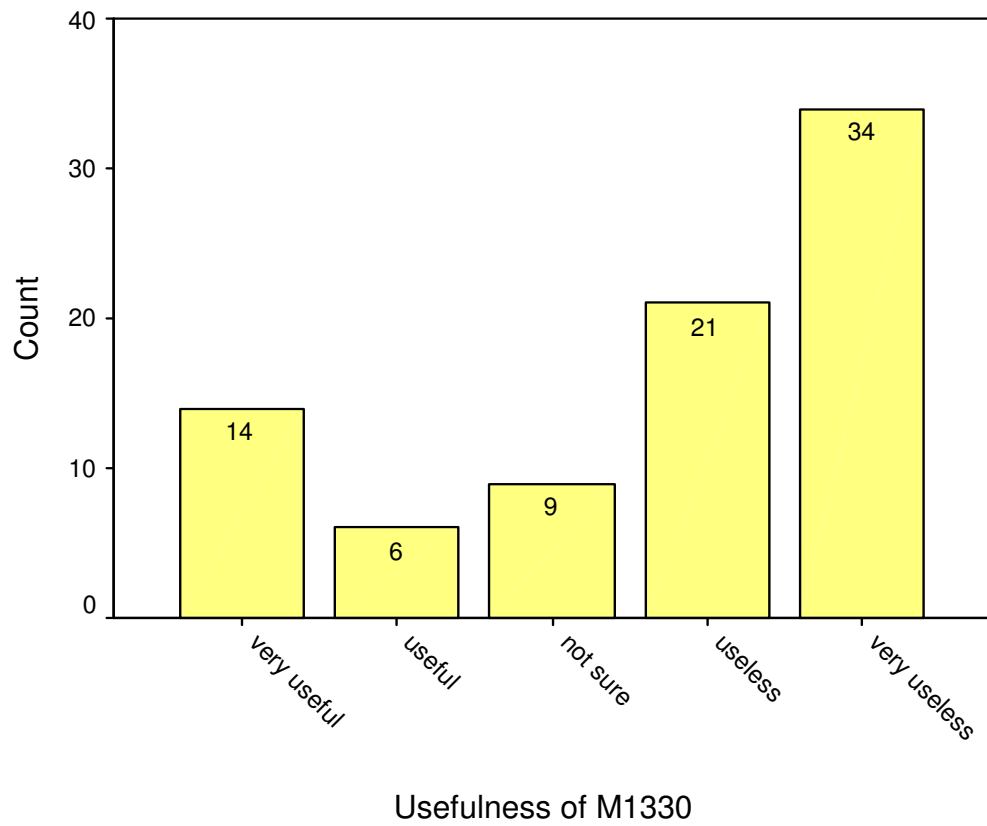
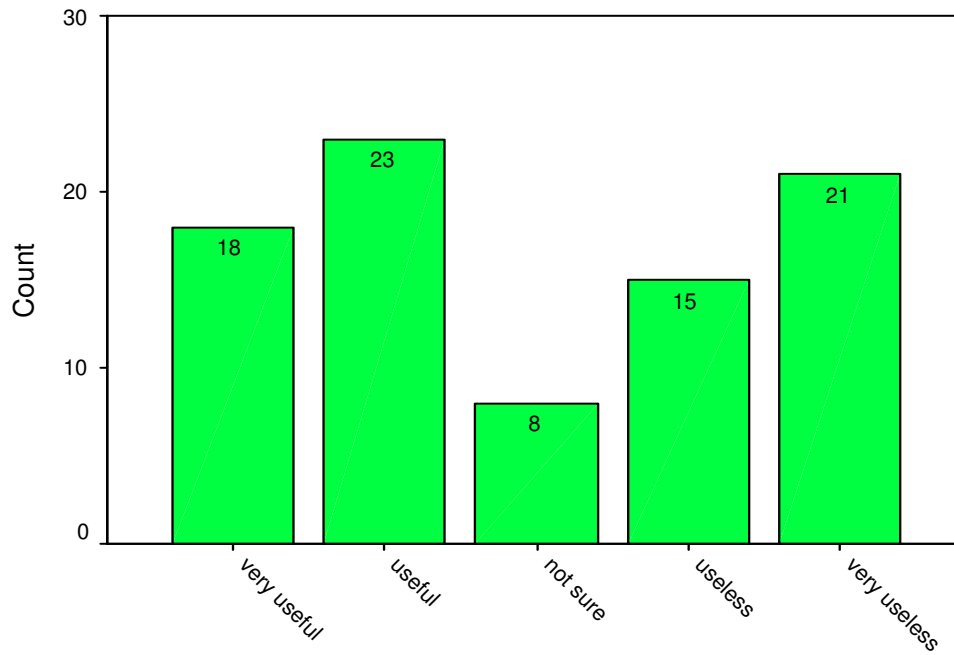


Figure 1: Perceived Usefulness of Essential Mathematics



Usefulness of ST1381

Figure 2: Perceived Usefulness of Elementary Statistics & Probability

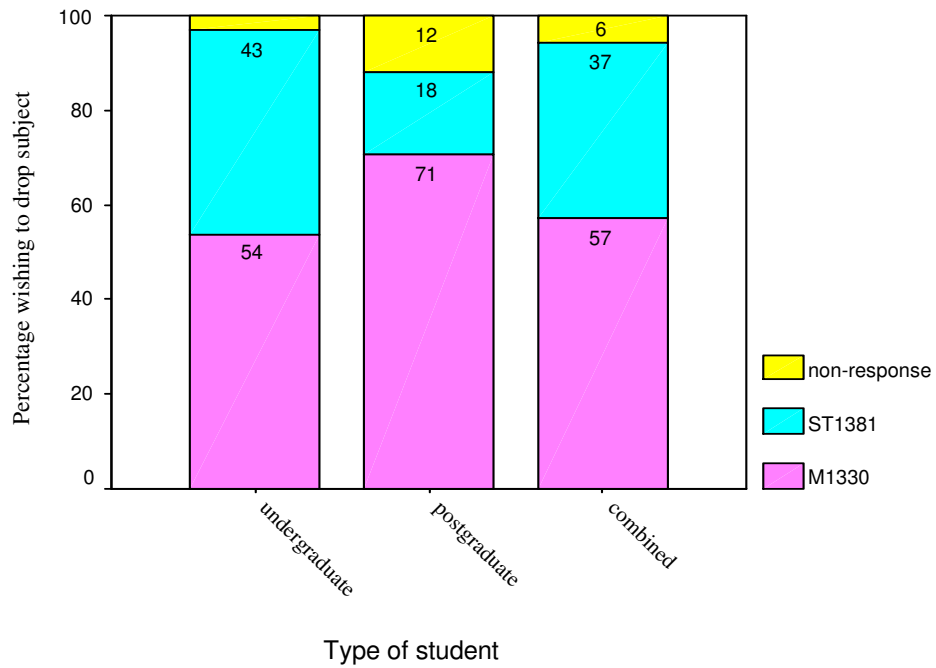


Figure 3: Choice of Subject to Drop