

HIGHER-GRADE MATHEMATICS THE
FORMULA FOR SUCCESS? ESTABLISHING THE ODDS FOR
PROSPECTIVE LLB STUDENTS

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It is human nature to look for a simple solution to a difficult problem. I have been trying to find such an answer to a question that vexes me: Would it be possible for a law faculty to establish which applicants are most likely to succeed in their LLB studies; that is, what criteria could be developed to predict which applicants would obtain their LLB degrees in the minimum time (four years)? In a time of diminishing state subsidies and pressure on universities to improve the pass rate or ‘throughput’ rate of students, it seems prudent to attempt to answer this question.

Previous research has identified an array of variables that have an effect on or act as a predictor of performance at university. These include age, race, gender, cognitive aspects (such as motivation, patience, persistence, self-confidence in functioning independently), high school background,

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strictness or lenience of marking standards, faculty teaching style, lecture attendance, cultural background, social and occupational status of parents, reading comprehension ability, and performance in a bridging year: see for instance C A Bohlmann & E J Pretorius 'Reading skills and mathematics' (2002) 16 *South African Journal of Higher Education* 196; G K Huysamen 'Marking standards and the differential predictability of the first-year university performance of different demographic groups' (2001) 15 *South African Journal of Higher Education* 129; P Dawes, N Yeld & M J Smith 'Access, selection and admission to higher education: Maximising the use of the school-leaving examination' (1999) 13 *South African Journal of Higher Education* 97; G K Huysamen 'The differential validity of matriculation and university performance as predictors of post-first-year performance' (2000) 14 *South African Journal of Higher Education* 146; Vicky Malefo 'Psycho-social factors and academic performance among African women students at a predominantly white university in South Africa' (2000) 30 *South African Journal of Psychology* 40; E J Pretorius 'Reading ability and academic performance in South Africa: Are we fiddling while Rome is burning?' (2002) 33 *Language Matters* 169; G K Huysamen 'Die prestasievooruitsigte in verskillende universitêre vakrigtings: 'n Internasionaal vergelykende ondersoek' (2002) 16 *South African Journal of Higher Education* 139; U G Hendrich & J M Schepers 'Locus of control and learning strategies as predictors of academic success' (2004) 18 *South African Journal of Higher Education* 250; Corné van Walbeek 'Does lecture attendance matter? Some observations from a first-year economics course at the University of Cape Town' (2004) 72 *South African Journal of Economics* 861; G K Huysamen & L A Roozendaal 'Curricular choice and the differential prediction of the tertiary-academic performance of men and women' (1999) 29 *South African Journal of Psychology* 87; C M Fourie & Susan J Naudé-De Jager 'Die identifisering van risiko-studente' (1992) *South African Journal of Higher Education* 17; J de Villiers & H Rwigema 'The effect of a bridging year on the graduation success of educationally disadvantaged commerce students' (1998) 12 *South African Journal of Higher Education* 103.

Earlier research by this author at the University of Pretoria (Anton Kok & Annelize Nienaber 'Legal skills for first year law students: Too little, too late?' (2005) 39 *The Law Teacher* 161) isolated the following as core criteria: mother-tongue education, matriculation subjects, matriculation symbols, class attendance and the 'm-score'. (The 'm-score' is an aggregate score calculated with reference to the symbols that the student achieves in the matriculation examination. The University of Pretoria calculates the m-score in the following way. An A symbol on the higher grade (HG) is awarded 5 points and a B symbol 4, on a decreasing scale on which an E symbol (HG) is awarded 1 point. An A symbol on the standard grade (SG) is awarded 4 points, and so on. An E symbol (SG) is awarded no score. G K Huysamen 'Optimalisering van die omskakeling van matrieksimbole vir universiteitstoelatingsvereistes' (2003) 23 *South African Journal of Education* 45 criticizes the arbitrary nature of the conversion of matriculation symbols to a

number and argues that at least the symbols obtained for Mathematics should be converted to a higher number than the same symbols for subjects such as History and English (second language). The (new) National Senior Certificate (NSC) that will be issued from 2008 prescribes that the minimum statutory requirement to obtain university entrance is an NSC with an achievement rating of 4 (50–59%) in a minimum of four 20-credit subjects from the prescribed list of subjects. All matriculants will be required to take Mathematics or Mathematical Literacy, as well as Life Orientation as a seventh subject. The University of Pretoria will be utilizing a so-called Admission Point Score (APS) which will be calculated by simply adding the ratings for each of the subjects taken by a particular applicant, excluding Life Orientation. Possible ratings range from 7 ('outstanding achievement') to 1 ('not achieved') and will replace symbols. The law faculty will be prescribing an APS of 24 as from 2008, and will also require that applicants achieve at least 4 (50–59%) in two languages, 3 (40–49%) in Mathematics or Mathematical Literacy and 4 in Life Orientation.)

With hindsight, the research that isolated the criteria identified by Kok and Nienaber was too narrowly defined. The criteria were primarily matched with first-year law students' results in only two first-year law modules (Legal Skills 110/111 and 120/121) and only to a limited degree with other first-year law modules, but not to performance in the second-, third- and final-year modules and not to 'throughput' or course completion figures. In subsequent research I have focused on course completion figures. The results of the research follow below. My research focused on the performance of LLB students in the law faculty of the University of Pretoria. I am grateful for the considerable assistance of the Bureau for Institutional Research and Planning at the University of Pretoria, which performed all of the requested statistical calculations. Student consent was not an issue as the particulars of individual students were not required in order to perform the calculations.

A disturbingly large proportion of LLB students leaves the University of Pretoria without a degree: 48% of the 1998 first-year group, 45% of the 1999 first-year group and 42% of the students of the 2000 first-year group. (The average 'dropped out' percentage for universities countrywide, for all degrees, for the 2000 first-year group was 38% (*Mail & Guardian* 22 September 2006 at 6.) Perhaps unsurprisingly, the better the performance in the matriculation examinations, the less likely it is that the student will leave the university without obtaining the LLB degree. (Many previous studies have concluded that the strongest single predictor of success at university is the aggregate score on the school leaving examination: see eg Dawes, Yeld & Smith *op cit*; Van Walbeek *op cit*; F D Bokhorst, D H Foster & S J Lea 'Factors affecting academic performance in first-year Psychology at the University of Cape Town' (1992) 6 *South African Journal of Higher Education* 59 at 59 and 64.)

M-Score	LLB I 1998	LLB I 1999	LLB I 2000
0-13	60	62	58
14	65	57	43
15	56	42	26
16	47	44	40
17	38	35	50
18	27	33	64
19	60	31	25
20	27	15	18
21	14	8	10
22	8	8	20
23	30	0	17
24-30	0	5	5
Average	48	45	42

The percentage of students who complete the LLB degree in the minimum time (four years) is small: 27% of the 1998 and 1999 intakes and 29% of the 2000 intake completed the LLB in four years. Generally speaking, the higher the m-score, the greater the percentage of students who complete the degree in the minimum time:

M-score	LLB I 1998	LLB I 1999	LLB I 2000
0-13	12	6	8
14	15	19	29
15	20	27	32
16	26	54	20
17	38	18	33
18	47	33	29
19	7	38	38
20	64	50	27
21	50	69	60
22	77	67	80
23	50	100	50
24-30	94	70	86
Average	27	27	29

Based on the above figures, it is observable that students with an m-score of 18 or higher (that is, students who achieved 6 Cs (HG) or better in the matriculation examinations) cope relatively well with the demands of academic study. The current admission requirement for acceptance as an LLB student at the University of Pretoria is an m-score of 14 (ie mainly D and E symbols). In the absence of a 'foundation' year or bridging programme, the admission requirement is set too low. It may be felt an unethical practice for students with this level of m-score to be accepted if it is known that most will not graduate. (Kate O'Regan 'Producing competent graduates: The primary social responsibility of law schools' (2002) 119 *South African Law Journal* 242 at 244-5 may be read to argue that it would be unethical to admit students incapable of achieving the LLB. William J Fraser & Roy Killen 'Factors influencing academic success or failure of first-year and senior university students: Do education students and lecturers perceive things differently?' (2003) 23 *South African Journal of Education* 254 at 254 put it bluntly: 'To knowingly admit students who, for whatever reason, have no

chance of academic success would be immoral' (my emphasis). To answer O' Regan, some students with low m-scores *are* capable of achieving the LLB. As to Fraser and Killen's statement, it may be argued that students with a low m-score do not have 'no chance' of academic success: A small percentage of students with low m-scores *do* manage to pass the LLB degree in the minimum required time.) At the very least, LLB applicants should be informed of their poor chance of success if they have an m-score of between 14 and 18.

The seemingly simple solution of raising the m-score to 18 or 19 is unacceptable for the effect it would have on racial representativeness in the student body:

Year	White	Black	Indian	Coloured
1998	70	99	100	100
1999	72	97	100	75
2000	67	99	95	100
2001	78	91	64	90
2002	71	93	69	88
2003	63	94	67	100
2004	57	83	44	80
2005	56	88	67	86

Based on the figures for the 2005 intake, raising the admission requirement to an m-score of 19 or higher would have the result that 88% of black (African) applicants, 67% of Indian and 86% of so-called coloured applicants would be barred from registering for the LLB degree. If the intent of the faculty is to take transformation seriously and to alter the race profile of its student population, especially the race profile of students who graduate, more is needed to prepare 'at risk' students for the demands of their studies.

With regard to correlating achievement in specific matriculation subjects and the successful conclusion of law studies, conventional wisdom holds that a high symbol in languages is the best predictor of successful performance. (A previous dean of the law faculty of the University of Pretoria believed that law students should have History to matriculation level.) The results of my research indicate that students who have Mathematics (HG) and Physical Science (HG) at matriculation outperform students who do not have these school subjects. The table below reflects the throughput rate of the first-year groups of 1998, 1999 and 2000, that is, the percentage of students who completed the LLB in four years, as compared with matriculation subjects:

Subject	1998	1999	2000
Afrikaans 1st	33	37	41
Afrikaans 2nd	19	18	14
English 1st	28	23	15
English 2nd	27	30	35
Maths HG	51	57	51
Maths SG	27	22	25

Science HG	39	45	41
Science SG	29	26	16
Percentage of all students who graduated in the minimum time	27	27	29

On the other hand, if the measure of performance is based on the symbol achieved in the matriculation subject, it appears that students with A and B symbols in languages perform better than the average LLB student, whereas even D and E candidates in Mathematics (HG) and Science (HG) perform better than the average. Tables E to J, which appear at the end of this note, indicate the percentage of students who achieved the LLB degree in the minimum time and the percentage of students who left without obtaining any degree, measured against performance in specific matriculation subjects. The tables set out the performance of the 1998, 1999 and 2000 first-year LLB groups over the period of the degree.

Does the LLB degree suffer from an image problem? It seems to have become (or perhaps it has always been) a degree for rugby players and beauty queens — shorthand for students with no inclination to study, to think, to read and to write every day of their lives. Matriculants who have Mathematics and/or Science (HG) are probably an elite group, and a good mark in these subjects probably stands as proxy for ‘intelligence’ or ‘academic ability’ more than any other matriculation subject. (*Rapport* 13 November 2004 at 4 records that only 8.4% of matriculants wrote Mathematics (HG) in the 2005 matriculation examinations.) What used to be said of Latin ([W]e also use Latin to keep the less cultivated from the profession, for it is usually the subject avoided by the schoolboy or student not academically inclined or who is work shy’: B Beinart ‘Latin and the Lawyer’ (1958) 1 *Newsletter Department of Classics University of Stellenbosch* 4 at 5) perhaps is also true for Mathematics (HG) and Science (HG). Surprisingly, Mathematics may even act as a proxy for ‘reading ability’: Bohlmann & Pretorius op cit argue that poor reading ability functions as a barrier to effective mathematical performance and that mean Mathematics scores improve as reading ability improves. Taken from another angle, perhaps Mathematics (HG) develops the capacity for logical thinking (cf Bohlman & Pretorius op cit at 204), and perhaps law is (depressingly?) still taught in a formulaic fashion at my institution, in a way akin to solving a mathematics problem: Here is the principle, here are the facts, apply the facts to the law to arrive at the (one) correct answer. (Bohlman & Pretorius op cit observe at 197 that mathematics is ‘a discipline characterised by precision, conciseness and lack of ambiguity’ and say at 204 that mathematics and science require logico-deductive skills. O’Regan op cit notes at 247 that law is a ‘discursive and *analytical* discipline’ (my emphasis).)

In the short term, if the desire is to improve the throughput rate, then recruitment drives at high schools and marketing material should point out the indirect practical utility of Mathematics (HG) and Physical Science (HG) for law students, and preference should be given to applicants who take Mathematics (HG) and/or Physical Science (HG) as matriculation subjects.

(Some South African law faculties currently have language subject admission requirements in place, but none prescribes Mathematics (HG) for the LLB. Where Economics is taken as an elective or if a student wishes to register for a BComm (Law) degree, law faculties in general prescribe Mathematics (HG).)

But, alas, should Mathematics (HG) be made compulsory, enrolment figures for the LLB would plummet — only 76 of 339 (22%) first-year students (1998) had Mathematics (HG) as a matriculation subject in 1997. The respective figures for the 1999 and 2000 first-years are 56 (20%) and 72 (27%). For black first-year students the respective figures for 2000 and 2001 are 3 (5%) and 5 (7.6%). Mathematics on the higher grade as an entry requirement, as is the case with a higher m-score requirement, would therefore impact severely on racial representativeness.

In the long term it is to be hoped that the Department of Education's drive to improve the ability of pupils in Mathematics and to increase enrolment figures for Mathematics (HG) will be successful. The new matriculation curriculum prescribes that all matriculants are to have either Mathematics or Mathematical Literacy. Based on the research set out above, this requirement is to be welcomed. The predictive value of good performance in Mathematical Literacy is impossible to ascertain at this stage; but I would suggest that matriculants set on tertiary study should be encouraged to enrol for Mathematics rather than Mathematical Literacy, based on the findings related to Mathematics (SG) as set out above.

Table E: Afrikaans first language (in percentages)		
1998		
Symbol	Minimum time	No degree
A	75	20
B	48	30
C	21	52
D	10	50
Subject average	33	42
Average for all students	27	48
1999		
Symbol	Minimum time	No degree
A	82	9
B	58	24
C	33	39
D	4	59
E	0	67
Subject average	37	37
Average for all students	27	45
2000		
Symbol	Minimum time	No degree
A	77	5
B	65	11
C	32	39
D	16	68
E	0	100
Subject average	41	36
Average for all students	29	42

Table F: English first language (in percentages)		
1998		
Symbol	Minimum time	No degree
A	80	0
B	50	42
C	25	53
D	5	74
E	25	50
Subject average	28	53
Average for all students	27	48
1999		
Symbol	Minimum time	No degree
A	57	29
B	56	11
C	16	49
D	6	63
E	0	50
Subject average	23	45
Average for all students	27	45
2000		
Symbol	Minimum time	No degree
A	42	33
B	25	33
C	10	39
D	4	60
E	0	100
Subject average	15	45
Average for all students	29	42

Table G: Mathematics (HG) (in percentages)		
1998		
Symbol	Minimum time	No degree
A	75	25
B	88	13
C	50	28
D	45	41
E	42	38
Subject average	51	33
Average for all students	27	48
1999		
Symbol	Minimum time	No degree
A	67	33
B	60	0
C	71	14
D	61	11
E	48	30
Subject average	57	20
Average for all students	27	45

2000		
Symbol	Minimum time	No degree
A	88	13
B	80	20
C	25	25
D	37	26
E	50	19
Subject average	51	21
Average for all students	29	42

Table H: Students with Mathematics (SG) (in percentages)		
1998		
Symbol	Minimum time	No degree
A	46	23
B	45	35
C	21	54
D	22	39
E	20	56
Subject average	27	45
Average for all students	27	48
1999		
Symbol	Minimum time	No degree
A	67	11
B	26	48
C	23	38
D	0	71
E	17	53
Subject average	22	48
Average for all students	27	45
2000		
Symbol	Minimum time	No degree
A	60	27
B	32	25
C	14	29
D	20	55
E	13	50
Subject average	25	39
Average for all students	29	42

Table I: Students with Science (HG) (in percentages)		
1998		
Symbol	Minimum time	No degree
A	-	-
B	67	33
C	65	18
D	37	34
E	26	61
Subject average	39	43
Average for all students	27	48

1999		
Symbol	Minimum time	No degree
A	75	0
B	80	0
C	53	32
D	44	33
E	25	40
Subject average	45	31
Average for all students	27	45
2000		
Symbol	Minimum time	No degree
A	80	25
B	80	25
C	46	15
D	40	40
E	32	30
Subject average	41	29
Average for all students	29	42

Table J: Students with Science (SG) (in percentages)

1998		
Symbol	Minimum time	No degree
A	100	0
B	67	0
C	21	50
D	25	42
E	25	42
Subject average	29	40
Average for all students	27	48
1999		
Symbol	Minimum time	No degree
A	0	0
B	17	50
C	13	63
D	42	33
E	29	29
Subject average	26	41
Average for all students	27	45
2000		
Symbol	Minimum time	No degree
A	-	-
B	33	0
C	14	29
D	0	63
E	23	15
Subject average	16	29
Average for all students	29	42