Early Identification of Students at Risk versus Dropout

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Abstract

Students entering Higher Education (HE) in South Africa have various ideas out the HE environment. These include differences in perception and expectation. This can also lead to anxiety and fear. It is therefore not strange to find that first year students have a very high dropout rate.

The factors contributing to this may vary tremendously and are both academic and non-academic in nature. Although up to 60% of the factors may be non-academic, the academic risk factor indicators must not be ignored. Research into the factors that have a negative influence on student performance need to be collected and the results evaluated. Although it may be contraversional to place students based on test scores, the value of special interventions on improved retention rates are well recorded.

How can the Learner Management System (LMS), such as WebCT be used to assist with an early identification of risk factors? The immediate feedback and statistical detail it provides may allow us to identify possible risk factors which may be part of the complex nature of influences that the student see as threatening and allow the student to get (personalised) assistance in time to reduce the risk of failure. The past experience of placing the students were based on the grade 12 results from a diverse group of students from different schooling systems. Although the demise of the Apartheid system brought equal opportunities, the legacy of differentiated schooling systems in the past cannot be ignored. Changes to placement testing should allow for a fair and just system to improve inclusions on the one hand and at the same time to be diagnostic in nature to assist in assisting students timeously. By ignoring all these influences may contribute to a situation of students at risk of failure.

This paper will deal with experiences during a trail project in using WebCT to gather information and to set up quizzes to allow for the student to be placed into various interventions timeously to minimize the risk of failure and by doing that, may improve retention. The project deals primarily with students in the Sciences, Technology and Engineering programmes where the dropouts are high. Although the focus was on mathematical comprehension and ability, the project also looked at other influences and the same platform can be used to put the student at risk in touch with qualified student services personnel. This project was done in collaboration with the Highline Community College in Seattle, Washington State USA.

Defining the problem

Students entering HE are not always prepared for it. Educationists look at the various factors and pre-testing for placement purposes is not something new, in fact, there is a tendency world-wide to increase the use of pre-testing. In the past the student body was seen to be from a elitist group, but now HE are pressured to move away from this elitist attitude and adopt an open door policy, hence the need for pre-testing. Next to the dropout rate under first year students is the problem to retain students for the duration of the course.

The factors contributing to a high dropout amongst first year students may vary tremendously and they are both academic and non-academic in nature. Research by the Department of Student Services at the Cape Technikon indicated that up to 65% of the factors that may contribute to dropouts are non-academic.

This paper will deal with experiences during a trail project in using WebCT to gather information and to set up quizzes to allow for the student to be placed into various interventions timeously to minimize the risk of failure and by doing that, may improve retention. The project deals primarily with students in Science, Technology and Engineering programmes where the dropouts are high. Mathematics as a subject is used as a measure as it is important for success. Unfortunately the dropout in Mathematics is still much higher than other first year subjects.

The integration on the schooling system in South Africa from the previous differentiated system for different ethnic and cultural groups to ensure equal standards, has become a problem in itself as the playing fields for teaching is not yet equal and the subsequent grade 12 results in itself does not give a clear indication of standard for placement purposes.

Other experiences on placement testing

Reform amongst educationists to improve access and equity is not unique to the South African context, as the rest of the world contentiously addresses the same issues in the combined quest for reform and redress. Although labels as defined by Jenny Williams [2] can be problematic, I would like to use it to show that the South African context is in line with world-wide trends.

Academic traditionalists (Ball [3]) may be seen as the neo-conservatives, the elite descendents of the nineteenth century humanists. "*Certain aspects of this position are central to many academic cultures particularly highlighted in terms of academic standards, merit, excellence and intellectual freedom. Who should determine the nature of higher education and the number of students admitted? Within this position the answer is clear: academics should. Academic freedom is intertwined with the institutional freedom to determine who is admitted to study what academics determine is on offer. It is those students who can demonstrate in advance of entering that they have the capacity to benefit who should be admitted. The academic traditionalists place enormous emphasis upon the gold standard of A level points scores which symbolize and reinforce notions of academic merit and are presented as neutral, fair and a just selector of the suitable. A normal, acceptable student is one who has undergone a quite particular form of academic socialization, designed for 16-18-year-olds in schools. A higher education institution can, on this basis, take for granted the preparation that the individual has received and build upon it. The abnormal student is one for whom this preparation, this academic and cultural socialization, cannot be taken for granted.*[1]

Liberal meritocrats come from the historical changes in compulsory education and the new movement to open access and redress past imbalances. Williams [2] stated that: "*who should be admitted to higher education, and how, revolves around the notions of 'qualified', 'accessibility' and 'under-representation', focusing upon the individual within the framework of these three factors. Historically certain social groups have sent a smaller proportion of their members to higher education; the working class, women (particularly to scientific and technological disciplines), ethnic minority groups, the disabled and the mature. The solutions to this under-representation have taken two forms in particular: a version of accessibility in terms of the 'packaging' of knowledge acquisition into semesters, modules and credits, and second, a widening of 'qualified' to include skills gained in different institutions and in contexts other than education*."

Robbertson [4] stated: *"Credit systems may be usefully judged against the proposition that they may help to improve the efficiency of higher education by attracting a wider range of students with previously untapped potential. They assist the effectiveness of higher education by accepting that learning may he recognised in all its forms, by mitigating the consequences of non-completion and `failure' and by facilitating greater flexibility in student choice and curriculum design. The effect is to make higher education more relevant to individual life career needs."*

Making sense of the numbers game

Pat Davies [5 explained the relevance of using numbers to define placement strategies as follows:

"There have been differences in the preferences for certain types and sources of quantitative data and in the way in which they have been used within the official and academic policy communities.

An examination of these discursive practices reveals the positions and the underpinning ideologies of the various players. For example, the relationship between entry and completion of a programme of study might be referred to as the `retention rate' - a measure of the success (or failure) of an institution, depending on its relation to some (usually unstated) norm; or it may be known as the `wastage rate' - a measure of the wastage of investment of cash and/or of human capital. Alternatively, it might be referred to as the `completion rate', a positive term; the 'non-completion rate', a relatively neutral term; the `withdrawal rate', usually negative but active; or the 'drop-out rate', again usually negative but passive; or the `failure rate', the most negative - all measures of students' success or failure to stay the course. All these terms might be used to describe the same number and all are (usually tacitly) assumed to be related in some way to entry qualifications - `standard' or `non-standard' entry - and/or the social characteristics of the students - `traditional' and `non-traditional' entrants. Thus there is considerable divergence in the way data have been interpreted and presented and in the terminology *used, which reflects different interests and perspectives - social, individual, systemic - and hints at different views about the purpose and beneficiaries of higher education."*

The academic traditionalists eschew numbers at one level particularly as performance indicators and measures of institutional and staff quality since they represent an attempt to undermine intellectual freedom and impose bureaucratic and managerial measures, rather than academic or professional ones. At the student level they defend the use of numbers to measure student quality and the relevance of value-added is then ignored.
Liberal meritocrats at one level reject quantitative measures, particularly in relation to the assessment of students, arguing instead for learning outcomes, records of achievement and so on, and percentages and grading have become part of their discourse of derision in relation to the academic traditionalists. However, the individualized notion of value-added which they embrace, framed and supported by institutional and national credit accumulation and transfer schemes, requires sophisticated data systems if they are to be credible and effective. In addition, institutional and national data are required to argue that present arrangements have failed to deliver a democratic higher education and to suggest a more managerial approach to admissions based on a central operation. What is under attack here is the elite professional academic culture, and numbers are used to expose the weakness of such a position. There is on the one hand a silence about the problematic nature of the data on which this attack is based, while at the same time offering a critique of the system of national data collection for failing to provide the kind of statistics for properly informed policy decisions (Robertson, [4).

Whether to use numbers to test competence is an ongoing debate. What may be relevant is to look at the process, rather than the number and then try and make sense of the numbers to "steer and direct", rather than to exclude in a modern pre-testing environment.

What must be in place is the alternative support programmes to channel students to when they show signs of at being at risk of failing. This may be seen as being supportive or underpinning. Supportive programmes or foundation courses will assist students to get up to speed and must be designed to fill the gaps identified during pre-testing. Underpinning may be seen as the same as bridging the gap between secondary school and tertiary training and may include components of skills training programmes and Recognition of (other) Prior Learning (RPL).

The Meno Chart [6 may be used to identify the type of pre-testing required that can be use to guide students to various intervention programmes. If these tests are well designed and used in time to effect change it can give a lot of assistance to reduce dropouts.

The Meno `chart' of thinking skills is shown as **Figure 2** The chart may be read in two dimensions: bottom to top and left to right. Lower skills are towards the bottom; higher skills towards the top. To the right are skills which involve finding solutions to problems, and these solutions are necessarily (or logically) correct. To the left are skills which involve the exploration of issues with a particular sensitivity to context. The chart also shows the sub-skills which are the components of the main skills. The lines in the figure show the ways in which the skills relate to each other. For example, Understanding Argument is based on Literacy, and is an underlying skill of both Communication and Critical Thinking.

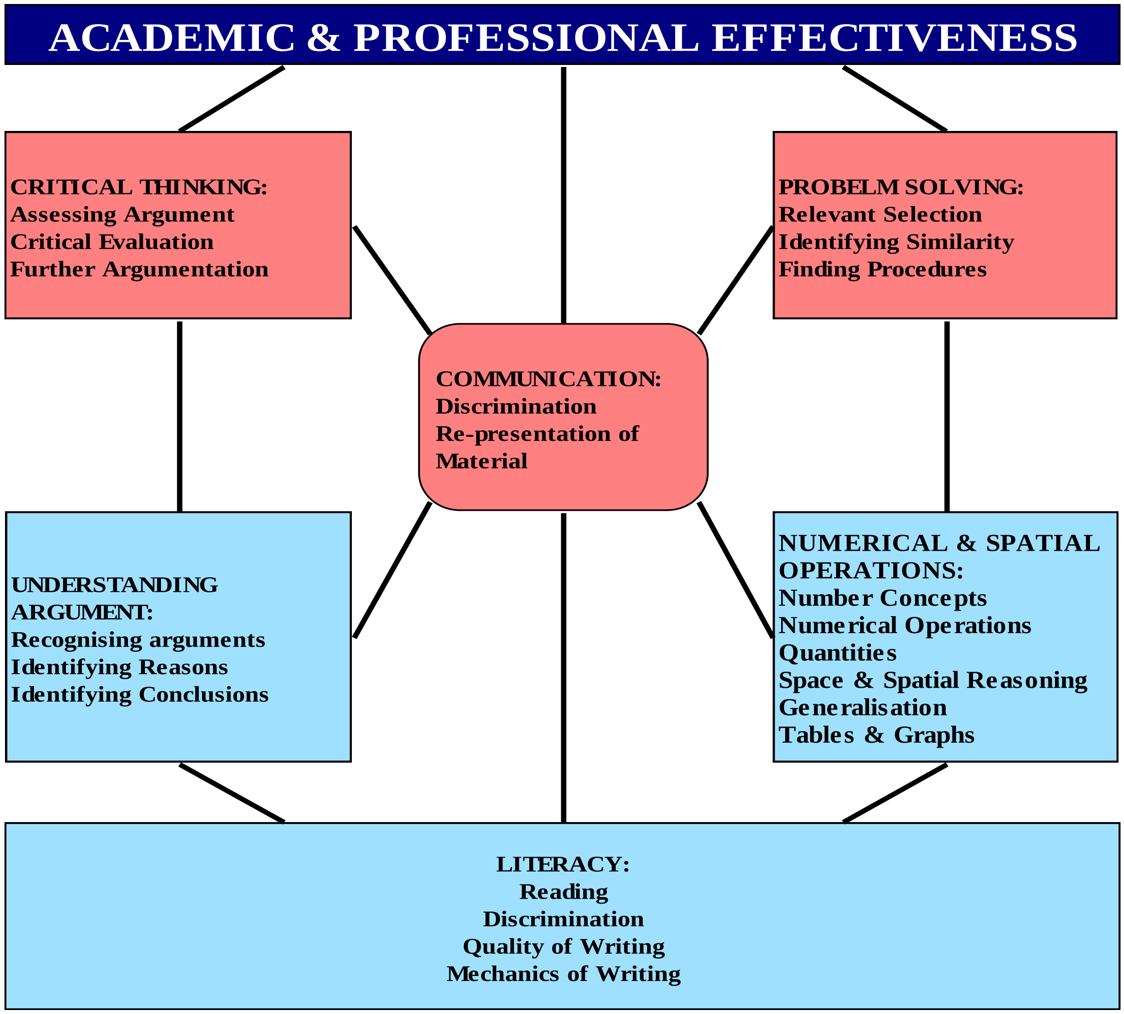

ACADEMIC & PROFESSIONAL EFFECTIVENESS
CRITICAL THINKING:
Assessing Argument
Critical Evaluation
Further Argumentation
PROBELM SOLVING:
Relevant Selection
Identifying Similarity
Finding Procedures
COMMUNICATION:
Discrimination
Re-presentation of Material
UNDERSTANDING ARGUMENT:
Recognising arguments
Identifying Reasons
Identifying Conclusions
NUMERICAL & SPATIAL OPERATIONS:
Number Concepts
Numerical Operations
Quantities
Space & Spatial Reasoning
Generalisation
Tables & Graphs
LITERACY:
Reading
Discrimination
Quality of Writing
Mechanics of Writing

figure 2

From the early days of development, it was recognized that there should be three `strands' to a conceptualization of the thinking skill which underpin academic performance. These are represented by **Communication, Critical Thinking**, and **Problem Solving**, and it was in these areas that the original skills specification work was undertaken, often with the benefit of the previous experience of developing the specifications for the psychometric aptitude tests.

The skill of Communication occupies the central position in the Meno chart. It is the skill which is generally acknowledged to be the key skill in academic work. This skill of Communication is essentially concerned with an understanding and use of written language. This focus upon written language is not to deny the importance of spoken communication but to recognize the central place of the skills of reading and writing in higher education.

The specific abilities required within Communication have been identified by establishing what is required in the production of academic and professional writing. When writing essays or reports, students and employees need to understand information, to select from the information available that which is relevant to the subject and purpose of the essay or report, and to recombine that information in a coherent and persuasive piece of writing. These are the abilities demanded by Communication.

Based upon Communication, but also with distinctive elements of their own, are the other two academic skills of Critical Thinking and Problem Solving. Both take ordinary language as their basis but apply to it their own particular kinds of logic: informal logic in the case of Critical Thinking, and scientific or deductive logic in the case of Problem Solving. Critical Thinking also demands a basic understanding of the structure of argument, while Problem Solving demands a knowledge of certain numerical and spatial concepts and procedures.

The skills of Critical Thinking and Problem Solving are intended to be insightful, demanding that a student should go beyond the information given (and this distinguishes these two skills from Communication). For example, in Problem Solving, insight may be demonstrated by restructuring data or by finding analogies in the search for novel procedures, and in Critical Thinking by suggesting alternative explanations while putting forward objections, possibly including moral objections, to proposed courses of action.

The three lower skills may be seen as supportive of the academic and professional skills just outlined. The most basic skill is **Literacy**, and it includes the ability to read newspaper articles and information leaflet, the ability to pick out information as required (for example, from a guide to television programmes), and the ability to write a short essay with regard to both the coherence of the content and the mechanics of the writing (for example, punctuation and spelling). **Understanding Argument** includes the ability to recognize arguments, the ability to identify the conclusions in arguments, and the ability to identify the reason which may lead to particular conclusions being drawn. **Numerical and Spatial Operations demands** knowledge of six sub-skills: number concepts (for example, knowing that 100 is 10 X 10); numerical operation (addition, subtraction, multiplication, division); quantities (for example. litres, metres, minutes); space and spatial reasoning (for example. knowing the shape of a cube); generalization (for example, identifying patterns in sequences of numbers); and the interpretation of tables and graphs (for example, as provided in newspapers).

Discussion

In the light of the full understanding of academic and professional effectiveness, we can argue that pre-testing can help to predict the underpinning skills (literacy, understanding argument and numerical and spatial operations) required for students entering HE. Psychometric tests are in use for more than a decade now to allow for another route to identify students with potential when it became apparent that the grade 12 results in mathematics and science was not an accurate measure for admission into engineering programmes.

Even with all this, the pass rates of Mathematics remained low and the idea of pre-testing surfaced again, with the exception in this case not to use for placement, but rather to identify same time foundation programmes to assist students with additional resources and to act as an early identification of students at risk.

The use of an electronic learner management system (LMS) allows for the students to be tested in their faculty by skilled lecturers with immediate statistical feedback. The results of the tests are also available a reference for the duration of the student's term of study.

The first trials started during 2003, using data used by the Highline Community College in Seattle, USA. They use these batteries of tests to identify skills levels and to place students in pre-college programmes. Another international test was added to test the mathematical comprehension skills of the students. This test is a measure of the literacy skills of the student. During 2003 it was used on students in Civil Engineering, adapted after evaluation of the results and tested again on all students in the faculties of Applied Sciences and Engineering who enrolled for Mathematics 1. The results of the pre-tests against final scores in Module A, Module B and the Final score are shown below. The pre-tests consists of 4 individual 30 minute tests on comprehension, basic, intermediate and advanced mathematics. The theory was that that the comprehension test should yield whether students understand mathematical literacy and have a general understanding of what will be required of them, whilst the basic, intermediate and advanced tests will test their current basic mathematical knowledge.

Figure 3indicate the general distribution of the group in terms of their pre-testing against the final score. 50% was taken as the pass rate with the final score consisting of a weighted distribution with the year mark: examination mark equals 40:60

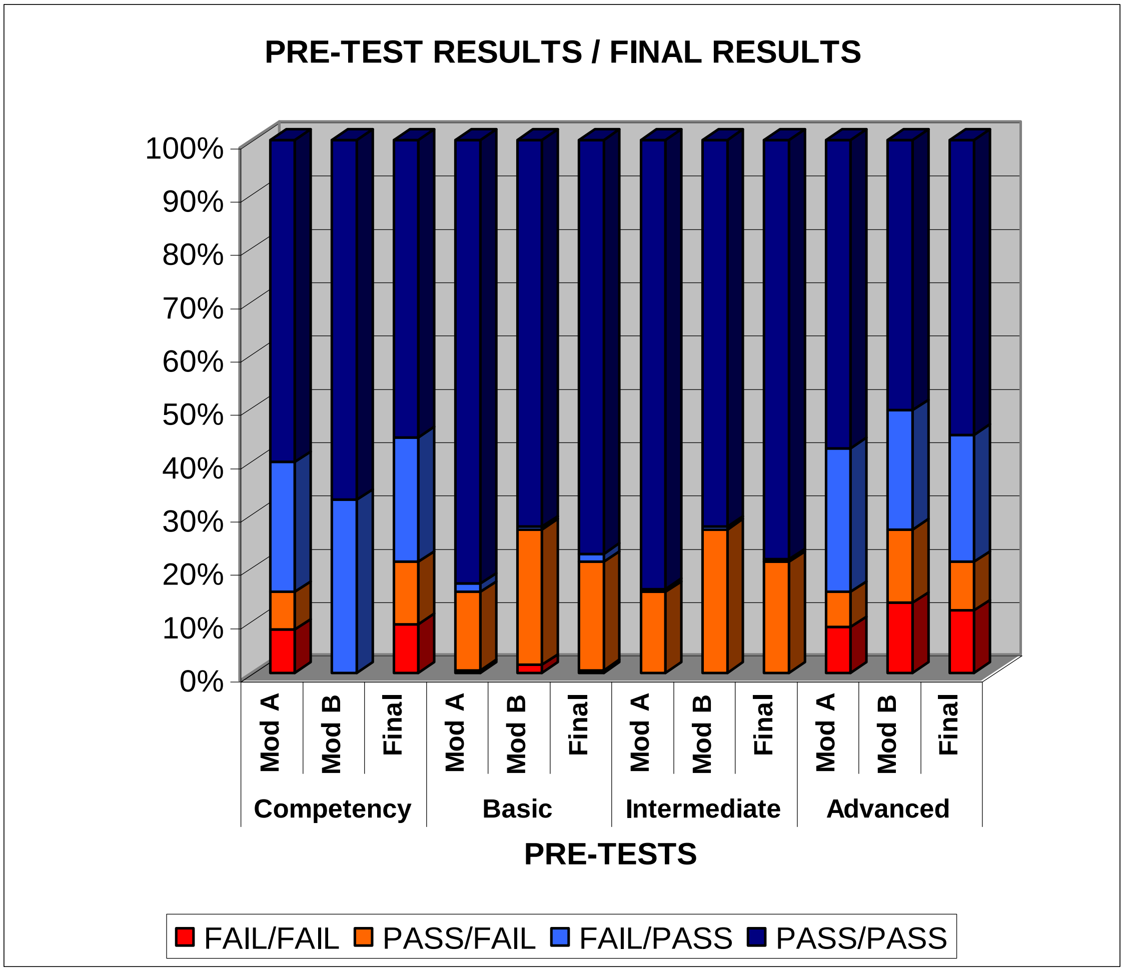
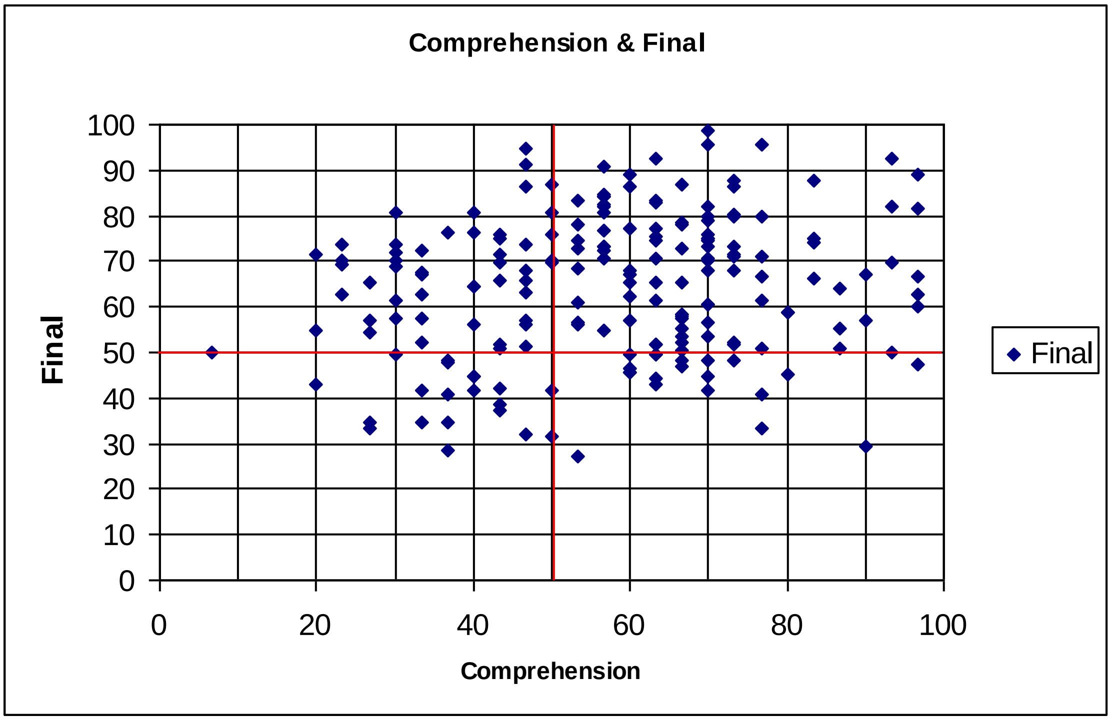


figure 3

Students were allowed to sit the final examination when they had a year mark of 40% or more with the final pass rate at 50% for each module. The final score for the subject is the sum of modules A and B, weighted 50:50. The pass for the pre-tests was also taken as 50% or more.

The next graphs in figures 3 to 6 shows the evaluation between the individual pre-tests and the final marks obtained. Figures 7 to 10 shows the normal distribution graphs of the same evaluations of results.



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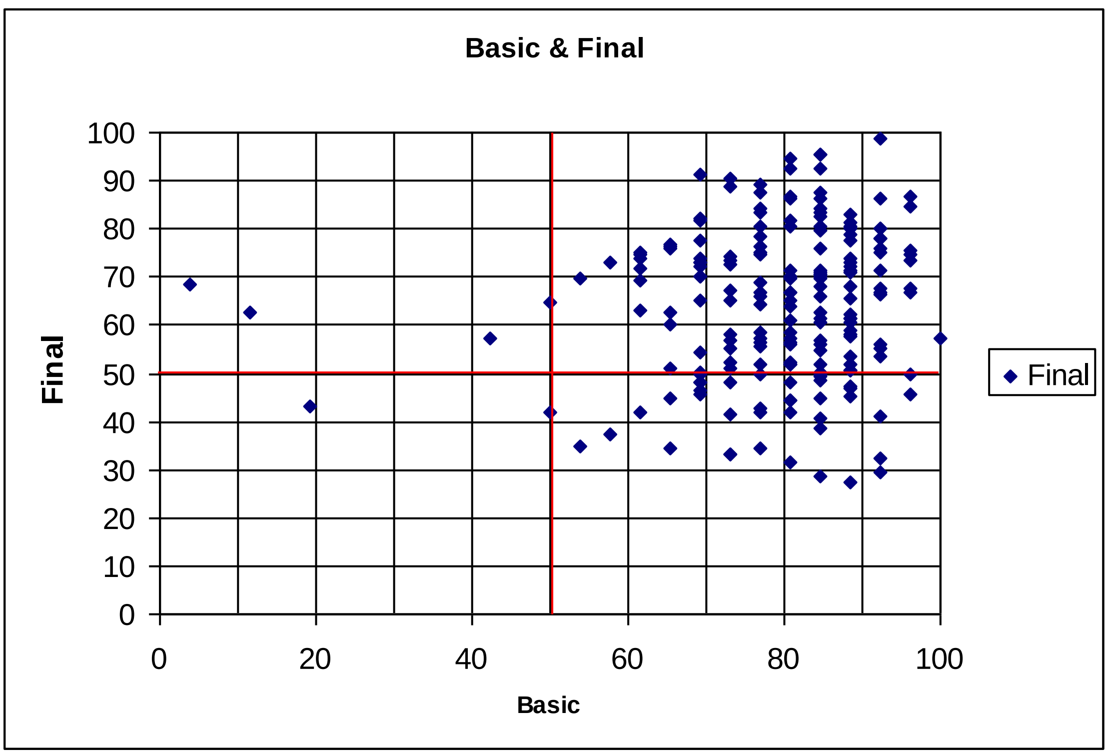

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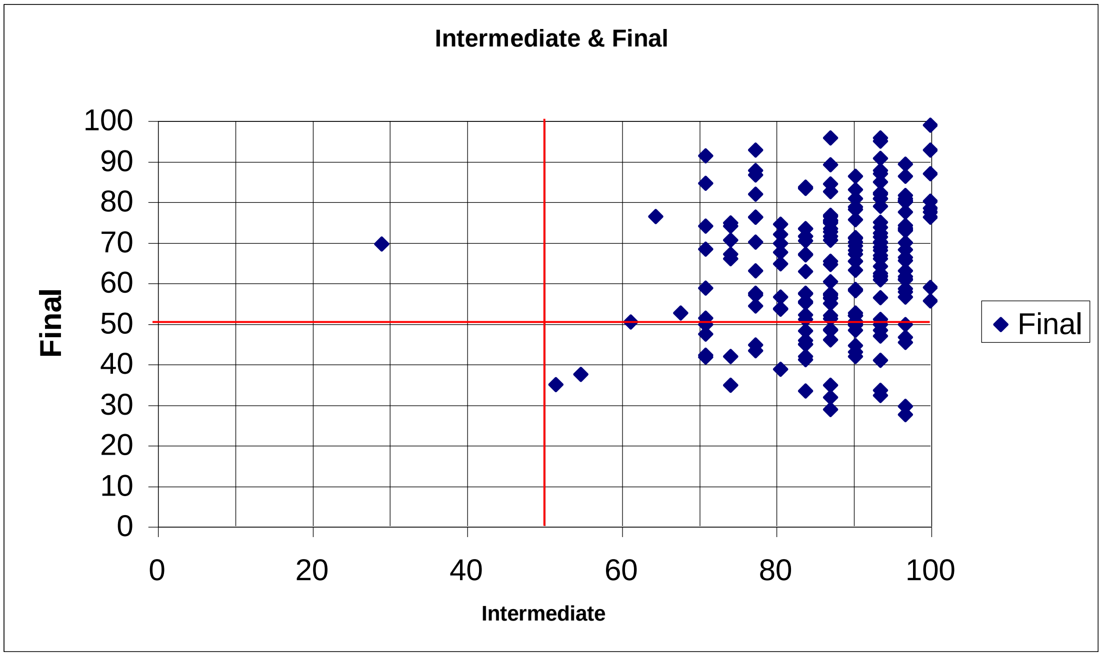

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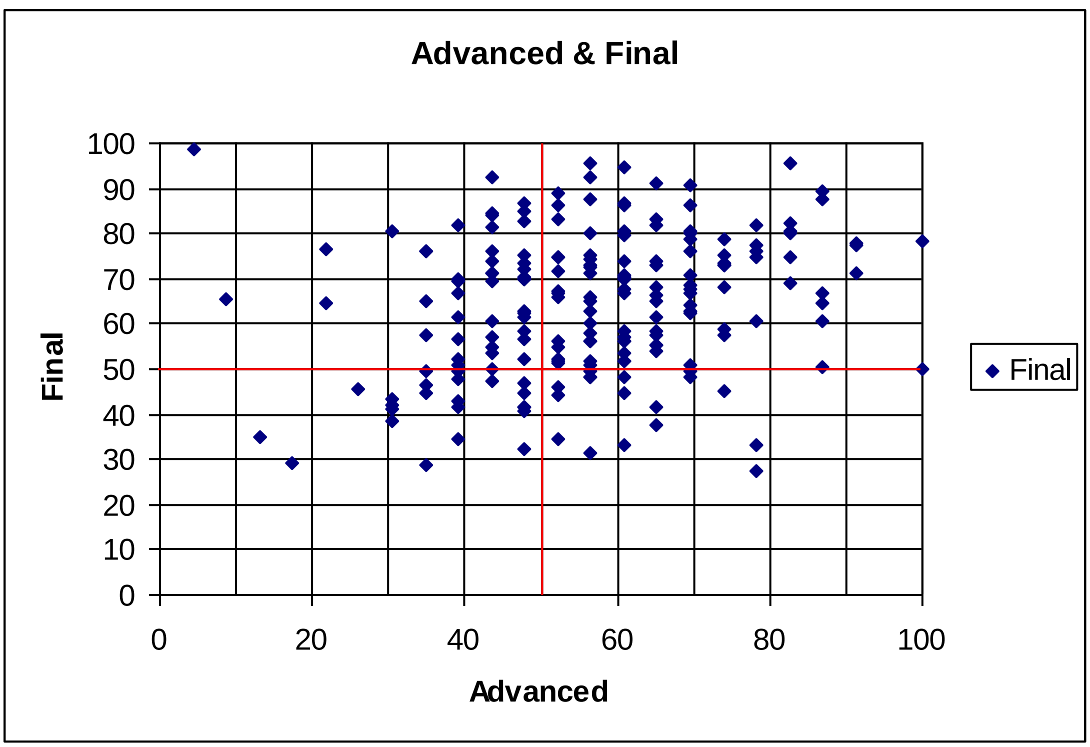
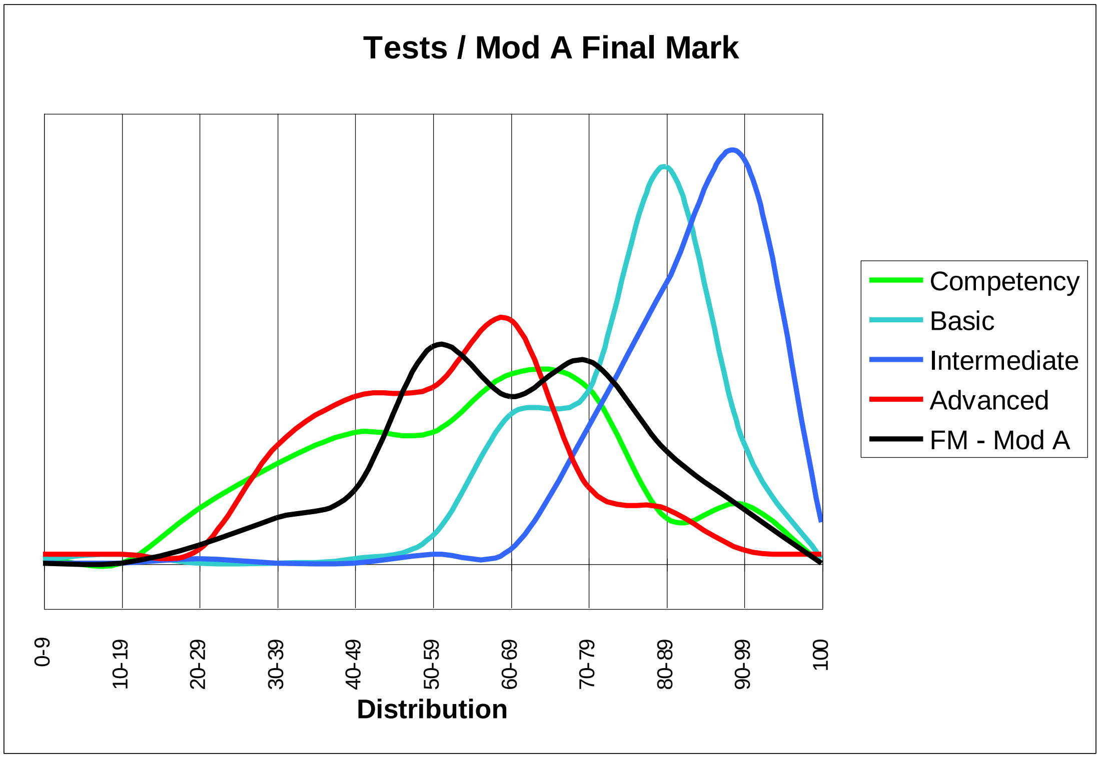
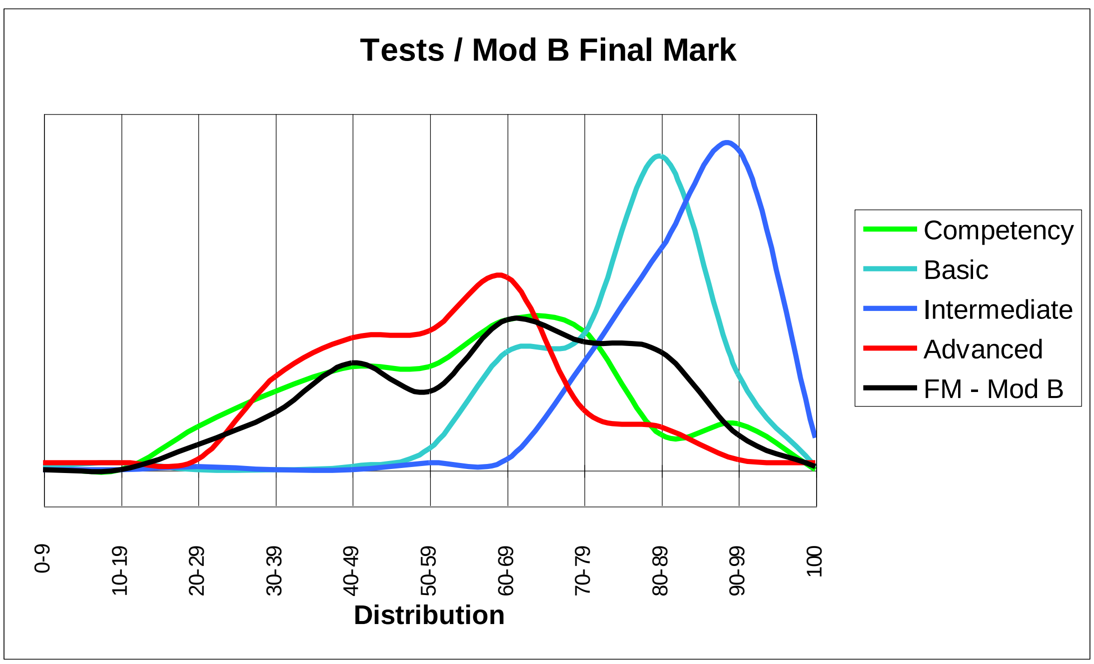


figure 6



final 7



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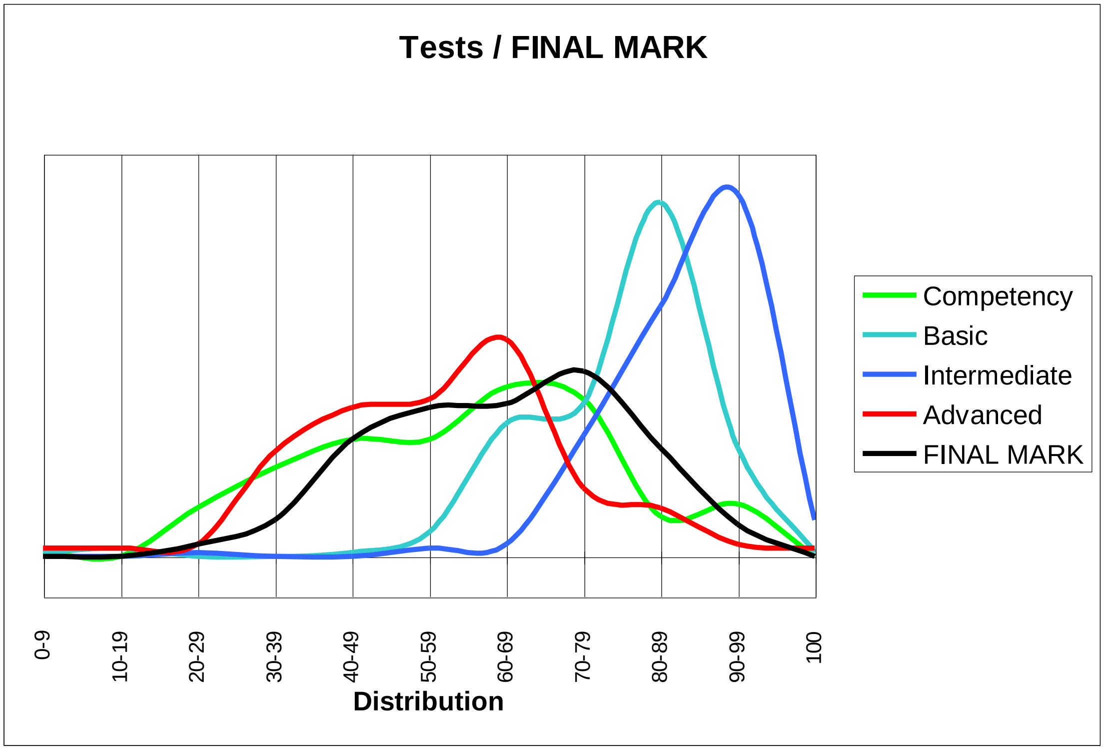

figure 9

Conclusion

It is clear that there is a good relation between the comprehension test and the final score. The correlation between the advanced test and the final score gives the impression of equal standard and the expectation was that it should rather have been a pre-test for diagnostic purposes. The basic and intermediate tests correlate well and it is clear that students who fail these two tests may have serious problems unless they are not put into special intervention programmes and the can be seen as students at risk.

There are some doubts as to the effectiveness of the series of tests to be used for full diagnostic purposes and another tests, consisting of more trigonometric content have to be introduced to complete the range. This will be designed by July 2004, tested during the second semester 2004, for use in 2005.

The tests have shown that it can be used to identify students at risk and that it should be used together with psychometric testing and literacy tests to enable us to get a more complete picture of the prospective student in Science, Engineering and Technology.

Targeted foundation courses are in the design stage to enable academics to assist students during the course of study.

References

[1] Jochems et al (2004), "*Integrated e-Laerning – implications for pedagogy, technology and organisation",* Open and flexible learning series, RoutledgeFalmer, Londonand New York.

[2] Williams J, (1997), "*Negotiating Access to Higher Education – The Discourse of Selectivity and Equity",* Open University Press UK

[3] Ball S J, (1990), "*Politics and Policy Making in Education",* Routledge, London.

[4] Robbertson D, (1994), "*Choosing to Change: Extending access, choice and mobility in Higher Education*", Report of HEQC CAT Development Project, HEQC, London.

[5] Davies P, (Chapter3), (1997), "*Negotiating Access to Higher Education – The Discourse of Selectivity and Equity",* Open University Press UK.

[6] Edwards A, Knight P, (1995), "*Assessing Competence in Higher Education*", Kogan Page, UK