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Mathematical Competencies of Third Level Students: a Review

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Abstract

Many lecturers of mathematics and related disciplines in Ireland and internationally believe there has been a gradual decline in mathematical competencies of students presenting for first year at third level educational establishments. Some of the evidence to support this view is reviewed, along with the types of solutions being applied in Ireland and the UK. Attention is drawn to the explicit and implicit decline in standards potentially associated with some of the solutions, particularly for short courses involving mathematics.

1 Introduction

The primary stimulus for this paper is the author's increasing sense over the last few years that while 3rd level student's inherent ability has been relatively constant[8], their capacity to apply such abilities to "basic business mathematics" (BBM) has been diminishing. The author has been teaching the basic business mathematics modules within the School of Business and Humanities across three courses since the opening of Institute of Technology Blanchardstown (ITB) in September 1999. These are two semester modules with 30% of marks allocated to continuous assessment and 70% to a 2 hour final examination, per semester.

This paper is essentially a review of both some worrying potential "trends in the making" at ITB and of supporting evidence for there being a decline in the mathematical competencies in Ireland, along with some suggested solutions, and a review of solutions both in Ireland and the UK. Counteracting any such problems is clearly a strategic issue for an institution due to the wider effects on general student retention.

One area of concern is the indirect potential lowering of standards associated with many student support schemes particularly for short courses, e.g. one year or two semester. While 3rd level institutions must service the society within which they find themselves it is important that employers and society are informed and aware of the actual capacity of

graduates. O'Grady et al (2004) depicts the type of results that may occur if cognizance is not taken of the effect of some student "supports", although O'Grady et al (2004) is directed at a broader set of issues.

In addition improved standards may in fact be what is required. From Forfás (2004):

> *Forfás is of the view that the overall standard of the Irish education system must be raised; Ireland must strive for continuous improvement and ensure that it achieves, and maintains, a high ranking among OECD states.*

where the report goes on to say:

> *The problem in relation to mathematics is underscored by Ireland's poor ranking of 16th, out of 28 OECD states, for mathematical literacy among 15 year-olds.*

1.1 Experience at ITB on the Higher Certificate in Business (BN003)

Initial evidence of a potential problem in BBM is shown by Figure 1 with relevant information shown in Tables 1 and 2 in Appendix A. While ITB is at an early stage of development there are potentially worrying signs in these BBM results. It should be realized that there are many factors which could in fact account for the decline in pass rates. The initial intake of students in 1999 got a lot of attention and had a special relationship with lecturers. Subsequent years have had other changes, although the main syllabi and the lecturer have remained constant throughout. A computer based practical component was introduced in the academic year 2000/01, and subsequently for 2001/02. This was temporarily suspended for 2002/03 and 2003/04 due to resource constraints. In years where the practical was given the number of lectures was reduced by one, with this being replaced by a laboratory session.

Of key importance will be the results at ITB for BN003 for 2004/05 and perhaps 2005/06 in order to establish whether the particularly poor outcome for 2003/04 is part of a trend or an anomaly.

[8] Based on simple introductory surveys of students looking at 3 basic business maths skills: Use of a scientific calculator, ability to draw a chart, and ability to follow a procedure. Also based on a

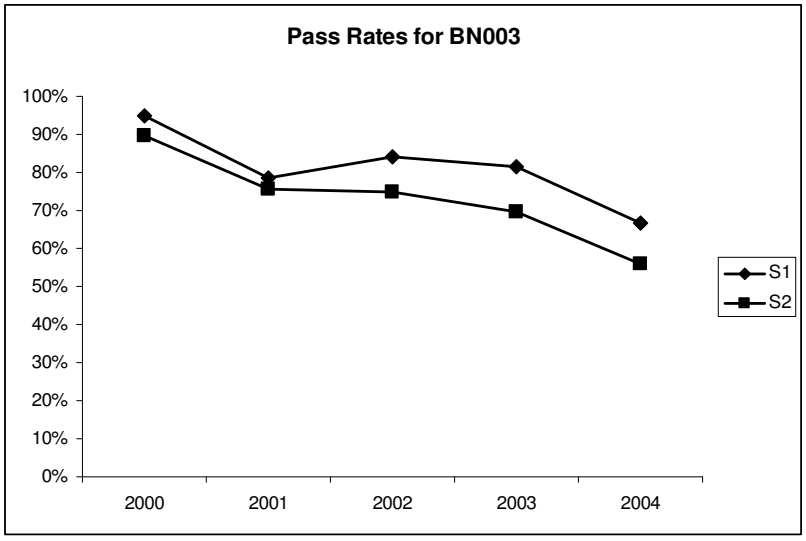

Figure 25: Business maths pass rates for Higher Certificate in Business Studies (BN003) since ITB opened. The year values refer to the end of the relevant academic year.

Notwithstanding the 2004/05 results there is a probable downward trend, which is more evident from the semester 2 results. Calculating the least squares slope for the semester 1 results: Slope b=–5.32%, and using a one tailed t-test shows that P($\beta_1 < 0$) = 96.0%, ie the probability that the population slope is negative[9] is 96.0%. For semester 2: Slope b = –7.31% and P($\beta_1 < 0$) = 99.5%.

This evidence is further reinforced by Figure 2, which looks at grade point values (GPV) of passing students. For semester 1 the correlation coefficient r = –0.58, slope b = –0.1126 and P($\beta_1 < 0$) = 84.5%. For semester 2: r = –0.93, b = –0.2868 and P($\beta_1 < 0$) = 98.8%.

Adjusting the GPV figures[10] to take account of changing entry points per year produces Figure 3, which shows less correlation now for semester 1 with r = –0.32, b = –2.3494 and P($\beta_1 < 0$) = 70.0%, and semester 2 r = –0.91, b = –8.1211 and P($\beta_1 < 0$) = 98.5%.

subjective sense after dealing with the students.

[9] This was done using a one tailed t-Test to construct a confidence interval that had an upper limit of 0. The associated p value gives the level of significance, and 1-p gives the probability that the population slope is indeed negative.

[10] See Appendix A.

The adjusted semester 1 analysis is suggesting that a relatively significant part of the downward trend for semester 1 GPVs may be accounted for by changes in CAO entry points. Of course in the current context that is again indicative of overall declining competency in mathematics. Figure 2 is more relevant to this paper.

Figure 2 is consistent with the anecdotal view of lecturing staff of disimproving standards in analytical and mathematical abilities of the associated students.

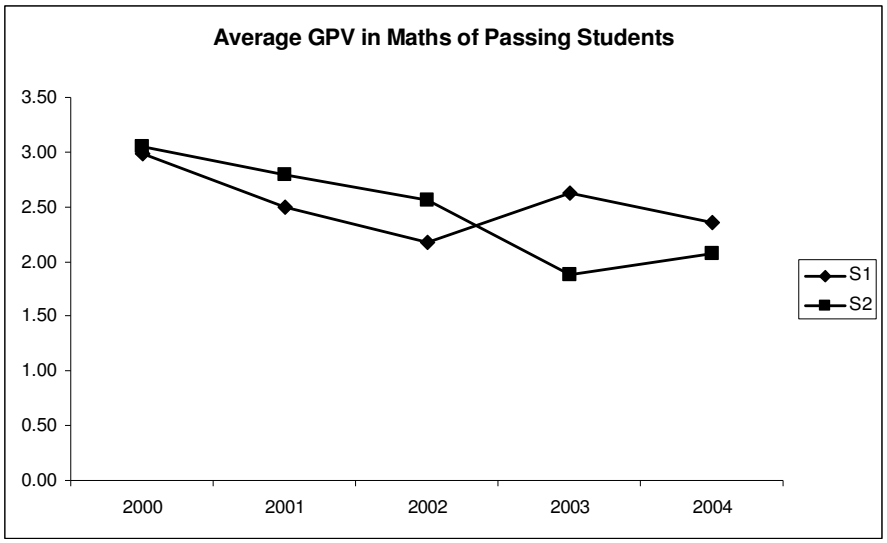

Figure 26: Average grade point value (GPV[11]) for BN003.

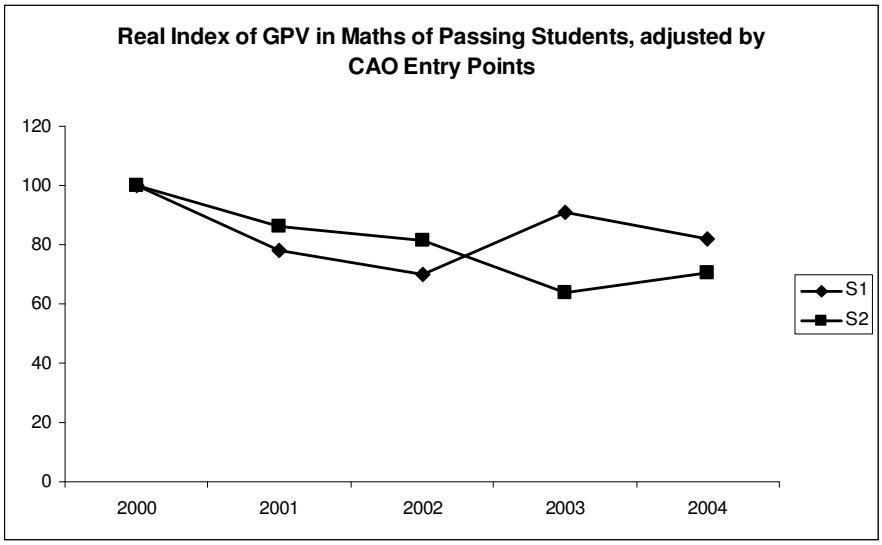

Figure 27: Adjusted GPV values by CAO entry points[12] using a real value index.

[11] GPV calculations as used at ITB are show in Appendix B.
[12] See Appendix A.

These results from BN003 are certainly not definitive. As yet there is insufficient data to draw strong conclusions. For example if the 2004/05 and 2005/06 semester 1 average GPV outcomes are 2.8 then we'd have b = +0.0084 and P($\beta_1 > 0$) = 55.4%, which is a complete turnaround. However allying the current results with the anecdotal sense of student standards from the lecturing staff, and the wider national and international perspective, would suggest that these trends, if unmanaged, will likely in fact go on to replicate the experiences verified elsewhere. Some form of intervention/support seems justified by the current analysis.

Current (2004/05) students have the same syllabus, lecturer, and overall resources as previous years. While a survey of the 2003/04 or previous cohorts is not available, a November 2004 survey of those who had missed or failed a continuous assessment worth 10% of overall marks, from two first year classes (BN003 and BN010[13]), gave the following results[14]:

Question: In relation to maths which of these apply
(students could check one or more from a list of options).

Option	**Number of Students**
Between the lectures, tutorials and notes I have plenty to help me master the subject	11
I think lectures are a waste of my time	1
I think tutorials are a waste of my time	0
I think the notes are very good	9
I think the notes are poor	2

These results would suggest that students are not identifying problems, from their perspective, as being caused by their current learning environment.

1.2 Experience at ITB on other courses

BN003 was specifically chosen above since it has displayed the most worrying of the pass rates within the three business mathematics related courses, so this does present a worst case scenario. In addition, analysis for example of the Higher Certificate in Engineering (BN001) is at some variance with the above. This could be for a number of reasons with an apparent

[13] Bachelor of Business in Information Technology.
[14] Total number included in the survey was 40, but some of these had likely in fact left without informing administration. Total responses was 18.

increasing pass rate trend within the BN001 mathematics results depicted in Figure 4: For BN001 Semester 1: b = +6.14% and P($\beta_1 > 0$) = 96.2% and Semester 2: b = +6.19% and P($\beta_1 > 0$) = 93.2%. It is certainly true that the syllabus content is quite different between the two courses. The absence of sufficiently many time points within the data make it hard to suggest anything definitively different is going on here between BN001 and BN003 that wouldn't be subject to possible significant change depending on the next few year's results.

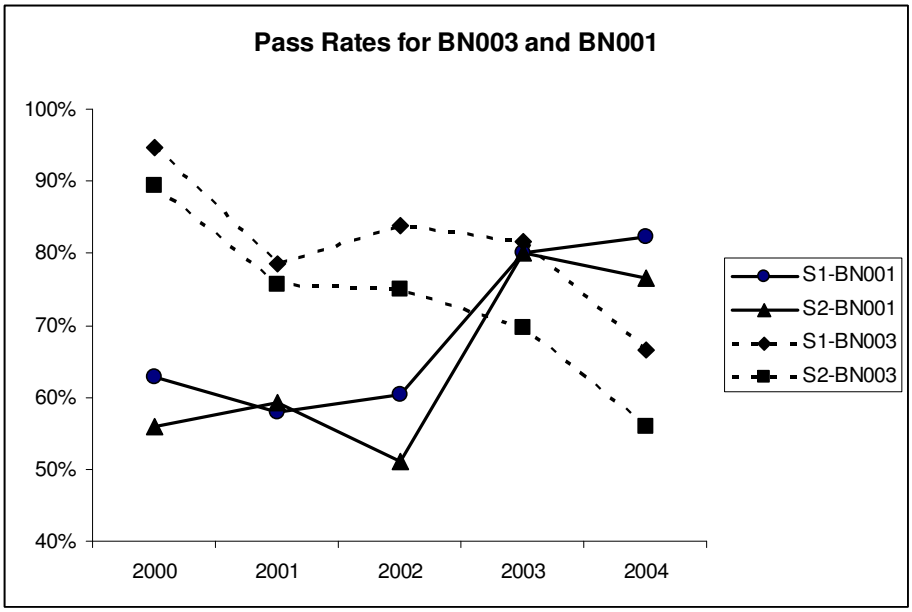

Figure 28: Comparison of pass rates for BN001 and BN003.

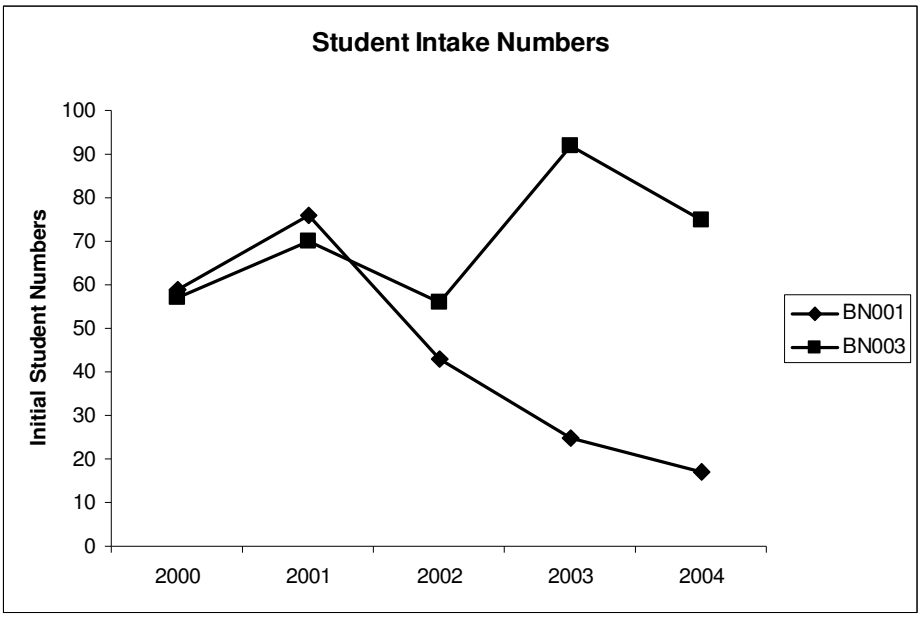

Figure 29: Total student intake on BN001 and BN003. This includes all students who initially registered for a course, but some may never have attended classes, and others will have withdrawn before examinations.

It must also be stated that two potentially significant changes on BN001 occurred in 2002/03 which continued in 2003/04. These where: a) the number of students admitted was significantly reduced, and b) the number of student support hours changed from 2 tutorial hour per week to 3 tutorial hours per week.

1.3 Evidence from Ireland

There is much anecdotal opinion that mathematical (and other) competencies are decreasing. This has been the subject of Oireachtas committees (Dáil 2003) and government reports. For example from O'Hare (2002):

> *Serious concern about the mathematical competence of students in schools and in higher education permeates the debate on the declining uptake of the sciences. The decline in performance in mathematics at second level was highlighted by the highest-ever failure rate (17%) in ordinary level Leaving Certificate Mathematics in 2001.*

From Forfás (2004):

> *There is a significant body of opinion, both in the enterprise community and among academics that standards have declined in the Irish education system over the past decade, both at second and*

> *third level. Empirical evidence to support this perception is contained in an earlier submission to the YES review*[15].

The employer's body IBEC in a press release from 18th August 2004 (IBEC 2004), state:

> *IBEC, the business and employers organisation, has responded to today's Leaving Certificate results by expressing major concern at the ongoing decline in the number of students taking science related subjects and the increasing failure rate in some of these disciplines.*

They go on to suggest that "…*consideration should be given to introducing bonus points in the Leaving Certificate for people who take science subjects.*"

On the same day the Irish Times had an article titled: "*Leaving results show high failure rates in maths, science*".

The Irish Times education editor writing for www.skoool.ie (Flynn 2004) wrote:

> *The chief examiner in the subjects has said that students are too preoccupied with part-time work, and their hectic social lives to give maths the concentrated attention it requires.*

Again commenting on the 2004 leaving certificate results, the Director General, Paddy Purcell, of The Institution of Engineers of Ireland (IEI 2004) comments:

> *… this years high failure rate in Maths and Science subjects mirrors a most worrying trend in recent years …*

Indirect evidence is provided by the provision of supports for mathematics by many third level educational institutions. From Flanagan & Morgan (2004):

[15] Reference to O'Grady et al (2004).

	UCD	UCC	NUI G	TCD	NUI M	UL	DCU
Science and Maths interventions	Faculty care team *learning support unit	Pre-entry Science programme Easter revision programme * peer tutoring	Mathematics support * peer tutoring	*peer tutoring	Mathematics support * orientation	Mathematics Learning Centre (Engineering / Technology)	*orientation & peer mentoring

Initiatives funded under Targeted Funding for Special Initiatives: Student Retention

Some details on the University of Limerick's (UL) support centre are available at http://www.ul.ie/~mlc/About.html.

1.4 Evidence from UK

Hawkes & Savage (2000) state:

> *"There is strong evidence from diagnostic tests of a steady decline over the past decade of fluency in basic mathematical skills and of the level of mathematical preparation of students accepted onto degree courses."*

See also Gordon (2004), Perkin & Croft (2004) and Pyle (2001), for example. According to Savage (2003): "*… 200+ Departments of Mathematics, Physics and Engineering now give their new students a diagnostic test and provide some form of mathematics support.*"

2 Current solutions

According to HEA (2004):

> *A number of trends are evident in the types of student retention initiatives:*
>
> o *The provision of support to students in specific subject areas, notably in the areas of mathematics, science or languages.*

In terms of BN003 various supports have been tried on an ad-hoc basis to date, with the most "sophisticated" of these being Macromedia Flash based audio-visual animations of syllabus content. Other supports include or have included: Excel based automated question and detailed answer software, online access to all lecture notes, problem sheets and detailed

solutions, extra tutorial/clinic supports, and some provision of personal one-on-one support as requirements arise and resources permit.

Interestingly while the Macromedia Flash based material, which had been a large body of work to complete, was widely welcomed by students it did not have any obvious effect on final grades. This support was in place for the 2003/04 students on BN003.

Given the high level of student satisfaction expressed with this support material the only conclusion to date has been that students viewed the material without subsequently carrying out personal practice. This would be consistent with experience over the academic year with many students who view material as "easy enough", then fail to put in sufficient time and practice, only to find that they cannot in fact apply techniques come examination time. However, research is required to substantiate this, or any other explanation.

In the November 2004 survey (referred to previously) the following question and answers perhaps give some ideas:

What are the main reasons that you think that you didn't do so well in the maths CA?
(Students could select one or more options)

Option	**Number of Students**
I did little or no practice	9
I missed more classes than was good for me!	5
I did a fair bit of practice, but not enough with hindsight	2
I did a lot of practice, but I had problems on the day	0
The exam was harder than I expected	1
I'm lazy and find it hard to get started	5
I'm confused and find it hard to get started	6
There are personal circumstances which are taking up my time, and college is low priority at present	2
Other reasons	1

Lawson et al (2001) reported that CAL is the 2nd least used resource with 33% of respondents saying that the resource was "barely used". CAL was second after videos which had a 70%

"barely used" response rate. The most popular resources were "staff", with 48% reporting considerable use was made of the resource; and handouts with 31%.

Lawson et al (2001) provides an extensive review of supports available in the UK. Lawson et al (2003) "*distils the findings*" of Lawson et al (2001) giving more details related specifically to maths supports centres, with a chapter on dyslexia. Perkin & Croft (2004) updates Lawson et al (2001). Perkin & Croft (2004) state that of the 48 old polytechnics surveyed 35 (72.9%) had some form of learning support, with the following breakdown:

Number	35
Learning Support/ Drop-in Centre	25
Maths Clinic-Drop in with limited hours	4
Numeracy Support	3
Learning Support Tutor	2
Postgraduate Support	1

The old polytechnics perhaps represent the closest match to Ireland's Institute of Technology (IoT) sector.

Many initiatives aimed at the broader issue of student retention in Irish Universities are reported in Flanagan & Morgan (2004). This includes some of the student supports provided in Ireland. See MathsTeam for a series of case studies on student supports provided in various UK universities and colleges.

Other possible support examples/ideas include:

- **Extra/longer tutorial class times** – A key part of the learning process in mathematics is personal practice. In light of the chief examiner's comments reported in Flynn (2004) combined with local experience at ITB it is felt that more student "management", particularly at 1st year/entry level, may improve their performance. Longer tutorials would provide a better opportunity for both interactive parallel problem solving (students solve a similar, but not identical problem, as one is solved for them) and managed/directed time, when students could attempt problems under direction, and in addition avail of readily available support. Extra and longer tutorials are currently in place on BN001 at ITB, with a total of 3 hours per week, allocated in a single 2 hour class, followed later in the week by a 1 hour class. Anecdotal evidence suggests this is working well, but it has only been in place two years, so it is too early to tell.

- **Streaming of students within an existing syllabus** – Similar to an honours and pass two level system, the idea here is to avoid exposing weaker students to more advanced

material, which can negatively impact their overall perception. Students would have the option to skip certain lecture classes and associated materials and then sit a simpler set of examinations, on the reduced content. Maximum grade available is lowered pro-rata to reflect the reduced content. While it is a somewhat defeatist approach, since it accepts the lower standard, it is perhaps relatively simple to implement, and is at least better than doing nothing. This approach is not in use at ITB nor has it been reported anywhere to date. It would most likely meet with opposition from lecturers whose own subjects would be impacted negatively by the omitted content. However the question of whether knowing 60% of a course well is preferable to know 100% poorly must be posed.

- **"Struggling student" manager** – Surveys of students performing poorly in BBM at ITB have regularly reported that they "need help but don't like to ask questions"[16]. In addition when extra time slots have been made available, for one-on-one support that are reservable by students, little use has been made of these. Similarly optional additional and targeted tutorial ("clinic") support has been met with decreasing attendance levels. See also Lawson et al (2003) under "Student Engagement".

In contrast most students have been found to have little difficulty looking for assistance once contact is made by the lecturer. This gives rise to the idea of having a suitable resource who would actively "pursue" a range of students who are found to be having difficulties by course lecturing staff, across all first year classes. This is basically a more proactive drop-in centre, perhaps more aptly it might be called a "called-in centre". Once the guidelines from Lawson et al (2001 & 2003) are followed then such a proactive service might be what these students would most benefit from to get them started.

A key aspect of support provision is identification of students who will benefit from such support. Due to "grade inflation" (see O'Grady et al 2004) required entry standards for third level courses are no longer necessarily consistently indicative of expected competencies in mathematics. The solution adapted most generally in the UK appears to be early diagnostic testing. This is at an earlier stage of development overall in Ireland but Flanagan & Morgan (2004) reports that several institutions have systems in place or are working towards implementation of such diagnostic testing. As sufficient data becomes available from such testing any further "grade inflation" should be detected.

[16] 9 out of 18 responses in a November 2004 survey of students who had failed a continuous assessment BBM examination. Survey was of a potential 40 students, across two first year classes, BN003 and BN010, with some of these 40 probably having left the course without notifying administration.

3 The standards dilemma

Evidence of a problem has been provided here and is widely accepted in general. Possible support options have just been outlined in section 2, but there is a further aspect to consider, and it is a problem encompassed by the term "grade inflation", see O'Grady et al (2004). The concept of "grade inflation" addresses a wider range of issues.

If person A can learn to complete a task unsupported, have they a higher standard at this task than person B who needs support? Having provided supports for person B to the extent that now A and B can complete that task equally, then are they of the same standard?

It can be argued that, in terms of the specific outcome of completing the task, A and B are of equivalent standard. However academics also sometimes argue that in academic terms A has a higher standard than B, and the questions above are regarded as too narrow in determining the "standard" of the individuals. For example, in Gordon (2004) the fact that students took longer to answer questions was regarded as indicative of lower performance:

> *… however, the 2001 cohort did take an average of 2 min longer than the 2000 students, and the 2002 cohort took a further 2 min. Since Diagnosys does not have a fixed time, nor fixed question bank, this would indicate a decrease in performance, that is, they take longer to get the same mark.*

The "academic standard" can be hard to pin down in measurable terms as required learning outcomes may have been fully achieved by both individuals, and based on a range of imaginable examinations these two will be awarded the same grade … But perhaps business in particular might value and benefit from the additional information based on the path to the grade in addition to the grade itself; or benefit from a grading system that could take such additional factors into account.

Certainly some levels of business would be quite satisfied with either individual as task completion is all that is required, but there are also areas of business where variation on the original task is a key component of the business, and in such contexts there is probably benefit in hiring A over B.

Within this context the more supports that students require, or are provided with, the more the academic standard is potentially reduced, or at least becomes shrouded by the provision

of the supports. Of those receiving supports who are the ones who in fact have a high task specific and broader "academic" standard? Who are the A's and who are the B's?

The other side of this business focused standards argument is that 3rd level education should service the needs of the current cohort of students and thus society, within some reasonable degree of year to year variation. Standards or approaches to education that exclude many people are not of much real value.

The issue is further complicated by the fact that there are certainly students with high ability, effectively A's, who need, for a variety of possible reasons, some support to bring out this ability. The suggested new grading system from above incorrectly labels this type of person.

The dilemma of providing supports with consequential grade inflation, or no support, with consequential student attrition, can be resolved, once it is recognized and managed, or for that matter possibly accepted. For a 3 or 4 year degree program supports provided in year 1 only should not be expected to inflate grades obtained in the final year. More susceptible to grade inflation are shorter courses, such as the 2 year Higher Certificate offered in Ireland, or in general where supports are provided up to and including award years. Perhaps government, society and business will need to explicitly make clear their preference: Grade inflation, lowering competency, and consistent or improving pass rates, or consistent standards possibly associated with increased fail rates.

4 Conclusions

There is clearly a problem nationally and internationally, which is being actively assessed and addressed by many institutions in many different ways. It is still too early to say if a corner has been obviously turned due to specific and repeatable interventions.

ITB is still in its early years. Possible trends mirroring national and international experience may be present, but more data is required to decide to a reasonable level of confidence. However, it would be naïve to expect that ITB will be that much different in terms of the students it receives. Initial supports at ITB at any given year for BN003 and BN001 have included one or more of: Macromedia Flash based audio-visual material, Excel based visual basic Q&A support, online notes and practice questions and answers, extra class tutorials, and one-on-one or small group meetings with lecturing staff. The most desired support from a student point of view seems to be one-on-one contact, with many struggling students reporting that they do not like to ask questions. This is consistent with research in the

UK.There are a wide range of supports possible, but only time will tell which work best in general, or in specific contexts. Implementation of some form of diagnostic testing seems essential to appropriately and accurately manage the subsequent provision of supports.

The potentially parallel and broader issue of grade inflation, both at pre-entry and subsequent award levels, needs national inquiry, review and direction. Through better student course choice along with better options and management for students if problems do arise, it would seem possible to maintain standards, but perhaps provide more appropriate exit points consistent with each student's displayed ability. There are palatable alternatives to grade inflation.

5 Thanks

This paper was motivated by personal experience and consequent discussions with many staff and students at the Institute of Technology Blanchardstown (www.itb.ie), and various and repeated visits to materials available from the UK's Learning and Teaching Support Network, LTSN. As of October 2004 LTSN has moved to the Higher Education Academy website http://www.heacademy.ac.uk.

6 Appendix A – Basic Business Mathematics (BBM) Results and analysis for Higher Certificate in Business (BN003) since ITB opened.

Semester 1

Grade	2000		2001		2002		2003		2004	
A	5	9%	0	0%	2	4%	4	4%	2	3%
B+	11	19%	4	6%	1	2%	9	10%	3	4%
B	17	30%	9	13%	7	13%	15	16%	9	12%
B-	8	14%	12	17%	2	4%	12	13%	4	5%
C+	8	14%	12	17%	5	9%	10	11%	5	7%
C	5	9%	12	17%	13	23%	18	20%	17	23%
D	0	0%	6	9%	17	30%	7	8%	10	13%
F	3	5%	6	9%	9	16%	12	13%	12	16%
NP	0	0%	3	4%	0	0%	1	1%	7	9%
EXE	0	0%	2	3%	0	0%	0	0%	1	1%
DEF	0	0%	1	1%	0	0%	1	1%	2	3%
W	0	0%	3	4%	0	0%	0	0%	0	0%
NA	0	0%	0	0%	0	0%	3	3%	3	4%
Other	0	0%	0	0%	0	0%	0	0%	0	0%
Total	57		70		56		92		75	
Passes	54	95%	55	79%	47	84%	75	82%	50	67%
Fails	3	5%	6	9%	9	16%	12	13%	12	16%
Avg GPV of those who pass	2.99		2.49		2.17		2.63		2.36	
Adjusted GPV of those who pass	100		77.9		70.1		91.0		81.7	

Table 2: Grades and analysis for BN003 semester 1 since ITB opened.

For marks ranges associated with grades A to F see Appendix B. The grades in tables 1 and 2 include any repeat examinations taken with the academic year, so represent the best performance of the associated students within that year. They did not take into account results obtained in any subsequent repeats. The meaning of the other rows are as follows:

Row Label	**Meaning at ITB**
NP	Not present – Means student is registered on course, but sat no examinations, including no continuous assessments.
EXE	Exempt – Student has an exemption for some reason.
DEF	Deferred – Student has deferred their course for now. May come back later.
W	Withdrawn – Student has officially withdrawn from the course.
NA	NA – No information available on the corresponding students.
Other	Other – Counts anything "strange", which is different from all of the other available "grades".
Total	Total number of "grades", excluding "other".
Passes	Number of grades ≥ D
Fails	Number of grades = F
Avg GPV of those who pass	Average Grade Point Value (GPV[17]) of those with grade D or higher.
Adjusted GPV of those who pass	A "Real Value Index" is calculated as: $\frac{GPV_n}{GPV_{2000}} \div \frac{CAO_n}{CAO_{2000}} \times 100$, where n=2000, 2001, …, 2004, and CAO values are given in Table 3. This formula basically compares changes in the GPV's compared with 2000 against changes in the CAO points. Values below 100 indicate that changes in GPV since 2000 have been smaller than changes in the CAO. Conversely values above 100 indicate that changes in GPV since 2000 have been larger than changes in the CAO. It is thus a simple way to attempt to adjust the GPV values to allow for changes in entry standards.

[17] See Appendix B.

Semester 2

Grade	2000		2001		2002		2003		2004	
A	5	9%	3	4%	5	9%	1	1%	1	1%
B+	10	18%	11	16%	3	5%	0	0%	2	3%
B	23	40%	13	19%	6	11%	3	3%	4	5%
B-	3	5%	9	13%	6	11%	2	2%	4	5%
C+	6	11%	6	9%	6	11%	5	5%	2	3%
C	4	7%	5	7%	8	14%	19	21%	9	12%
D	0	0%	6	9%	8	14%	34	37%	20	27%
F	4	7%	3	4%	7	13%	15	16%	18	24%
NP	0	0%	7	10%	6	11%	9	10%	12	16%
EXE	0	0%	2	3%	1	2%	0	0%	0	0%
DEF	0	0%	1	1%	0	0%	1	1%	3	4%
W	1	2%	4	6%	0	0%	1	1%	0	0%
NA	1	2%	0	0%	0	0%	2	2%	0	0%
Other	0	0%	0	0%	0	0%	0	0%	0	0%
Total	57		70		56		92		75	
Passes	51	89%	53	76%	42	75%	64	70%	42	56%
Fails	4	7%	3	4%	7	13%	15	16%	18	24%
Avg GPV of those who pass	3.04		2.80		2.57		1.88		2.07	
Adjusted GPV of those who pass	100		86.0		81.7		63.8		70.5	

Table 3: Grades and analysis for BN003 semester 2 since ITB opened.

Year	BN003 Entry Points	Index of Entry Points with 1999 as base
1999	290	100.0
2000	310	106.9
2001	300	103.4
2002	280	96.6
2003	280	96.6
2004	280	96.6

Table 4: BN003 entry points

7 Appendix B – Grade Point Value (GPV)

Mark Range	Alpha Grade	GPV
80 and over	A	4.0
70 and < 80	B+	3.5
60 and < 70	B	3.0
55 and < 60	B-	2.75
50 and < 55	C+	2.5
40 and < 50	C	2.0
35 and < 40	D	1.5
< 35	F	0.0

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