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An investigation of the self-evaluation skills of first year pharmacy students

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Abstract

Introduction: Self-evaluation is an important skill in many fields of endeavour, including education and learning. Health-care workers, e.g. pharmacists, have a particular need to develop this skill. We therefore investigated the self-evaluation skills of several cohorts of pharmacy undergraduates during the first year of their course. Students were asked to predict their end of first year and end of course results, and these predictions were compared with their actual marks.

Methods: A wide-ranging questionnaire was designed to interrogate a number of aspects of students' lives, including their perceptions of their present and future academic progress. Arrangements were made for it to be completed during a scheduled class (the captive audience approach).

Results: The response rate to the questionnaire, using this approach, was 87%. Male students were found to predict better academic performance for their final degree than females, despite the fact that females outperformed males in both first and final year. Most students, both male and female, predicted better marks for themselves in the final year than in the first year. In general, the better students gave more realistic predictions than the weaker students.

Conclusions: These findings suggest that first year students do not have good self-evaluation skills, and might benefit from formal opportunities to practise self-evaluation during their time at University.

Keywords: *Academic achievement, pharmacy students, examination prediction, health-care workers*

Introduction

Most universities currently have policies for improving students' achievement during and beyond the study years. These policies may target academic progress, or focus on more generic abilities such as study skills and time management; increasingly, many universities seek to address both areas. There is a vast research literature examining the complex relationship between various cognitive and non-cognitive factors and academic achievement. Among the factors affecting academic achievement are self-efficacy and academic self-regulation (Sandler, 2000; Lim, 2001; Ruban, McCoach, McGuire, & Reis, 2003).

Self-efficacy is the ability to plan and undertake a task in order to accomplish a desired goal (Bandura, 1997). It associates positively with academic success (Sandler, 2000; Lim, 2001). Self-regulation is a related concept, but is concerned with process rather than with ability. Ruban et al. (2003) define academic self-regulation as "the process by which students obtain knowledge and behaviour that are supportive of academic goals", examples of which are time-management, organising information and mastery of learning methods. Academic self-regulation has strong links with academic achievements (Ruban et al., 2003). Self-regulated learning variables are seen by some even as more important in influencing academic achievement than standard measures of aptitude (Zimmerman, 1989; 1998 cited in Ruban et al., 2003; Tracey & Sedlacek, 1986).

Self-evaluation of academic performance is key to students' success in self-regulation (it is difficult to find your way to Coventry if you do not know whether you are starting from Aberdeen or Skegness). The educational relevance of self-evaluation is highlighted

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in the literature (Carroll & Garavalia, 2004). Self-evaluation is also relevant to life-long learning: a practising professional will normally be alerted to the need for additional learning by self-evaluation, rather than by formal evaluation carried out by others. Taking this as a positive answer to the question posed in the title, the purpose of this paper is to investigate the self-evaluation skills of first year pharmacy students—specifically, it is an investigation of their ability to predict their examination marks.

Methods

Sample and approach

About 293 pharmacy students from the University of Manchester participated in this study; data were collected during the period 1999–2001. All participants were first year students and data were collected in the middle of semester 2, when the students had been members of the University for about 6 months. Students completed a questionnaire designed specifically for this study.

The questionnaire was administered during a compulsory practical class, but participation in the study was voluntary and participants were informed (by means of a covering letter) of their right to withdraw from the study without consequences at any stage. The captive audience approach taken during this study made it possible to reassure students, verbally as well as in writing, about confidentiality issues, and to encourage participation. The study benefited from a good response rate to the questionnaire, approximately 87% of the class lists. The non-respondents, of course, include those who were absent from the sessions in which the questionnaire was distributed.

Procedures

First year pharmacy students were asked in the middle of the second semester to predict their end of first year course results and final degree results relative to those of their peers. The 1999 intake was not asked to predict the end of first year results; they only predicted their final degree results. The options given were "just a pass", "average", "better than average" and "first class mark". These options were used because first year students were not necessarily expected to have a good understanding of the degree classification system. Demographics, attendance and achievement data were obtained from the University's records during all four years of the course. The students' predictions were then correlated with the actual marks obtained at the end of the first year and at the end of the course. The questionnaire was also used to gather data on a number of other factors (including the average time spent on independent study and their general feelings about their studies).

The attendance data were collected as units of absence, where each timetabled session missed is marked as one unit of absence for that student. This could refer to anything from 1 to 3 h depending on whether a tutorial, lecture or practical class was missed.

The information gathered in the questionnaires was linked to other sources through the use of students' registration numbers. These codes are confidential to selected University staff and the students themselves. Thus, the researcher was unable to identify individuals on the basis of these codes. Staff involved in the project did not have routine access to the questionnaires, and so could not normally identify the individual students. However, the code could be broken if the researcher had grounds for concern about an individual, and it was explained to the students the staff might exceptionally break the code in order to help or advise students about their studies. In practice this was not necessary.

Results

Response rate to the questionnaire

Bias due to low response rate is a concern when using questionnaires as a means of collecting data (McColl et al., 2001). A study of the response rates of 321 postal questionnaires, the outcomes of which were published in medical journals, reported a mean response rate of around 60% (Asch, Jedrziewski, & Christakis, 1997). The subject matter of the current study and the approach taken (captive audience) are different from the studies investigated by Asch et al.; nevertheless, the relatively good response rate of 87% to this voluntary questionnaire is exceptional, especially since no rewards for completion (prize draws etc.) were offered.

Students who completed the questionnaire and undertook the first year examinations (mean mark = 63.9%, standard deviation = 10.1, $n = 279$) performed better on average than those who did not (mean mark = 56.7%, standard deviation = 11.4, $n = 43$); this difference was highly significant ($t = 4.30$, $p < 0.0001$). It was known from previous studies that non-participants in individual events (diagnostic tests, questionnaire completion etc) tend to be poor attenders overall (Sharif, Gifford, Morris, & Barber, unpublished). The difference in units of absence between the two groups (those who completed the questionnaire and others), however, was not significant at the 95% confidence level.

Predicted achievements for the end of first year—correlation with study time

Figure 1 illustrates students' predictions for the end of the first year; the most commonly predicted result was "average". These predictions were independent of gender. The predictions (Table I) correlated moderately

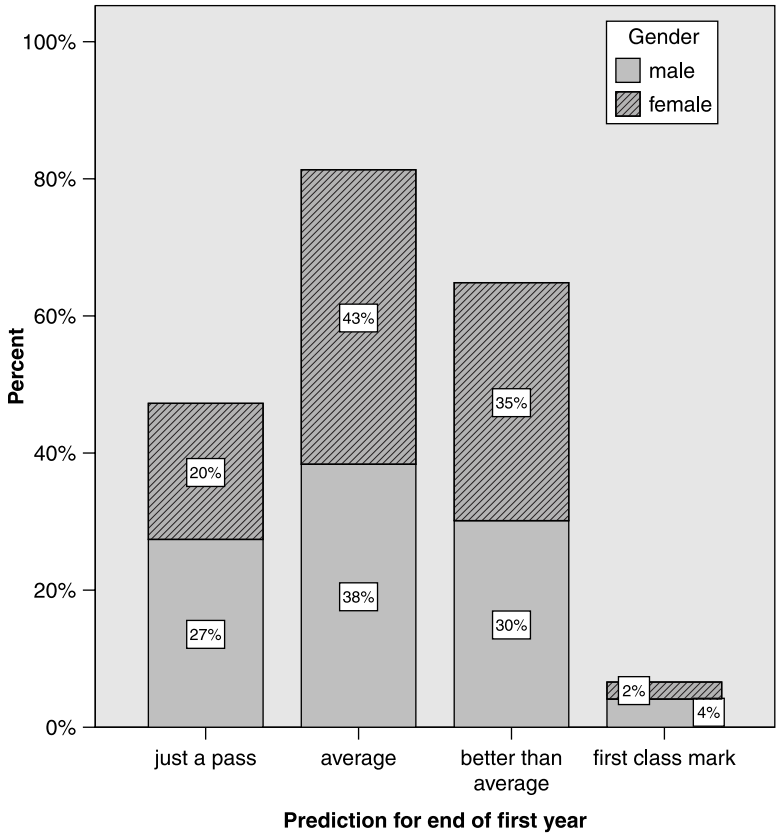

Figure 1. Pharmacy students' predictions of achievement for the end of first year. Percentages are rounded up and may sum to more than 100.

with the self-declared time spent on independent study (Spearman's correlation $= 0.4, n = 172, p < 0.0001$). The students who predicted "a pass mark" for themselves spent, on average, about half the time in independent study of the students who predicted "above average". The total weekly time spent on study was about 30 h for students predicting "a pass mark" and about 38 h for students predicting an "above average" mark, allowing for 23 h of timetabled classes and assuming 100% attendance (see below). This is, in itself, an interesting finding. The School and the University recommend that students work a 40 h week. Only the students who predicted above average performance come close to reporting this.

Predicted achievements for the end of first year—correlation with absence from classes

A weak negative correlation was seen between absence from classes and predicted achievement for the end of first year (Spearman's correlation coefficient $= -0.3$, $n = 195$, $p < 0.001$; Table I). A weak negative correlation also existed between absence and self-declared study time (Spearman's correlation coefficient $= -0.2$, $n = 258$, $p < 0.05$). Thus, students whose attendance at classes is poor compound their problems by spending smaller amounts of time in independent study, falling well below the recommended 40 h working week.

Table I. Mean reported independent study (hours per week) and mean units of absence for students who predicted just a pass mark, average, better than average, or a first class mark for the end of the first year. Numbers in brackets are the relevant standard deviations, and *n* refers to the number of students in each category.

Predicted achievement for the end of first year	Time spent on independent studies	Units of absence
Just a pass	7.8 (6.9) $n = 39$	24.9 (21.2) $n = 44$
Average	12 (6.1) $n = 73$	15.5 (14.1) $n = 80$
Better than average	15.8 (9.6) $n = 55$	11.2 (9.2) $n = 65$
First class mark	13.1 (4.7) $n = 5$	18.0 (19.2) $n = 6$

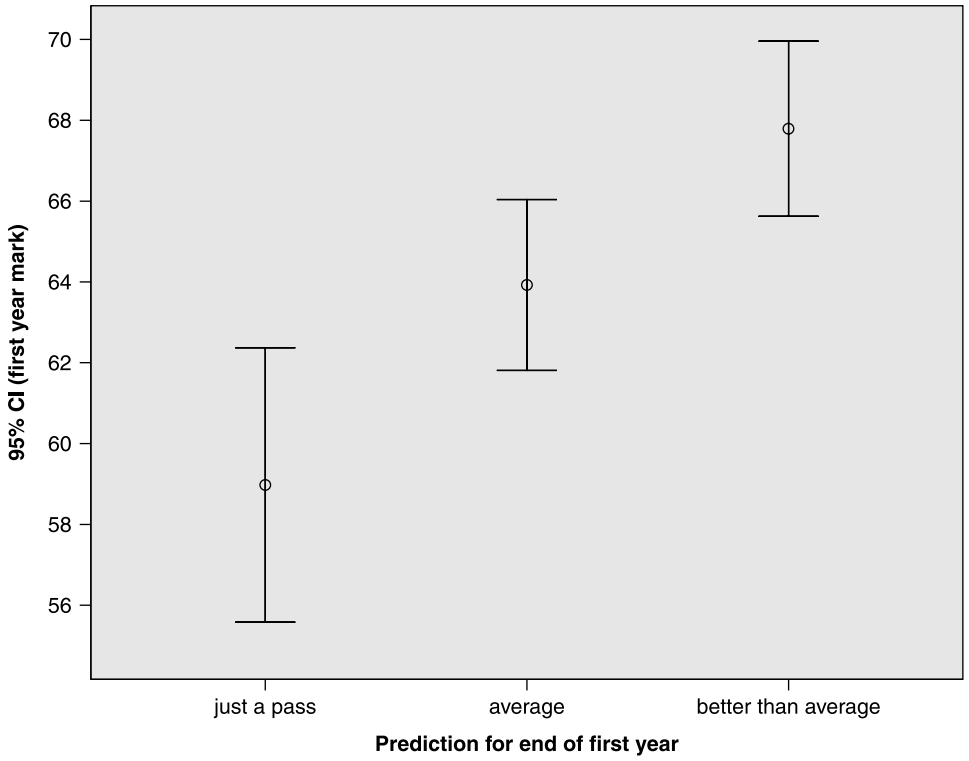

Figure 2. Error bar chart representing the 95% confidence interval for the means of first year examination marks for students who predicted just a pass mark, average or better than average. The category "better than average" on the graph represents those who predicted better than average or first class marks.

Accuracy of predictions—correlations with first year examination performance

A small number of students (14) dropped out of the course between the administration of the questionnaire and the first year examinations. The questionnaire responses for these students showed no obvious distinguishing features and the number was too small for meaningful statistical analysis, so they were not considered further.

Figure 2 shows the mean error bars of actual examination results obtained by each group of students (those predicting just a pass mark, average, above average or top performances) in the first year. There is a statistical difference between the mean scores (Table II) of these different groups ($F_{(3,184)} = 7.44$, $p < 0.001$). A *post hoc* test (LSD) indicated that the significant differences lie between the following prediction categories: (a) just a pass mark and top mark (mean difference = 11.86, $p < 0.01$), (b) just a pass mark and better than average mark (mean difference = 8.52, $p < 0.0001$), (c) just a pass mark and average mark (mean difference = 4.95, $p < 0.01$), and (d) average mark and better than average mark (mean difference = 3.57, $p < 0.05$). Table III shows that, even with the very broad bands of achievement adopted, only 79 students of 188 who predicted their first year performance did so correctly.

The relationship between predictions and the actual results was investigated further. The actual mean score for the first year was found to be 62.2% (standard deviation = 10.7). Students were divided into two groups based on their actual examination marks in the first year examination: those who scored below 62% and those who scored 62% or above. No significant correlation between students' predictions and the actual marks was observed for those who had marks below 62%. However, predictions for students who scored 62% or above correlated positively with their actual marks (Spearman's correlation coefficient = 0.2, $n = 124$, $p < 0.05$).

Absence, independent study and achievement

Two simple regression analyses were conducted. In the first analysis the dependent variable was the first year examination mark and the independent variable was

Table II. Average examination marks for students with different predicted achievements for the end of the first year. Numbers in brackets are the relevant standard deviations, and *n* refers to the number of students in each category.

Predicted result for the end of first year	Average actual examination mark for the first year
Just a pass	59.0 (10.8) $n = 41$
Average	63.9 (9.5) $n = 80$
Better than average	67.5 (9.0) $n = 61$
First class mark	70.8 (7.7) $n = 6$

Table III. Number of students (and column percentages) scoring actual marks in the first year examinations within a specific range as a function of predictions made.

	Number of students scoring marks within the range			
Predictions	34–55% (bottom quarter of the group)	56–70% (middle half of the group)	71–78% (top quarter of the group excluding top 5%)	79–84% (top 5% of the group)
Below average	13 (35%)	21 (22%)	6 (13%)	1 (11%)
Average	17 (46%)	43 (44%)	18 (40%)	2 (22%)
Above average	7 (19%)	31 (32%)	17 (38%)	6 (67%)
Top mark	0	2 (2%)	4 (9%)	0

the number of units of absence. The resulting regression was statistically significant ($F_{(1,321)} = 73.67$ $p < 0.00001$). R^2 for the regression was 0.19 and β coefficients for constant and units of absence were 66.42 and −0.29, respectively. Standard errors for the β coefficients were 0.66 and 0.03, respectively. The analysis suggests that units of absence account for 19% of the variation in the first year examination marks; one unit of absence corresponds on average to a reduction in examination mark of 0.3%.

In the second analysis, the dependent variable was the first year examination mark and the independent variable was the reported number of hours per week spent on independent study. The resulting regression was statistically significant ($F_{(1,247)} = 13.94$, $p < 0.001$). R^2 for the regression was 0.05 and β coefficients for constant and number of hours spent on independent study were 60.81 and 0.28, respectively. Standard errors for the β coefficients were 1.11 and 0.08, respectively. The number of hours of reported independent study accounts for 5% of the variation in the examination marks; each hour of independent study (per week) corresponds to 0.3% in first year examinations. These results are broadly consistent with the simplistic but appealing view that examination marks earned are in direct proportion to the hours of study invested.

Predicted achievements for the end of course

Figure 3 illustrates students' predictions for the end of the course. Where most students predicted an "average" mark in first year examinations, most students now predicted an "above average" mark.

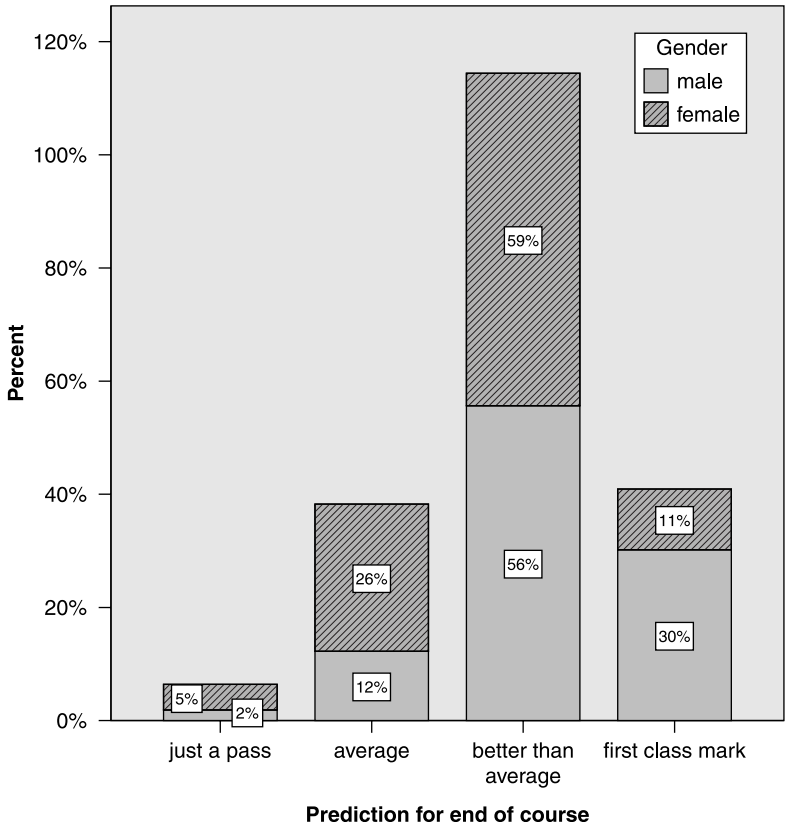

Figure 3. Pharmacy students' predictions of achievement for end of the course. Percentages are rounded up and may sum to more than 100.

Table IV. Cross-tabulation of gender with degree result prediction. Column percentages are rounded up and may sum to more than 100.

Predicted results for the end of the course	Number of pharmacy students	
	Male	Female
Just a pass	2 (2%)	8 (5%)
Average	13 (12%)	46 (26%)
Better than average	59 (56%)	104 (59%)
First class mark	32 (30%)	19 (11%)

Table V. Cross-tabulation of gender with self-declared feeling with respect to the course. Column percentages are rounded up and may sum to more than 100.

General feeling with respect to the course	Number of pharmacy students (1999–2001 intakes)	
	Male	Female
Confident/OK	61 (59%)	69 (39%)
Anxious	32 (31%)	80 (46%)
Stressed out	10 (10%)	27 (15%)

The predictions were not gender-independent ($\chi^2 = 21.3, p < 0.001$); male students were especially optimistic (Table IV), with 86% predicting that they would score an above average or top mark compared with 70% for female students. Not surprisingly, self-declared feelings with respect to the course were also gender-dependent; male students reported feeling more confident about their studies ($\chi^2 = 10.5$, $p < 0.01$; Table V).

The reality was rather different from the students' perceptions; males scored an average mark in finals of 62.9% (standard deviation = 6.6), while females scored 64.7% (standard deviation = 6.0). Thus, although women were on average somewhat over-optimistic about their final position in the class list, their male colleagues had a still weaker grasp of reality.

Table VI shows the overall profile for students' predictions against their final examination marks. The mean final year examination mark was not statistically different for the different groups of students (those predicting below average, average, above average and top performances for their final; Table VII). There was a weak negative correlation between prediction and actual performance (Spearman's correlation coefficient $= -0.2$, $n = 220$, $p < 0.05$). Students predicting a top mark actually did less well on average than those predicting an average mark (Figure 4).

Correlation between predictions for the end of first year and final degree mark

A weak positive correlation was seen between predictions for the end of first year and final degree mark (Spearman correlation coefficient = 0.4, $n = 198$, $p < 0.00001$). Among the participants, 75 predicted the same results for the end of the first year and the final degree; 119 predicted better results for the end of the course, whereas only four predicted lower marks for the end. A one-category difference between predicted results of the first year and final degree was seen for students who predicted lower results for the end of the course. For those who predicted better results for the end of the course, 77 predicted a one-category difference (e.g. average to above average), 37 predicted a two-category difference, and five predicted "below average" for the first year and "a top mark" as their final degree outcome.

Discussion

Overall, students' predictions for the end of first year correlate weakly with their actual achievement. Not surprisingly, the students' predictions correlated both with attendance at classes and with time spent on independent study. For most students the time spent on independent study fell below that expected by the University, and, alarmingly but perhaps unsurprisingly, students who spent inadequate time on independent study tended to be poor attenders at classes.

Higher performing students were more likely to predict their first year examination results correctly; lower performing students showed overconfidence in their predictions. This finding was in line with other studies (Hacker, Bol, Horgan, & Rakow, 2000). Most

Table VI. Number of students (and column percentages) scoring actual marks in final year examination within a specific range as a function of different predictions made.

Prediction	Number of students scoring marks within the range			
	45–59% (bottom quarter of the group)	60–69% (middle half of the group)	70–73% (top quarter of the group excluding top 5%)	74–78% (top 5% of the group)
Below average	1 (2%)	5 (4%)	1 (2%)	0
Average	7 (15%)	25 (21%)	12 (28%)	5 (42%)
Above average	29 (63%)	70 (59%)	27 (63%)	6 (50%)
Top mark	9 (20%)	19 (16%)	3 (7%)	1 (8%)

Table VII. Average examination marks for students with different predicted achievements for the final degree mark. Numbers in brackets are the relevant standard deviations, and *n* refers to the number of students in each category.

Predicted result for the final degree	Average actual examination mark for the final year
Just a pass	64.0 (5.4) $n = 7$
Average	65.8 (6.2) $n = 49$
Better than average	64.3 (6.1) $n = 132$
First class mark	62.2 (6.5) $n = 32$

students predicted that they would perform better in final assessments than in the first year assessments. A few students predicted very significant improvements in their performances relative to their peers. Perhaps (like St Augustine) they intend to be good, but not yet, or perhaps they underestimate the level and volume of work required for the rest of the course.

The literature suggests that self-efficacy (the ability to plan and undertake a task) and self-regulation correlate with success. Both of these skills rely on the ability to appreciate how well one is performing; this in turn is a skill that students should learn. The current study suggests that half-way through the second semester of the MPharm course, self-evaluation is still an underdeveloped skill, especially for male students. The final cohort in this study graduated in 2005, and completed the questionnaire in 2002. In the five years since 2002, peer mentors for all first year students have been arranged, and a number of deliberately tough course tests have been introduced. These measures are expected to improve self-evaluation among first year students. In addition, our results of correlating attendance at classes with examination performance are disseminated to all first year students at the beginning of their course.

The present study suggests that students might benefit from additional opportunities to monitor their performance. It is not feasible to administer large numbers of traditional mock examinations in a large university class; both room bookings and staff time spent on marking are prohibitive. However, we have recently reported the successful introduction of computer-based summative assessment in the first year of the MPharm programme (Aojula, Barber, Cullen, & Andrews, 2006). Many advantages to this mode of assessment are reported, but an additional advantage might be the relative ease of setting up mock examinations (e.g. by simply remounting the previous year's examination).

Conclusion

The concept of lifelong learning relies partly on self-evaluation/self-assessment skills. The current study suggests that first year students are, in the main, poorly equipped with these skills. Students' self-evaluation

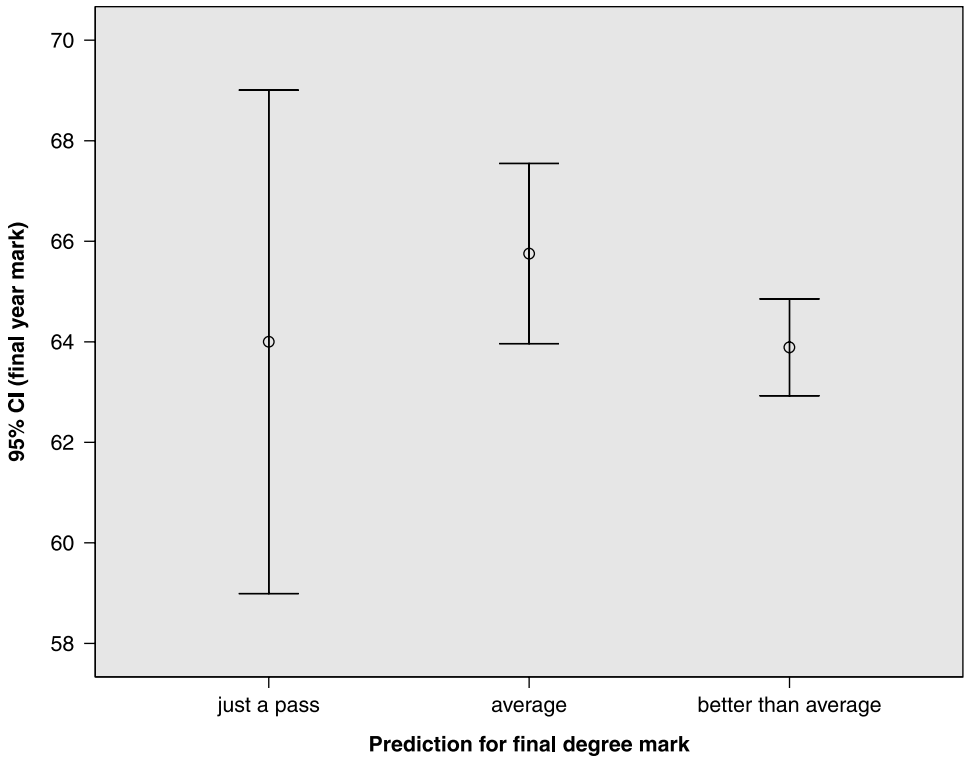

Figure 4. Error bar chart representing the 95% confidence interval for the means of final year examination marks for students who predicted just a pass mark, average or better than average. The category "better than average" on the graph represents those who predicted better than average or first class marks.

can be improved by increasing their awareness of what is expected from them (e.g. by making use of model or worked answers to past examination questions). It may also be helpful to provide formal opportunities for prediction of the marks for assessments during the course, as suggested by others (Carroll & Garavalia, 2004; Hacker et al., 2000).

This study does not address the extent to which students' self-evaluation skills improve over the four years of the course. Both active interventions in the curriculum designed to promote reflection and the experience of being at University for a number of years are expected to promote self-evaluation skills, and further research could usefully focus on the self-evaluation skills of second, third and fourth year students.

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