# CHOOSING TO STUDY INDEPENDENTLY - WHEN IS IT A BAD IDEA? ®

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*With ever increasing demands on limited resources, universities are looking for ways to utilise their resources more efficiently. At Swinburne University of Technology, in the statistics component of the psychology course, we have developed a set of materials which allow students to work independently, rather than attending lectures and tutorials. This means fewer students attend tutorials and we can give those that need it more individual assistance. A major concern with this strategy is that students might choose to work independently for inappropriate reasons. This study explores the differences in performance between students who choose to attend lectures and those who opt for independent study, and seeks to identify factors which explain these differences. The research is based on a number of questionnaires collected throughout the semester and analysed in conjunction with the students' results.*

## INTRODUCTION

In recent times there have been profound changes in university teaching and learning. There has been a move to incorporate more technology into teaching, especially the use of web-based learning, and a trend towards encouraging students to work more independently. This has often been inspired by a need to reduce costs in an increasingly competitive international environment. In Australia in particular, there has been a decline in funding in real terms, which has put great pressure on the university system. These changes are discussed in some detail by Nunan (2000).

While changes to course structures may be inspired by the need to operate more efficiently, they can also be seen as an opportunity to develop more flexible and more effective learning environments. This paper addresses changes in the statistics program for psychology students at Swinburne University of Technology, which were aimed at increasing efficiency while maintaining or improving the learning environment. In the past, the program was delivered via classroom teaching, with approximately 30 subjects in each class. With increasing financial pressures on the institution, the program has changed to a lecture/tutorial format.

As classes have never been compulsory, there have always been a substantial number of students who chose not to attend. With the introduction of the new format, we anticipated a further decrease in the attendance rate, which gave rise to some concerns about the welfare of the students. We chose to acknowledge that there would always be a cohort of students who would not attend lectures and tutorials, and set about redesigning our teaching materials to support students who chose to work independently. Students were then given the option of either attending lectures and tutorials each week, or of working independently from comprehensive notes, with the support of an internet site. In practice, most students chose a mixture of approaches, attended lectures and tutorials in some weeks but not others. Broadly speaking, however, the students fell into one of two categories - either attending most of the lectures (regular attenders), or very few of the lectures (independent learners).

This study primarily addresses two questions. Firstly, have our support strategies worked? Is the performance of the two groups of students comparable? Secondly, are there some people for whom independent learning option is not a good idea? If students at risk of failure can be identified early in the semester, it might be possible to offer them more specific advice and support and hence improve their chances of success.

## BACKGROUND

The study was conducted on 120 students who completed a second stage statistics subject. This subject is a compulsory component of the Psychology course. All students had previously completed a first year introductory statistics subject either at Swinburne or elsewhere. All students were expected to attend the first lecture, where the supported independent learning structure was described. After the first lecture, all lectures and tutorials were optional. Teaching

was based on a textbook *Introduction to SPSS for windows* (Francis 2001) and a set of notes on the Analysis of variance specifically written for the subject. All subject matter discussed in the lectures and tutorials was also covered in the written materials. When the lecture/tutorial format was introduced, three additional support structures were devised - a learning guide, a form of continuous assessment and feedback, and an internet site.

*The Learning Guide:* Students were provided with a very structured learning guide. This set out specific objectives, a summary and review exercises for each topic, clearly laid out which sections of the text or notes should be read each week, and suggested appropriate exercises to be completed.

*Continuous Assessment and Feedback:* In order to encourage students to keep up to date with the work, and to get regular feedback from staff, we instituted a set of 5 minor assignments known as workbooks. Every two or three weeks students were required to complete a workbook task. Workbooks generally required students to produce appropriate statistics using SPSS and to write a brief report on their results. Ten different data files were used for each workbook and students were allocated a file number at random. The workbooks were marked and returned to the students within a week, together with an example solution and detailed comments on where they went wrong. While the main aim of the workbooks was to give formative assessment, they also contributed a total of 15% towards the final mark (3% for each workbook), to provide additional incentive for students to complete them.

*Internet Site:* Students enrolled in the subject also had access to an Internet site. This site contained details about assessment, copies of the powerpoint slides used in the lectures and all data files used in examples, exercises and workbooks. Students were expected to check the site regularly for updates on the subject. These generally involved minor corrections to the notes and reminders about assessments.

All students had access to the same materials. They used the same text and notes, could access the Internet site and completed the same assessments - workbooks, a test, and an exam.

## MEASURES

The measure of student achievement used in this study was a percentage score calculated just from a test mark and an exam mark, rather then the final score for the subject. This score reflects only the students' individual work (although students were meant to work independently on their workbooks a fair amount of discussion took place between students). The other advantage of excluding the workbook marks from this measure of achievement is that it avoids a bias in favour of students who actually completed all of the workbooks. Although all students were expected to complete the workbooks, many opted to forgo the workbook marks when they were pressed for time.

A careful record of attendance at lectures and tutorials was kept throughout the semester. This was used to broadly categorise students as regular or non-regular attenders. The number of workbooks completed was recorded. Information on the first year statistics and psychology marks was also obtained from the students' records. During the first lecture, students were asked to complete several questionnaires.

### *Demographics and Attitudes to the Subject*

This questionnaire included demographic information such as gender, age, time taken to travel to Swinburne and hours of paid employment. There was also a range of items relating to students' attitude to the subject. These were measured on 5-point Likert scales with items relating to interest in statistics, perceived difficulty of the subject, how useful and enjoyable they thought lectures and tutorials would be and to what extent other commitments made it difficult to attend lectures and tutorials. Single factor congeneric scales were constructed from these questionnaire items. Each scale was constructed from at least 4 items, and all showed quite good fit. (A single factor congeneric model is a confirmatory factor analysis involving just one factor.) It was thought that these scales might give some insights into why students chose to attend/not attend lectures and tutorials. Students were also asked whether they intended to regularly attend lectures and tutorials and also what grade they expected for the subject. There was an 88% response rate to this questionnaire.

*Cognitive Scales*

Previous research has suggested that performance might be related to various cognitive measures and that these measures might also differ between students who choose a conventional mode of study and those who chose to work independently.

*Rotter's Locus of Control scale* (Rotter 1966) - Wang and Newlin 2000 found that this scale discriminates between students taking conventional courses and those taking web-based courses. They also reported that for web-based students those with a more internal locus of control tended to perform better.

*Approaches to study questionnaire* (Entshistle & Ramsden, 1983). Various forms for this questionnaire have been used in studies on student achievement. The shortened 32 items version discussed by Richardson (1990) was used in this study. This form of the questionnaire incorporates four 'meaning orientation' sub-scales and four 'reproducing orientation' sub-scales.

Unfortunately, there was insufficient time for students to complete all of the questionnaires in the lecture, so the response rates on the cognitive questionnaires were not very satisfactory (50-60%) All questionnaires were completed anonymously and connected to final marks and attendance records via a student identification code, after the results were released. Completion of the questionnaires was completely voluntary.

RESULTS

Approximately equal numbers of students chose to work independently ($n = 58$) and to attend lectures regularly ($n = 62$). The achievement scores were substantially lower, and substantially more variable for those who chose to work independently ($M = 56.3\%$, $s = 16.3$) than for those who attended lectures ($M = 65.5\%$, $s = 11.1$). A t-test, modified to take account of the difference in variance, showed that the difference in achievement was significant ($t(99.4) = 3.58$, $p < 0.01$). This result is consistent with that of Wang and Newlin (2000) who found that their web-based students performed significantly worse on the exam than conventional students, but contrary to the findings of Schuyten et al. (1999) who found no significant difference in performance between those attending traditional lectures and those working independently. Studies comparing the academic performance of distance students to on campus students (Spooner et al., 1999), also consistently showed no significant differences between the achievement of distance and traditional students. These inconsistencies across studies could be explained in terms of the selection into traditional or independent learning options. In Schuyten's study, students were randomly allocated to the various conditions, but in both the present study and that of Wang and Newlin, students self-selected into the two groups.

A comparison between the fail rates of independent and traditional students shows an even more dramatic difference in performance. Of the students who regularly attended lectures, only 5% failed, but of those not coming to lectures, 31% failed, and this difference was significant ($\chi^2(1) = 14.2$, $p < .001$). Could differences in the demographic profile, attitudes, or the cognitive measures for the two groups explain these differences in results?

The means, standard deviations and t statistics for all measures which differed significantly across the groups are given in Table 1. There were some differences in the academic backgrounds of the two groups. Those who chose independent learning had significantly lower marks in first year psychology than those who attended lectures. The first statistics marks, on the other hand, did not differ significantly between the two groups of students. None of the demographic measures showed any significant difference between those who chose to attend lectures regularly and those who did not. There was no significant difference in travel time or hours of paid employment. Nor was there any difference in the percentage of mature age students, percentage of part time students or percentage of females between the two groups.

Table 1
*Comparison of Lecture Attenders and Independent Learners*

| | Independent Study | | | Regular Lectures | | | t-test Statistics |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *n* | *M* | *SD* | *n* | |
| Psychology Mark | 65.5% | 12.0 | 58 | 69.4% | 9.8 | 60 | $t(116) = 1.95$, $p = .05$ |
| Improvidence | 2.67 | 0.48 | 21 | 3.00 | 0.61 | 37 | $t(56) = 2.14$, $p < .05$ |
| Number of Workbooks | 2.90 | 1.80 | 58 | 4.18 | 1.02 | 42 | $t(118) = 4.83$, $p < .001$ |
| Expected Difficulty | 3.22 | 0.70 | 46 | 3.50 | 0.58 | 59 | $t(103) = 2.28$, $p < .05$ |
| Lecture Usefulness | 3.76 | 0.80 | 45 | 4.20 | 0.57 | 57 | $t(100) = 3.22$, $p < .01$ |
| Lecture Enjoyability | 2.68 | 0.77 | 44 | 3.22 | 0.76 | 57 | $t(99) = 3.47$, $p < .01$ |
| Tutorial Usefulness | 3.86 | 0.65 | 46 | 4.30 | 0.53 | 59 | $t(103) = 3.77$, $p < .001$ |
| Tutorial Enjoyability | 2.77 | 0.79 | 44 | 3.28 | 0.79 | 59 | $t(101) = 3.24$, $p < .01$ |
| Time constraint concerns | 2.49 | 0.82 | 45 | 2.12 | 0.83 | 57 | $t(100) = 2.24$ , $p < .05$ |

NOTE: All scales, apart from Psychology mark, were standardised to take values from 0 to 5.

Of the cognitive measures, only Richardson's 'improvidence' sub-scale (Richardson, 1990) differed significantly across the groups. Independent learners scored significantly lower on this measure. Unlike Wang and Newlin (2000), there was no significant difference in locus of control, but this may be due to the poor response rate on this questionnaire and the consequent small sample size.

The most obvious differences between the two groups lie in their behaviours and attitudes. Those who did not attend lectures regularly completed significantly less workbooks. On average, they expected the subject to be easier, expected both lectures and tutorials to be less useful and less enjoyable and expressed more concern about time constraints than those who attended lectures regularly (see Table 1).

This gives some insight into the reasons why students chose to study independently, but does not go far towards explaining why their performance is lower. In order to explore this further, correlations between performance and each of the other variables were produced.

Achievement was significantly correlated with both the first year psychology mark ($r = 0.60$, $n = 118$, $p < .001$) and the first year statistics mark ($r = 0.47$, $n = 111$, $p < .001$). The only demographic variable which was significantly related to achievement was hours of paid employment ($r = -0.22$, $n = 114$, $p < .05$). Not surprisingly, those who did more hours of paid employment tended to achieve worse results.

Only one of the cognitive measures, Richardson's 'comprehension learning' sub-scale, was significantly correlated with achievement ($r = -0.32$, $n = 66$, $p < .01$). The negative correlation here was somewhat surprising. Previous research would suggest that students interested in a deeper understanding of the material would tend to achieve better results. However, a closer inspection of the items used in this subscale suggests that it may not be measuring an interest in 'deeper understanding' at all. Items such as 'Ideas in books often set me off on long chains of though of my own, only tenuously related to what I was reading', are more suggestive of not focussing on the task at hand, rather than of looking for deeper meanings.

None of the attitudinal variables were significantly correlated with achievement, but as one might expect, several of the behaviour variables did have significant relationships with achievement. As already noted, those who attended lectures regularly tended to achieve better results ($r = 0.32$, $n = 120$, $p < .01$). There was also a significant relationship between regular tutorial attendance and achievement, although this was not as pronounced ($r = 0.21$, $n = 120$, $p < .05$). The most revealing relationship was between number of workbooks completed and achievement. The more workbooks completed, the greater the achievement on tests and exams ($r = 0.44$, $n = 120$, $p < .001$).

A multiple regression was used to investigate whether differences in performance between those who chose to attend lectures regularly and those who did not could be explained in terms of other factors. In this regression the first year psychology mark was used as a measure of academic aptitude, rather than first year statistics mark. This mark was available for more of the students, and was also more strongly correlated with achievement. The regression was run both

with and without Richarson's 'comprehension learning' scores. The results showed similar trends in both analyses, but this variable was omitted from the analysis reported here because of the large amount of missing data. The regression statistics are given in Table 2.

Table 2
*Regression Statistics for Model of Achievement*

| Predictors | Beta | Raw Correlation | Partial Correlation |
|---|---|---|---|
| Regular Lecture Attendance | 0.11 | 0.27 | 0.13 |
| Regular Tutorial Attendance | –0.01 | 0.14 | –0.01 |
| Hours of Paid Employment | –0.11 | –0.23 | –0.15 |
| First Year Psychology Mark | 0.53*** | 0.60 | 0.56 |
| Number of Workbooks Completed | 0.21* | 0.36 | 0.23 |

NOTE: * $p < .05$, *** $p < .001$, N = 111
Regular Tutorial and Regular Lecture Attendance coded 0=No, 1=Yes.

After taking into account previous academic background, number of hours paid employment and number of workbooks completed, regular attendance at lectures (or at tutorials) no longer contributes significantly. The correlation between attendance and number of workbooks ($r = 0.35$, $n = 111$, $p < .001$) suggests that the difference in performance between those who study independently and those who regularly attend lectures can be explained largely in terms of the number of workbooks completed. Those who study independently are likely to complete less workbooks and hence achieve poorer results. Note that number of hours paid employment also appears to be acting indirectly through number of workbooks completed.

Finally, it's instructive to select just those students who worked independently, and to compare the profiles of those who passed and those who failed. Descriptive statistics for measures which differ significantly between pass and fail independent study students are found in Table 3. Those who failed had significantly lower marks in both first year psychology and first year statistics subjects than those who passed. They also completed significantly less workbooks, started the subject expecting statistics to be harder and lectures to be more useful than pass students. They were much more likely to intend to go to lectures regularly. While 92% of the students who failed intended to attend lectures regularly, only 68% of the students who passed intended to come regularly ($\chi^2(1) = 3.75$, $p = 0.05$).

Table 3
*Comparison of Pass and Fail Students for Those Who Study Independently*

| | Fail | | | Pass | | | t-test Statistics |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *n* | *M* | *SD* | *n* | |
| Psychology Mark | 56.1% | 10.1 | 18 | 69.7% | 10.3 | 40 | $t(56) = 4.66$, $p < .001$ |
| First Year Statistics Mark | 61.9% | 11.2 | 16 | 72.9% | 9.3 | 39 | $t(53) = 3.44$, $p < .01$ |
| Number of Workbooks | 2.22 | 1.86 | 18 | 3.20 | 1.71 | 40 | $t(56) = 1.96$, $p = .05$ |
| Expected Difficulty | 3.67 | 0.83 | 12 | 3.06 | 0.57 | 34 | $t(44) = 2.80$, $p < .01$ |
| Lecture Usefulness | 4.18 | 0.83 | 11 | 3.63 | 0.76 | 34 | $t(43) = 2.06$, $p < .05$ |

## DISCUSSION

Many students who failed fit a common profile. They had a weak background with just a pass grade in first year statistics and a low mark in first year psychology. They thought statistics would be difficult and at the start of the semester intended to come regularly to lectures, which they thought would be useful. On average however, they only completed 2 of the 5 workbooks and only came to lectures occasionally. The results of this study suggest that it was not lecture attendance itself which made the difference between success and failure. Rather it was the ability to keep up to date with the work, as reflected by completion of the workbooks. Most students who failed showed a pattern of declining workbook completion throughout the semester. It is not clear whether lecture attendance actually helps to keep students up to date, or whether declining lecture

attendance is just another symptom of declining effort. This second possibility is suggested by the fact that most students who failed actually intended to come to lectures and tutorials regularly, but did not meet this intention.

There will always be some students who fall by the wayside throughout the semester as they fail to keep up to date with the work. All we can do is to offer as much encouragement and support as possible to students to sustain their effort. There are a few ways in which this might be done. Firstly, it could be helpful to offer strong advice for students who have a weak background, and who expect statistics to be difficult, to attend lectures regularly. Secondly, students whose performance is clearly not satisfactory at the mid-way point of the semester should be contacted and offered extra support - although past experience has shown that few students actually take up the offer, it does make a difference for those few. Finally, it might be worthwhile making the completion of the workbooks mandatory for a pass in the subject. At present, the workbooks are not seen as a high priority by some students, particularly when compared to assignments in other subjects. The 3% of marks for each workbook is obviously not sufficient incentive.

Returning to the original questions, are there some students for whom independent study is not a good idea? Yes! Predominantly, students with a weak background who drift into independent study rather than making a conscious decision to embrace it. And did our support strategies work? Only to a degree. There was a tendency for students who studied independently to not make enough use of the practice and feedback offered by the workbooks. This could be improved by making workbooks mandatory. Unprompted comments from students and comments on subject evaluation questionnaires indicated however, that the support strategies designed to assist independent study were also appreciated by students who chose to attend lectures and tutorials. Both groups of students commented that the learning guide and the subject web site were helpful in organising and directing their studies. Both groups also found that the workbooks were helpful in keeping up to date with the work and for the feedback they offered.

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