

# Aptitude Testing as a Predictor of Success: The Christchurch Experience

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## ABSTRACT

Christchurch Polytechnic has used an aptitude test to aid selection of students since 1975 and its usefulness as a predictor of success has been informally debated regularly since that time. In recent years, it has been used to assist in the selection process but achievement of a poor test result has not necessarily been used to exclude a student from beginning study. This paper examines the results of aptitude tests over a period of three years, and the subsequent performance of those students who joined the Certificate in Business Computing (CBC) programme for full-time study. Aptitude Test results are examined by section (pattern matching, mathematical reasoning, logic, words) in an attempt to find out if any one section provides a better indicator of success than the rest. The measure of success used is based on achievement of passes in the nine modules undertaken by new CBC students in their first semester of study.

Trends which are observed in this analysis suggest that at the Pass mark which has been used so far, the test does not give a valid indication of success or otherwise. Whether or not a student succeeds in their first semester is not significantly dependent on whether or not they Passed the Aptitude Test. When a higher pass mark is considered, then there is a small level of correlation between achievement of that mark in the test and subsequent success in CBC study. Results in the logic section of the test provide the best indicator but the figures show that many students who did not score well in that section were still able to succeed in their study. The ability to predict success or otherwise in CBC study by using scores achieved in the Aptitude Test as a critical indicator remains inconclusive.

### Keywords

Aptitude, predictor, success

## 1. INTRODUCTION

Christchurch Polytechnic has used an aptitude test to aid selection of students since 1975. In early years, when the number of applicants far exceeded the number of places available in the CBC programme, this measurement provided a useful tool for ranking the prospective students and admitting only those most likely to succeed. More recently it has been used in an attempt to answer the question "is this person likely to succeed at all?" when other well-recognised measures of academic ability are not available. Despite increasing pressure from management to admit as many as possible to our programmes, staff have felt compelled to be realistic when assisting students to choose an appropriate level at which to begin their education in business computing (or indeed whether to begin at all). The usefulness of the aptitude test as a



predictor of success has long been somewhat controversial and the study presented in this paper has been done in an attempt to evaluate its effectiveness for this purpose. Joyce (1998) presented preliminary data in a similar evaluation and concluded that selected sections of testing could be used to predict success for some groups of students but that other factors such as motivation and lack of disruption to studies were at least as important in determining success.

The paper describes the context in which aptitude testing is currently carried out and presents an analysis of aptitude testing administered at Christchurch Polytechnic over a three year period. The subsequent performance of students who joined the CBC programme for full-time study in 1997, 1998 and 1999 after completing aptitude tests is examined.

Testing was carried out for a total of 224 candidates of whom 121 chose to proceed with study towards CBC. The group of 121 students who joined full-time CBC study, and whose success is investigated in this study, comprised 78 who had passed the aptitude test and 43 who had failed the test. In addition, the progress of these 121 students has been analysed in terms of their performance in the four separate sections of the aptitude test.

An outline of the situations for which the aptitude test is used is included in the next section, followed by the nature of the currently used aptitude test with its scoring system. This is followed by a description of how students were declared to be "successful" for the purpose of this analysis. Results of the study are presented in bar chart form.

## **2. BACKGROUND AND CONTEXT**

All candidates who wish to embark on full-time study in the CBC programme at Christchurch Polytechnic complete a standard application form and submit evidence of academic history. School leavers who have good 6th form certificate grades (i.e., grades in the best 4 subjects total 18 or less) and others who have already successfully completed appropriate tertiary study are offered entry to CBC without further testing. The remaining applicants are asked to undertake an aptitude test which is then used to assist in the decision of whether or not to proceed with enrolment in the programme.

When advising candidates, it has regularly been stressed that the aptitude test result can provide a guide to their chances of success but is not intended to guarantee success or otherwise. The numerous other factors which are likely to influence their performance are not addressed

with this type of test. Those factors include motivation, drive and commitment as well as the ability to study effectively and balance student and private life conflicts. There are numerous examples of anecdotal evidence showing that highly motivated students can succeed despite predictions to the contrary.

## **3. METHODOLOGY**

The aptitude test was administered to 224 candidates who had applied to undertake full-time study in the CBC programme in 1997, 1998 and February 1999. Since new groups of students are able to commence study in either February or July the tests used in this analysis were therefore carried out for 5 separate intakes of students.

Subsequent course results for those who did proceed with CBC study were examined in order to determine the success or otherwise for each student.

### **3.1 The Aptitude Test**

The current test is very similar to that used by CBC course controllers at Christchurch Polytechnic since 1975. It was derived from an Aptitude Test used by International Computers Ltd in the 1960s. There are four sections and each section is administered and timed separately. For each section there is a set of instructions and for Sections 1, 2 and 4 some worked examples are included. Candidates are given a few minutes to read the instructions and in Section 1 they may attempt some practice examples which are not timed and are not counted in the final score. After the instruction to start is given, candidates complete as many exercises as possible in the allocated time for that section. Each section is collected by the supervisor before the next section is distributed.

Section 1 addresses pattern matching, Section 2 focuses on mathematical reasoning, Section 3 provides a test of logic and Section 4 tests the meaning and use of words. The entire test takes approximately 45 minutes to administer.

### **3.2 Successful Students**

Students who embark on the full-time CBC programme enrol in 9 individual courses in their first semester (half year) of study. Since our premise has been that the aptitude test may help us advise whether or not the candidate should even get started on CBC study, we have made an assumption that the first semester's results are indicative of the students' actual ability to succeed.

The aptitude test is not attempting to predict whether or not a student is highly motivated, has effective study skills, or has a personal life which allows space for successful study.

Beyond first semester study, there is even more opportunity for other factors to have a significant impact on a student's success or otherwise in the programme.

For these reasons, this paper identifies "successful students" as those who passed at least 7 of their first 9 courses.

### 3.3 Analysis of Data

Scores from the series of aptitude tests used in this analysis were recorded alongside candidate names and accumulated in a Microsoft Excel 97 spreadsheet. Results of each of the sections were recorded separately along with an overall test score for each candidate. The test has a possible maximum of 118 with a Pass mark of 60. Scores are categorised as Pass (60-69), Good (70-79), Very Good (80-89), Excellent (>89).

Data for those candidates who did not continue to full-time CBC study were removed without further analysis.

As results became available at the end of each semester, the total number of courses passed by each member of the aptitude-tested student group was recorded. All names were omitted from any raw data used in the preparation of graphs.

The findings were graphed as bar charts which focussed on a variety of ways in which the aptitude test results might be used as an indicator of future success. For each of those ways, the charts compared the number who were successful with the number who were not successful.

## 4. RESULTS

### 4.1 Aptitude Test

Of the group of 224 candidates who completed aptitude tests, only 121 proceeded with full-time study in the CBC programme. The following table shows a summary of the total number who passed and failed the aptitude test in each of those groups.

	Total	Passed	Failed	Passed %
All Candidates	224	118	106	53%
Enrolled for CBC	121	78	43	64%

Figure 1. Summary of Total Pass and Fail Numbers for Aptitude Test

In the group which continued towards CBC study, there is as expected a higher percentage of those who passed the aptitude test than in the overall group who were tested.

### 4.2 Successful Students

From the group of 121 students who studied full-time, 58 (i.e., 48%) were successful according to the "passed 7 courses" definition and 63 were not successful.

The data used for this analysis is limited to the group who had undertaken the aptitude test prior to commencing study. Data for the overall success for all students who began CBC study at the same time as this group was not collected for analysis.

### 4.3 Success and Performance in Whole Aptitude Test

Initially, data was grouped into two categories according to whether or not the students had passed the Aptitude test and their subsequent success in passing the courses was graphed. This was followed by an analysis based on whether or not the students had achieved a "Good" grade in the Aptitude Test instead of a simple "Pass".

Figures 2 & 3 illustrate the summary of those results.

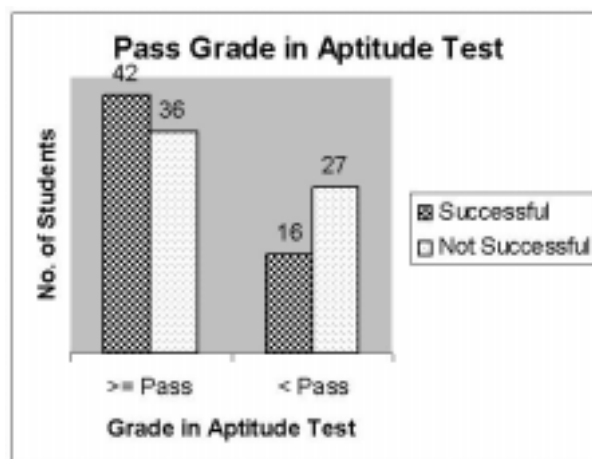


Figure2. Summary of Results for Students with Pass and Fail Grade in Aptitude Test

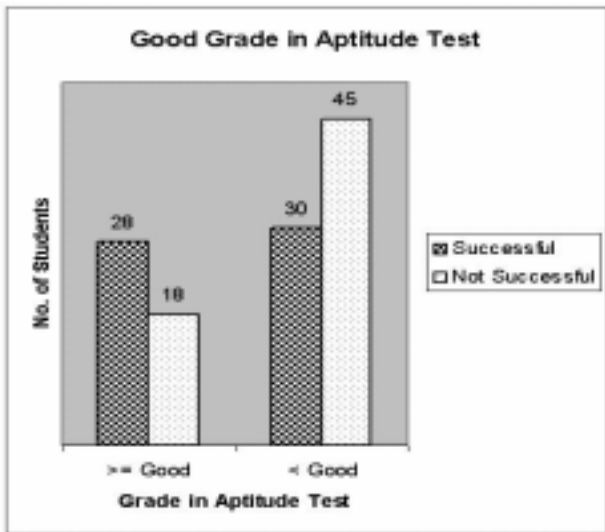


Figure 3. Summary of Results for Students with Good and Below Good Grade in Aptitude Test

There appears to be a trend which suggests that for the students who have not passed the Aptitude Test, more are unsuccessful than are successful but statistically there is very little significance in this result ( $p = 0.08$ ). When a "Good" grade is considered, then the same trend has some significance ( $p = 0.03$ ).

#### 4.4 Success and Performance in Sections of Aptitude Test

The data was also analysed according to performance in the four separate sections of the Aptitude Test.

When a Pass in each section was considered, there was very little observable difference in the numbers of students who succeeded compared with those who did not succeed except in Section 3 where the trend observed was suggestive of significance ( $p = 0.04$ ). The summaries of results for Pass Grades in Sections 1 and 3 are shown in Figure 4.

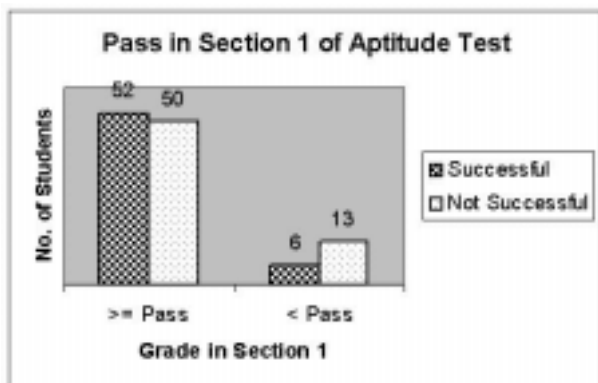


Figure 4. Summary of Results for Students with Pass Grade and Below in Section 1 of Aptitude Test

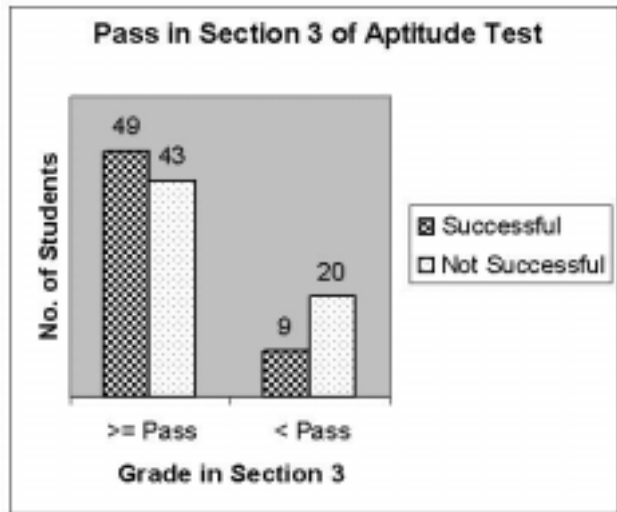


Figure 5. Summary of Results for Students with Pass Grade and Below in Section 3 of Aptitude Test

When a "Good" or better grade was considered for each section of the Aptitude Test, then with the exception of Section 3 the results show some trends but there is very little statistical significance. Summaries of results for Good Grades in all 4 sections are shown in the following bar charts. For Section 3, the result has some statistical significance with ( $p = 0.02$ ).

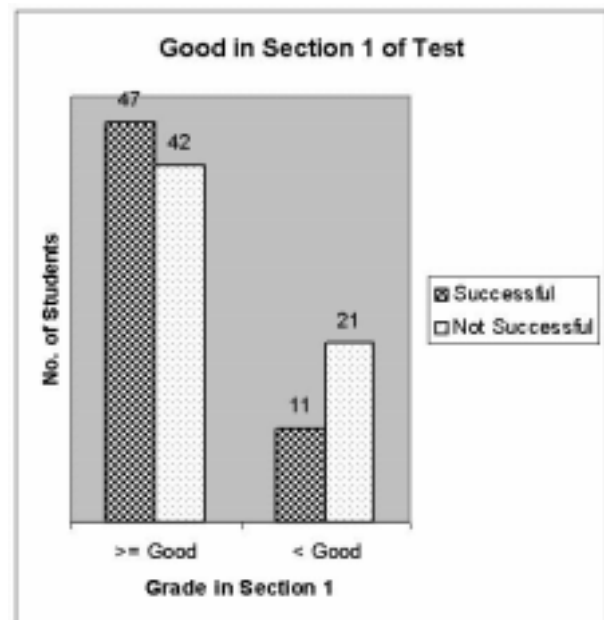


Figure 6. Summary of Results for Students with Good Grade and Below in Section 1 of Aptitude Test

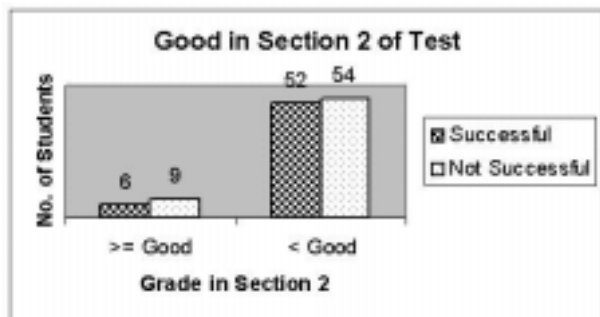


Figure 7. Summary of Results for Students with Good Grade and Below in Section 2 of Aptitude Test

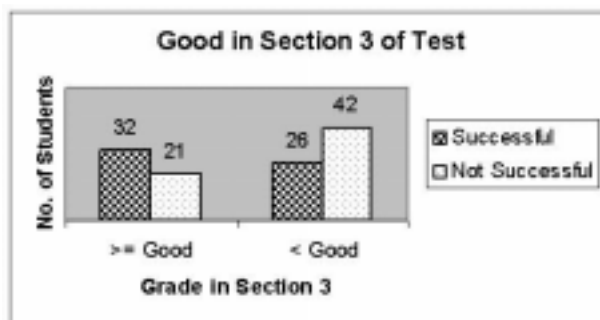


Figure 8. Summary of Results for Students with Good Grade and Below in Section 3 of Aptitude Test

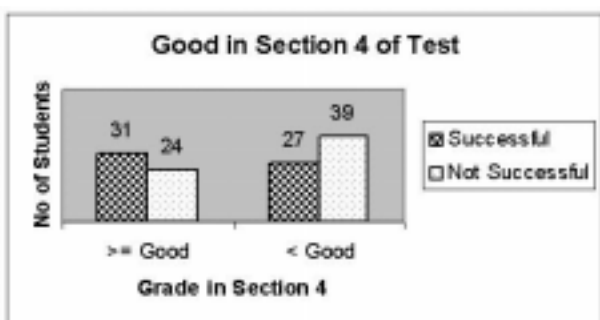


Figure 9. Summary of Results for Students with Good Grade and Below in Section 4 of Aptitude Test

There is a consistent trend evident in the groups of students who achieve less than a “Good” grade in the separate sections of the Aptitude Test. For each section, more of those “Below Good” grade students are unsuccessful in passing their courses than are successful. Conversely, in all except Section 2 (in which only a small number score Good or better) more are successful than are unsuccessful when they have achieved Good or better in the individual sections.

## 5. DISCUSSION

When considering the use of a “Pass” grade in the Aptitude Test as a predictor, it was noted that more were successful (42) than unsuccessful (36) in the group who passed the Aptitude Test but the number of unsuccessful students was still relatively high. Of the 63 students who were unsuccessful, 36 had actually passed and 27 had not passed the Aptitude Test. These figures do not give confidence to any predictions which might be based on these scores.

Trends which are detectable suggest that if candidates do not reach a score of “Good” or better then their likelihood of success on the programme is significantly less than that of candidates who achieve a higher score. However, the results do suggest that other factors may be just as important in determining success or otherwise. For example, of the 58 students who were successful, just 28 had achieved a “Good” or better score in the Aptitude Test and the remaining 30 had achieved less than “Good”. Statistically, more confidence could be expected by using the scores of “Good” in Section 3 as a predictor but even there, of the 58 successful students, 32 had scored “Good” or better whereas 26 had scored less than “Good”. If these 26 had been turned away because of the testing system, then all chances of their success would have been removed.

## 6. CONCLUSION

This study set out to establish whether or not the Aptitude Test which is being used to help predict success or otherwise for students embarking on the CBC programme is a valid and/or reliable tool to use in this context. The results suggest that the test being used at present is of dubious value if its Pass grade is used as the predictor.

A grade of “Good” or better in the test gives a little more chance of making a realistic prediction, but there is still a strong suggestion that other factors influence the success or otherwise of our students.

This analysis suggests that the current Aptitude Testing should only be offered as a broad guide in terms of its potential to predict success or otherwise. Candidates for whom there is minimal relevant background information other than a “Good” score in the test could be lulled into believing they will succeed when in fact there is almost as much likelihood of their being unsuccessful. Conversely, a lower score should not necessarily be used as a reason for discouraging an initial enrolment. The numerous other factors which influence any student’s progress in study are clearly very significant. Motivation, lifestyle, age, gender, ethnicity and socio-economic background are just a few of the factors which may influence the success or otherwise of these students and the interaction of all of these possible predictors remains a complex issue.

## 7. ACKNOWLEDGEMENTS

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## 8. REFERENCES

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