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Students' Understanding of Accounting Concepts and the Effects of a Computerised Accounting Package: Preliminary Results of an International Study

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DEPARTMENT OF ACCOUNTANCY

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STUDENTS' UNDERSTANDING OF ACCOUNTING CONCEPTS AND THE EFFECTS OF A COMPUTERISED ACCOUNTING PACKAGE: PRELIMINARY RESULTS OF AN INTERNATIONAL STUDY.

by

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THE EFFECTS OF COMPUTERISED ACCOUNTING INFORMATIONS SYSTEMS ON THE UNDERSTANDING OF ACCOUNTING CONCEPTS: PRELIMINARY RESULTS OF AN INTERNATIONAL STUDY.

ABSTRACT

This paper focuses on the use of a PC-based accounting package (Sybiz Plus rev L), to help teach accounting information systems concepts. Australian and Hong Kong students were used to investigate whether the use of computerised accounting information systems actually helped the students' understanding of accounting concepts. The students' identification numbers were used to match each students' performance before and after the Sybiz section. Accounting concepts were tested using true/false and multiple choice tests divided into five parts to identify different concepts. A questionnaire seeking demographic detail was given to the students to identify contributing variables.

There was an overall improvement in the performance of tests after the Sybiz section. These results were reflected in both the Australian and Hong Kong data. The AFTER tests of all but one test, showed an improvement to the BEFORE test. It was in the test on the topic *"Business income and adjusting entries and completing the accounting cycle"* that there was a deterioration in the students' performances. Although both data sets reflected the same trend, only the Australian data was statistically significant.

The demographic detail was not able to help explain any change in test scores of the Australian data. The Hong Kong data revealed that previous accounting education

significantly influenced the students' improved performance in the test relating to *"short-term liquid assets and inventories"*.

The most significant contribution of this research is the use of five part tests, which can allow differential performances to be detected. The five part tests are more revealing than using overall performance testing which can mask differences in performance in particular accounting concepts.

The other aspect of this research which is intriguing, is that the performance in some accounting concepts had deteriorated. This has serious implications for accounting education in general and the expectations and use of computers in accounting. The pedagogic assumptions of the use of computers in accounting and accounting information systems subjects require continuous consideration.

INTRODUCTION

There can be no denying that the technological advancement in the last 15 years has been astounding. Accounting education has also been affected by computer technology and the integration of computers in the accounting curriculum is still an evolving process (Birkett, 1987; McCall, 1988). There has been an overwhelming momentum for academic institutions, in particular for commerce faculties, to integrate computing into their degrees. It was pointed out in Bromson et al (1991), that this momentum has been accelerated by the accounting professions' reaccreditation requirements. This is demonstrated by McCall's (1988) quote of the American Accounting Association's 1985 objectives for integrating computers into the accounting curriculum being:

" 1. To teach accounting more effectively; and

2. To provide students with the prerequisite computing skills" (McCall, 1988, pg 12).

Although more computing has been inserted into degrees, the pedagogic implications of this has been unclear. Bromson et al (1991) considered that the results of empirical tests gave inconclusive and conflicting results of the effects of computers on learning accounting concepts (McKeown , 1976, Collins, 1983, Fetters et al., 1986, Dickens and Harper, 1986, Oglesbee et al., 1988 and Wilson, 1988). Part of the inconsistency rests with the fact that these experiments used different types of tests to measure achievement and different types of computers and programmes. It is no longer adequate to simply refer to *computers in accounting*, since the use of computers in accounting can include *computer-aided learning, computer simulation and modelling, computerised accounting information systems* (Bromson et al, 1991; Er and Ng, 1989). This paper focuses on the use of a PC-based computerised accounting package (with integrated subsidiary ledgers) to process transactions and produce reports, and falls under the *computerised accounting information systems* category. In this way

this paper differs from research which referred to the use of computers in general (such as the work of Orpen and Ferguson, 1991).

Bromson et al (1991) supported an approach to teaching computerised accounting information systems, which seemed to take into consideration the significance of learning theories as described by Flanagan and Stewart (1991, 1985). The Bromson et al (1991) teaching approach aimed to fulfill the following objectives:

" . develop and reinforce understanding accounting concepts,

. develop an understanding of the need for controls in an accounting computer environment,

. respond to the needs of the professional environment,

. expose students to a commercially available package" (pg 445).

This paper tests whether the first objective above is met Their approach was implemented in two institutions, one in Australia and one in Hong Kong.

It is not in the ambit of this paper to test whether students have significant differences in their learning styles, or to test which aspects of the teaching approach responds to their learning styles. At this stage the teaching approach used, intended to offer the opportunity for experiencing, observing and reflecting, forming abstract concepts and testing implications (Kolb 1976) in the expectation that this opportunity would increase the chances of inducing effective learning (Bromson et al 1991). Figure 1 represents the attempt to integrate Kolb's learning cycle with their teaching approach. At this stage, their intention remains intuitively appealing but no assertions can be made about effective learning.

This paper specifically explores changes in students' performances in a five part test of accounting concepts. The tests were given **before** and **after** a five week computerised accounting section, during an accounting information systems subject. Demographic variables which may have contributed to the changes in performances

were also collected in a questionnaire; the results of which were matched to the changes in test performance.

METHOD

The Sybiz Section and Teaching Approach

This section represented the practical side of the Accounting Information System subject where students learned to use a computerised accounting package. The package chosen was *Sybiz Plus, revision L* because it satisfied the following criteria, namely; it was a PC-based package that would run on stand-alone equipment or on a network, it was commercially available, site licence was available, data files could be maintained on floppy disks and it utilised accounting and programming controls (Bromson et al, 1991).

This Sybiz section was accompanied by teaching materials (Gerrard et al, 1989), which were specifically designed to relate the package to the topics covered in a typical undergraduate financial accounting text book. The sequence used is reflected in figure 2. The Sybiz section consisted of five consecutive weeks of lectures, workshops and assignments. Each lecture was designed to introduce abstract concepts, and demonstrate the implications of the concepts by using screen displays. The workshops and assignments provided practical or concrete experience to reinforce the lectures (see figure 1). The workshops and private study allowed students to work at their own pace.

The Students

The teaching approach described above was applied in Australia and in Hong Kong[1]. Both groups of students were doing the equivalent of a second year Accounting Information Systems subject as part of their Bachelor of Commerce degree. The prerequisite for this subject was first year accounting and the students were in their second or final year of study.

The Test

A 5-part test, consisting of multiple choice & true false questions was used. The questions came from the test questions provided for each section of a typical first year accounting text book (Needles, Anderson, & Caldwell, 1984). Neither institution was using this book in their courses. Figure 3 lists the topics of each test.

The students were given a 5-part test before five weeks of a computerised accounting information systems section. After this Sybiz section, a similar[2] but not identical, 5-part test was given to the students. The students' identification numbers were used to match each students' performances before and after the Sybiz section. Hence each student was his or her own control.

Demographic Variables

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1 The teaching approach was implemented by this author in Australia and by G Bromson in Hong Kong. Both were also involved in developing the teaching approach (Bromson, Kaidonis and Poh, 1991) and in the writing of the text book (Gerrard, Bromson and Kaidonis, 1989). Hence we (Kaidonis and Bromson) were both committed to the teaching approach and the importance of implementing it as consistently as possible.

2 A panel of experts compared all parts of the before and after tests and judged them to be similar but not identical.

It was speculated that there may have been a number of confounding variables which affected students' performances in the 5-part tests. It was necessary to identify whether other factors were contributing to any change in performances. Variables such as, student's age or previous work experience could have a confounding effect. A list of the variables that could have been contributing to the results is shown in Figure 4.

A questionnaire was given to the students to accompany the AFTER test. The students' identification numbers were used to match their answers to the demographic questions with their BEFORE and AFTER test results. Multiple regressions were fitted to see which demographic variables were associated with any particular test outcomes.

Hypotheses

The performance of each part of the 5-part test is compared, as is shown by the hypotheses below.

$H_0 1$: Students' performance in an accounting concepts Test number 1 (T1 B) BEFORE the Sybiz section is the same as their performance in Test 1 (T1 A) AFTER the Sybiz section.

performance T1 B = performance T1 A

$H_1 1$: Students' performance in an accounting concepts Test 1 (T1 B) before the Sybiz section is NOT the same as their performance in Test 1 (T1 A) after the Sybiz section.

performance T1 B =/= performance T1 A

$H_0 2$: performance T2 B = performance T2 A

$H_1 2$: performance T2 B =/= performance T2 A

$H_0$3: performance T3 B = performance T3 A

$H_1$3: performance T3 B =/= performance T3 A

$H_0$4: performance T4 B = performance T4 A

$H_1$4: performance T4 B =/= performance T4 A

$H_0$5: performance T5 B = performance T5 A

$H_1$5: performance T5 B =/= performance T5 A

$H_0$6: Students' performance in an accounting concepts Test in TOTAL (TT B) BEFORE the Sybiz section is the same as their performance in Test in TOTAL (TT A) AFTER the Sybiz section.

performance TT B = performance TT A

$H_1$6: Students' performance in an accounting concepts Test in TOTAL (TT B) BEFORE the Sybiz section is NOT the same as their performance in Test in TOTAL (TT A) AFTER the Sybiz section.

performance TT B =/= performance TT A

RESULTS

A t-test[3] was done to test whether the differences can be regarded as coming from a population with a mean of zero (implying that there had been no change from the before to the after test) or from a population with a non-zero mean. These t-tests are actually *paired t-tests* (because the raw data are *within-respondent* differences), and

3 The use of a t-test is appropriate because the raw data are differences between totals of 20 (or 100) observations, and under the Central Limit Theorem, each of these totals is approximately Normally distributed.

so variability between respondents should have been largely eliminated from the analysis.

Although 13 questions were given in the questionnaire for demographic variables, the categories were reduced to 8 (see figure 4) so that the categories could be more manageable. A multiple regression program was fitted to examine whether any of these variables had a significant effect on the changes in the before and after tests.

Australian data

Refer to Figure 5. The following hypotheses were supported, $H_1 1$, $H_1 2$, $H_1 3$, $H_1 4$, $H_1 5$, $H_1 6$. That is, there was a significant difference between the before and after performances in Test 1, 2, 3, 4, 5, and total performance. However, the AFTER performance was **better** than the BEFORE test for all tests except test 2, where the AFTER test was **worse** than the BEFORE test. The low probability scores show that the differences were too significant to be due to chance alone.

Only for test 3 did the regression model explain much of the variation; here the overall F-value for the model was significant at $p = 0.0604$, while for the other tests the p-values were greater than 0.6. For test 3, the individual predictor variables *age, part-time or full-time enrolment* and *previous computing experience*, each had p-values between 0.05 and 0.10. Other demographic variables had p-values greater than 0.1. None of these variables would warrant attention if the usual criterion that a term must be significant at $p < 0.05$ if it is to be worthy of mention.

Hence one can conclude that none of the demographic variables, when fitted into a multiple regression analysis, were significant at the 5% level of significance. Accordingly, none of the demographic detail help to explain why there was change in test scores before and after the introduction of an accounting package.

Hong Kong Data

Refer to Figure 6. The same pattern of results was revealed as the Australian data. The AFTER tests 1,3,4,5, and 6 were **better** than the BEFORE tests and for test 2, the AFTER test was **worse** than the BEFORE test. However, the difference in test 2 is **not** significant at the 5% level of significance (whereas the Australian data the difference is highly significant).

For none of the changes in score, was the overall regression model of any significance in explaining the observed variation; all p-values were greater than 0.4. The only variable that proved useful was previous accounting education, which had a p-value of 0.0627 for test 3 change and a p-value of 0.0048 for test 5 change. No other predictor variable gave a p-value less than 0.1 for any changes, and previous accounting experience did not give a p-value less than 0.01 for the remaining changes. Hence previous accounting experience is highly significant in helping to explain the change in scores from Before and After for test 5, marginally significant in its explanation of the changes in scores for test 3, and not significant in explaining the variation in the other changes in scores. No other predictor variable was of any significance.

That is, previous accounting education can be considered to be marginally contributing to the understanding of accounting for merchandising operations, accounting systems and special purpose journals (test 3) and definitely contributing to the understanding of short-term liquid assets and inventories (test 5).

The demographic detail seemed slightly more useful with the Hong Kong data than the Australian data.

DISCUSSION OF RESULTS AND LIMITATIONS

At first glance it can be said that both the Australian and Hong Kong students improved in the AFTER tests in total. It is very tempting to say that the results indicate that the use of the Sybiz Plus accounting package, accompanying teaching material and teaching approach have had a positive influence in the students' understanding of accounting concepts. However, it must be stressed that the results are encouraging rather than convincing.

In both the Australian and Hong Kong data, there was an overall improvement with their performances. Yet, there was a surprise in the results of test 2, where the students' performance had deteriorated rather than improved. There is no apparent reason to expect any tests to be different from the overall tests. If the overall improvement is in spite of, rather than because of, the Sybiz section, then why would the results of test 2 be so different? Although this experiment has identified more questions to ask, it has highlighted that overall testing of student performances can mask interesting or surprising results in particular aspects of accounting. Hence using a 5-part test, which distinguished topics to be tested, was more revealing. The overall test results obscured observations which are worth highlighting and investigating.

For test 2 (*Business income and adjusting entries and Completing the accounting cycle*), both groups did worse, although the Hong Kong data was not statistically significant. Nevertheless, one does need to ask why students are performing worse in a topic which was covered by their first year accounting. It may be that this section is one which needs more practice in order to reinforce the concepts and techniques in test 2. It is possible that the Sybiz section did not provide the students with more experience or practice in the topics of test 2, but did provide experience and practice for the other topics. Another possibility, is that other concurrent or subsequent

subjects (to first year accounting) do not offer that reinforcement. In any case, there are pedagogic implications worth investigating.

Perhaps it is not surprising that previous accounting experience is related to the outcomes of test 5 of the Hong Kong data. Test 5 tested short-term liquid assets and inventories, which were the last concepts tested. One explanation possible for this observation, is that students with more experience in accounting would be better students and that they would be more likely to reach the end of the tests. If this is the case, then any impact of the computerised accounting may be obscured or irrelevant. However, it is surprising that the Australian data did not reflect the same trend as the Hong Kong data, given that similar patterns were evident with the other test results.

Further analysis is required to ascertain whether the impact of the computerised accounting section was different for students who might be described as "poor" or "good" students, with respect to their performance in accounting. Perhaps poorer students were helped or hindered more than good students? If such a difference can be demonstrated, what are the pedagogic implications?

Other questions yet to be explored relate to the differences in student learning styles? Perhaps computerised accounting helps or hinders students of particular learning styles. What, if any, cultural differences are related to learning styles? What can be said about the differences and similarities between the Australian and Hong Kong data?

This experiment used a specific computerised accounting package, Sybiz plus rev L. It may be that the results are more indicative of using an accounting package, than necessarily using this specific accounting package. The general improvement in student performance may be in spite of the Sybiz section. The use of computers may change or improve students' attitude toward accounting (Abraham et al 1987, Orpen

and Ferguson, 1991) and it is this increased interest that helps to improve performance. It would be interesting to compare the results with a different accounting package.

CONCLUSIONS

The discussion above suggests that there is a positive influence of the 5 week Sybiz section, on the understanding of accounting concepts. The first objective of the integrated approach to teaching computerised accounting information systems of Bromson et al (1991), seem to have been met.

It is important to note that the results are encouraging rather than conclusive. This is due to the differential outcomes in the test results. Not all topics were improved after the sybiz section. The diminished performance in the topic *business income and adjusting entries completing the accounting cycle* (test 2) was seen in both data sets, although the Hong Kong difference was not statistically significant. The surprising results raises questions about first and second year accounting subjects as well as questions about the use of computerised accounting information systems.

Another curious result was that previous accounting education influences the understanding of some topics especially the understanding of *short-term liquid assets and inventories* of the Hong Kong students. There were statistically significant duplications of this influence with the Australian students' results. The differences and similarities between the Australian and Hong Kong data require further investigation in order to better understand the pedagogic implications of the use of computerised accounting information systems.

The use of the 5-part test was able to show which, if any, aspect of accounting was influenced by particular demographic detail or the Sybiz section. Although the results so far are inconclusive, the use of the 5-part test is significant.

The most significant contribution of this research is that overall performance testing can mask differences in specific aspects of accounting concepts. Hence it is imperative to use tests which can allow differential performance to be detected.

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Figure 1 AN APPLICATION OF KOLB'S LEARNING CYCLE TO THE TEACHING APPROACH

(From Bromson, Kaidonis & Poh, 1991)

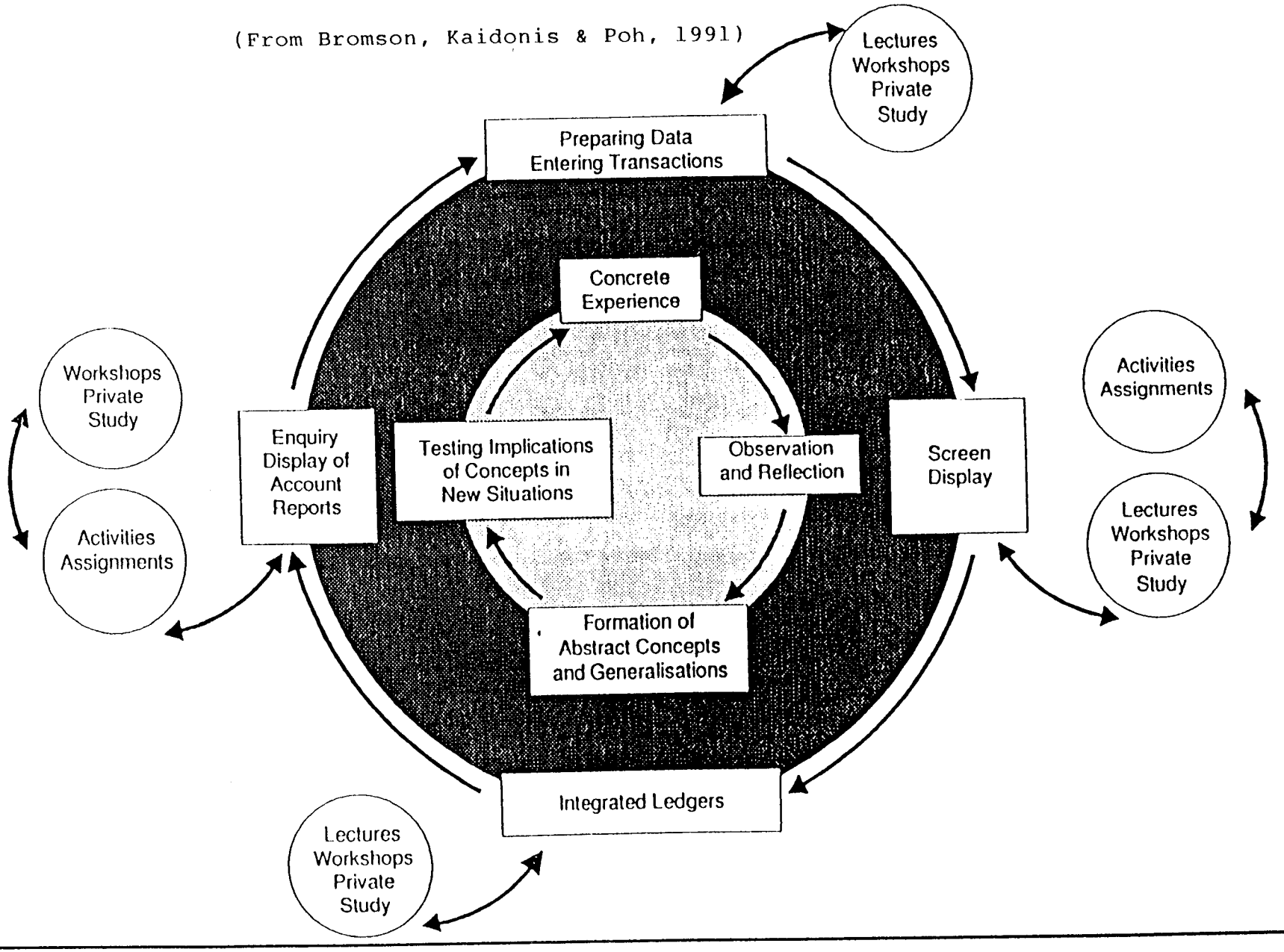

Figure 2 SEQUENTIAL APPROACH TO TEACHING COMPUTERISED ACCOUNTING

(The approach adopted by Gerrard Michael J, Bromson Garry and Kaidonis Mary A, *Computerised Accounting Using SYBIZ*, Melbourne: Prentice-Hall, 1989)

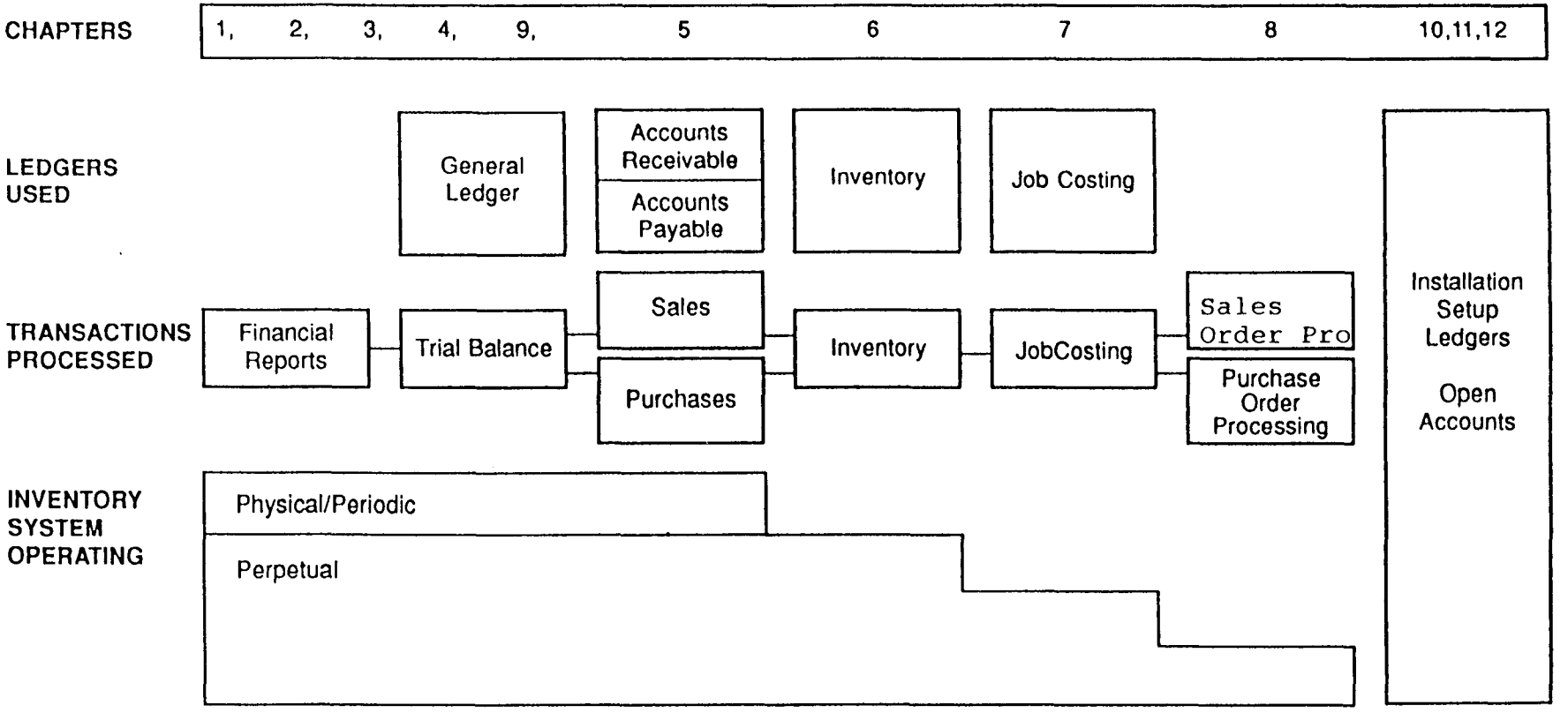

FIGURE 3: CONTENT OF TESTS

Test	Chapters in Needles et al (1984)	Concepts
1	1	Accounting in Business and Society
	2	Accounting as an Information System
	3	The Double-Entry System
2	4	Business Income and Adjusting Entries
	5	Completing the Accounting Cycle
3	6	Accounting for Merchandising Operations
	7	Accounting Systems and Special-Purpose Journals
4	8	Internal Control and Merchandising Transactions
	9	General-Purpose External Financial Statements
5	10	Short-Term Liquid Assets
	11	Inventories

FIGURE 4: DEMOGRAPHIC VARIABLES

DESCRIPTION

Previous accounting education

Previous computing experience

Work experience (not specifically accounting in nature)

Age

Enrollment part-time or full-time

Secondary education entry score

Year of study (eg final)

Accounting work experience

FIGURE 5 : AUSTRALIAN RESULTS

1	2	3	4	5	6
No Obs	Test	Mean A-B	Std Dev	Prob	t-Test
127	1	2.086	1.628	< 0.0001*	14.442
127	2	-1.835	2.429	< 0.0001*	-8.511
123	3	0.846	2.909	0.0016*	3.224
95	4	2.011	2.796	< 0.0001*	7.008
50	5	1.880	3.192	0.0001*	4.165
127	TOTAL	4.709	9.103	< 0.0001*	5.829

* significant

FIGURE 6: HONG KONG RESULTS

1 No Obs	2 Test	3 Mean A-B	4 Std Dev	5 Prob	6 t-Test
182	1	2.489	1.678	< 0.0001*	20.014
181	2	-0.282	2.627	0.1508	-1.443
181	3	0.674	2.285	0.0001*	3.968
180	4	2.861	2.334	< 0.0001*	16.443
178	5	0.623	2.568	0.0014*	3.239
182	TOTAL	6.264	6.191	< 0.0001*	13.647

* significant

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