An Examination of Vendor-Based Curricula in Higher and Further Education in Western Australia

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Abstract

Vendor-based curricula are becoming increasingly prevalent in two-year college (Technical and Further Education (TAFE) courses and in University programs in Western Australia. This reflects a world-wide trend in the provision of such programs; for example, in October 2003 Cisco Systems reported that there were over half a million students enrolled in Cisco Networking Academies in 150 countries around the world. In Western Australia, vendor-based curricula, such as the Cisco Certified Network Associate (CCNA) program, the Cisco Certified Network Professional (CCNP) program and the Microsoft Certified Systems Engineer (MCSE) program are offered for credit in TAFE Engineering and Information Technology (IT) Diplomas and in Bachelor and/or Masters Degrees in three of the five universities based in the State. In this paper we seek to examine the reasons why students enroll in the courses, and what career benefits they believe will accrue as a result of their studies. The paper will conclude with an evaluation of the strengths and weaknesses of offering curriculum over which universities and college have no control of content and standards.

Introduction

According to Nelson and Rice, "…*in today's business world the ideal employee has three critical components: education, certification and experience…*' [17]. Traditionally the main task of universities, and their major area of expertise, is the provision of education. Experience is difficult for students to obtain and its provision is likely to become a contributing factor in their selection of courses [1, 8, 14]. Certification has been addressed by the industry itself. Major IT companies are now endorsing training specifically tailored to the use of their product lines. These include companies such as Cisco, Microsoft and Novell. These companies have implemented [2, 5, 12], or have endorsed their own certification programmes [16]. Such qualifications are known as 'Vendor Certifications' [7, 10, 15]. Units that incorporate Vendor-Based Curricula (VBC) are very different in nature to the traditional offerings of the university sector. Hornbaker notes that:

"Over the years, vendors have created their own certification programs because of industry demand. The demand arises when the marketplace needs skilled professionals and an easy way to identify them. Vendors benefit because it promotes people skilled in their product. Professionals benefit because it boosts their careers. Employers benefit because it helps them identify qualified people" [10].

The introduction of these certifications has forced universities and Technical and Further Education (TAFE) colleges within Australia to re-examine the content and methods of delivery of their units. This in turn has led to the adoption by many educational institutions of VBC, where the curricula are under the control of the vendors and not the institutions themselves. It should however be noted that the form of delivery or assessment is not prescribed by the vendors, although the educational institutions must conform to the vendors' quality control measures. A major player in the area of internetworking vendor based education and training is Cisco Systems. The Cisco Networking Academy Program (CNAP) is offered online in 150 countries, in most major languages, around the world. On 18 December 2003, the Academy website reported that there were 454,657 students enrolled in 10,236 academies in 150 countries around the world [4]. The CNAP offers courses in networking, computer hardware and operating systems, Java, Unix, Web design, wireless networks and security. For many of its programs, Cisco has available textbooks that map to and supplement the CNAP Web-based content [19, 20]. Cisco's quality control procedures mandates that all of the users of such curricula, the teachers, lecturers and trainers, are required to attend and pass "train-the-trainer" sessions prior to delivering the material to students. The adoption of Cisco VBC can result in a number of advantages for participating academies:

- The material is supplied free of charge to participating educational institutions worldwide.
- Course material is provided on-line essentially 24 hours a day for seven days a week, and is supplemented by a large selection of books [12, 13, 9, 18], simulators, examination questions and other learning material.
- The material is continually updated to reflect rapid technological change.
- Laboratory equipment is provided at substantial discount.
- Equipment provided through the program can be used for other, non-vendor based units, and for research purposes.
- Staff are trained and up-skilled through required train the trainer courses.
- The hierarchical structure of participating institutions means that staff training and support can usually be provided locally to any new academies.
- A strong sense of community and cooperation is developed among participating institutions and their staff.
- The globalization of the program means that students can overcome study interruptions caused by international or inter-state relocation.
- The course is provided on-line and in several major languages.
- A major component of the program is hands-on training.
- The programs reflect the reality of the industry, in that for example internetworking is carried on Cisco equipment, Web design uses Adobe software, and Unix training is undertaken using Sun Solaris [4].

There are of course a number of potential problems associated with the provision of VBC within a traditional education format. These include:

- Resistance to the inclusion of what many educationalists classify as essentially training rather than education. This ongoing debate is unlikely to be resolved in the near future. Denning notes that:

  "*Learning the professional practices of a speciality of information technology is every bit as important as learning the intellectual core of computing. The mark of a well educated professional will be a balance of the two, and perhaps through partnerships and training companies. The current academic inclination to disdain skills-specific training does not fit a profession*" [6].

- Each unit of a VBC generally requires more time than is available under the university course structure as reported. For example, in one university in Western Australia, four hours per week for 12 teaching weeks, for a total of 48 student contact hours, are allocated to deliver a CNAP program that Cisco recommend should take 80 hours.
- Universities and colleges may believe that they will lose control of the material delivered to satisfy a particular unit.
- Although laboratory equipment is provided at significantly discounted rates, the purchase of such equipment can place heavy demands on already stretched educational institutes' budgets.
- There is large amount of material for students to learn, a lot of which is knowledge recall.
- Since only vendor-certified staffs are permitted to deliver the material, schools lose some flexibility with respect to allocation of staff to units. Of course from a quality control perspective, this must be regarded as a benefit to the students.
- The accusation may be levelled that VBC units emphasise vendor specific solutions at the expense of a solid grounding in underlying theory.

The Questionnaire

Given the above lists of potential advantages and disadvantages, we sought the opinions of students enrolled in units delivered using VBC in colleges and universities where these units are taught. The student survey was administered anonymously, and collected in such a manner that students' anonymity was guaranteed. The authors administered the questionnaire to four groups of students:

- CCNA students at a university in Western Australia (WA). This group complete the four Cisco semesters over two university semesters, for a total of 96 hours contact time (48 hours per semester). There are no entry prerequisites, and this permits cross-faculty and cross-institutional enrollment. This method of delivery requires the students to complete a significant amount of self directed study. For example, students are required to read curriculum in their own time, and use class contact for condensed curriculum-based lectures, practical exercises, and formative on-line quizzes and tests. The unit is assessed by a hands-on, competency-based test, assignment and a written final paper.

- CCNA students at a TAFE (two-year community college) in WA. This group complete the four Cisco semesters over two college semesters, for a total of 160 hours

contact time (80 hours per semester). This college also has entry prerequisites in electrical and electronic theory, mathematics and data communications. The units are assessed using the Cisco on-line final tests and a competency-based practical test.

- CCNP students at a university in WA. This group completes one CCNP unit a university semester, for a total of 288 contact hours for the four semesters (48 hours per semester). The entry prerequisite is passes in the CCNA-based units (but not necessarily the certification examination), or a CCNA certification. The units are assessed by a hands-on, competency-based test and a written final paper.
- CCNP students at a TAFE college in WA. This group completes one Cisco semester per TAFE semester, for a total contact of 320 hours (80 hours per semester). The prerequisite is CCNA certification or a pass in the TAFE CCNA course. This course has no college credit, and no internal assessment. These students pay full fees, and their objective is to obtain CCNP certification, although the students complete several case studies. This student population is much smaller (25%) of the populations surveyed in the other three groups.

Student Survey Results

The questions were grouped under the following topics:

1. Reasons for studying the unit:

Table 1

To Obtain University/College credit (by percentage, rounded)						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	6	0	13	56	19	6
CCNA TAFE	18	24	12	29	6	12
CCNP University	0	5	10	55	30	0
CCNP TAFE	0	20	0	40	0	40

Table 2

To obtain certification (by percentage, rounded)						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	13	0	13	44	31	0
CCNA TAFE	0	0	6	12	82	0
CCNP University	0	5	20	45	30	0
CCNP TAFE	0	0	0	0	100	0

Table 3

To add value to my degree/diploma (by percentage, rounded)						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	0	0	0	50	50	0
CCNA TAFE	0	0	24	47	29	0
CCNP University	0	0	5	25	70	0
CCNP TAFE	0	0	0	0	60	40

Some interesting points arise from Tables 1 to 3:

- Although CCNP TAFE students (fee for service) are primarily interested in certification (100%), and know that there is no college credit for the course per se, the results may reflect awareness of the fact that it is possible to obtain university and college credit when supported by the certification exam.
- Only 36% of TAFE students actively seek college credit, but 100% seek certification. This may reflect the fact that the survey group were an evening class group, and as such are more likely to be selecting classes with a view to furthering their employability.
- All groups believe that this training will add value to degrees/diplomas, although the CCNP TAFE and CCNA TAFE groups have significant percentages that are either neutral or believe the question not applicable. This may again reflect the industry focus of these two groups.

2. Benefits of studying VBC:

Table 4

Studying in this course has not improved my understanding of other topics in computing.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	13	50	13	19	0	6
CCNA TAFE	12	76	6	6	0	0
CCNP University	15	55	15	10	5	0
CCNP TAFE	20	60	20	0	0	0

Two points arise from Table 4:

- Most students in all groups believe that studying the material in their program has improved their understanding of other topics in computing. Interestingly, this is true for the students in both CCNP groups, who must have completed significant study to reach that level.
- Some students in the University CCNA group believe that this question does not apply. This may be an indication of the fact that there are no prerequisites for the course, and is offered as an optional unit to all students. There have been cases of performing arts students on other hands-on computing and networking units, and such students might have little or no knowledge of these topics to be improved.

Table 5

Studying in this course has improved my understanding of other topics in networking.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	0	0	6	63	25	6
CCNA TAFE	0	0	0	71	29	0
CCNP University	0	0	5	65	30	0
CCNP TAFE	0	0	0	40	60	0

Table 5 shows that the vast majority of students in all groups believe that the CNAP courses improve their understanding of other topics in networking, although again a small percentage of CCNA University students believe that this question does not apply.

Table 6

I am confident that I could use the knowledge and skills I have learned in this course in a work environment.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	0	6	6	50	31	6
CCNA TAFE	0	0	0	65	35	0
CCNP University	0	10	10	40	40	0
CCNP TAFE	0	0	0	20	80	0

The authors regard the results of the question in the above Table 6 as highly significant. Improving employment prospects is the predominant reason students undergo university education [3] (Campus Review, 1996). Furthermore, students have noted the importance of the ability to apply knowledge in the workplace [11](Kelly and Else, 1996). Furthermore, Table 6 shows that at least 80% of students agree or strongly agree that they are confident of their ability to use their learning in a work environment, which indicates student opinion of value of this program.

Table 7

The course strikes the right balance between the underlying theory and vendor specific material.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	0	6	25	50	13	6
CCNA TAFE	0	6	41	53	0	0
CCNP University	0	5	10	70	10	5
CCNP TAFE	0	0	0	100	0	0

A major concern of academics has been a perception that VBC emphasises vendor specific skills and knowledge at the expense of underpinning theory. The results from Table 7 show that the students believe that this is not the case. It may be argued that students are least able to comment on their lack of knowledge – how can they identify that which they do not know? However, if the students are required to carry out complex internetworking exercises as required in these programs and lack the underpinning knowledge, they cannot complete the task. The results for the question in the above table indicate that across all groups a majority agree that the balance is correct. It should be noted that both CCNP groups, who could be regarded as a more sophisticated population, have significantly higher levels of agreement than the CCNA groups.

3. Students satisfaction with course:

Table 8

I will not recommend this course to other people						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	13	69	0	6	6	6
CCNA TAFE	6	94	0	0	0	0
CCNP University	15	75	5	0	0	5
CCNP TAFE	80	20	0	0	0	0

The authors used this question to judge students' levels of satisfaction with the courses. Table 8 shows that in all groups an overwhelming percentage indicated that they would recommend the course to others.

4. Comparison of the VBC courses to non-VBC courses at the same level:

Table 9

The vendor-based course needs more of my time than other courses.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	6	0	19	44	25	6
CCNA TAFE	0	12	12	47	24	6
CCNP University	0	10	5	55	15	15
CCNP TAFE	0	40	20	0	0	40

Table 9 shows that CCNA University students, CCNA TAFE students, and the CCNP university students have provided similar responses to this question. In all three cases, the vast majority (around 70%) believe that the courses require more time than other courses from their respective institutions at the same level. In all three cases, there is a significant percentage of students to whom the question is not applicable. These are likely to be students enrolled in a single unit. The CCNP TAFE students are unlikely to be enrolled in other courses.

Table 10

The vendor-based course is harder than the other courses.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
CCNA University	6	13	44	31	0	6
CCNA TAFE	0	12	29	29	18	12
CCNP University	0	20	25	45	0	10
CCNP TAFE	0	0	40	20	0	40

Table 10 responses show a range of opinions, although leaning towards agreement.

Currently the authors are undertaking further research involving staff and faculty teaching VBC and non-VBC networking units.

Conclusions

Although VBC can present potential problems not present in more traditional university and TAFE units. There are many possible benefits that can arise from the incorporation of VBC. Many students believed that VBC- based units improved their prospects of gaining employment in the networking industry. Also a majority of students believed that studying on a vendor-based course improved their understanding of other topics in networking, were confident that they could use the knowledge and skills learned in a work environment and believed it added value to their degree or diploma. Overall the student response to VBC was very positive. VBC can involve extra expense for institutions in the form of equipment purchasing requirements and the cost of staff training. There is also an added restriction of the equipment to use trained staff to deliver VBC.

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