

# UNIVERSITIES TEACHING COMPANY-BASED COURSES: SUPPING WITH THE DEVIL?

**John Colville**

Faculty of Information Technology  
University of Technology, Sydney<sup>1</sup>  
Broadway, NSW, Australia  
colville@it.uts.edu.au

## **Abstract**

A number of universities are now delivering either whole programs, or sequences of subjects, provided by major commercial companies. For example, in the ICT area this includes programs prepared for, or syllabi defined by, Microsoft and Cisco. This paper looks at a number of the dilemmas involved with the decision by a university to deliver such courses.

## **1. Introduction**

A number of universities are now teaching either whole programs<sup>2</sup>, or sequences of subjects, provided by major commercial companies. For example, in the ICT area this includes programs prepared for, or syllabi defined by, Microsoft (Rada, 1999) and Cisco (Odom 2004). These companies have either implemented (Adelman 2000), or have endorsed, certification programs (Microsoft 2000). This paper examines whether this trend is a desirable, or unavoidable. It looks at a number of the ethical dilemmas involved with the decision to deliver such programs. The discussion is based upon the experience of the author as a member of a Cisco Networking Academy for a number of years.

Some of these issues were addressed by Koziniec and Dixon (2001). Watts questioned the implications for the universities and their autonomy if professional bodies competency standards were incompatible with the educational processes (Watts 1992) cited in (Reid 1996, p.134). Veal investigated company-based computer and network curricula (Veal 2003). This paper extends these discussions. Section 2 describes the Cisco Networking Academy Program. In Section 3, a number of reasons are advanced as to why universities might run company-based programs. The question of whether delivering company proprietary program is a suitable role for a University, is addressed in Section 4. Sections 5 and 6 examine whether such material is suitable for delivery at a university, and whether the company-based material can be delivered solely as it is offered by the company. Section 7, the paper discussed how a university which delivers such programs, can distinguish itself from other institutions which are also delivering the same material.

A number of years ago, a tertiary institution had a crest which contained three silver spheres above a chevron and an open book. The three spheres were meant to represent the three original faculties of that institution, the chevron a stylized bridge and the book a symbol of learning. Unfortunately,

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<sup>1</sup> The genesis of this paper was developed while the author was visiting Faculty of Information Technology, Monash University.

<sup>2</sup> The terminology used in this paper:

**Subject:** A single 'unit of instruction' which is assessed separately from other subjects. A full time student would be expected to attempt about four subjects per semester.

**Program:** A sequence of units, normally preparing students for a qualification, either from industry or from a university

**Course:** A program leading to a university award.

in monochrome, the spheres bore more than a passing resemblance to the three balls symbol of a pawnbroker's shop. That led to the suggestion that the institution's motto should have been "Pawning your intellectual integrity".

## **2. Cisco Networking Academy Program**

The Cisco Networking Academy Program (CNAP) (Cisco 2004) provides online access to a range of quality teaching materials. The material is provided in a number of semester subjects, the content of which is prepared as a number of web pages. Each subject is divided into a number of Modules. Within each Module there are a number of topic pages. Each page contains some text, supported by one or more diagrams. Many pages contain associated laboratory work and/or web links to other information on that topic.

Each module contains an online multiple choice assessment test. In each subject, Cisco requires, among other things, that students reach an acceptable level in an online final test. As the programs progress, increasing importance is attached to a practical test covering the skills of each subject.

The program organises academy institutions into a hierarchy, ranging from Local Academies at the lowest level, through Regional Academies and Cisco Academy Training Centers (CATC) to Super CATCs. All staff who intend to conduct Cisco-based classes must be trained to deliver those classes by staff from an Academy one or more levels higher up in the hierarchy. Students in Local Academies range from students in upper levels of high schools through the technical and further education (TAFE) system to some universities. Some Academies are directly part of these institutions while others are run separately by the consulting/external education arms of the institutions. A small number of commercial for-profit colleges are also Academies.

As part of being an Academy, an institution undertakes to support this material with a major hands-on component of training. In a normal set up, each week's formal introduction to a topic (lasting, typically, about half an hour) is supported by three or four hours of practical work. An institution's agreement with Cisco also requires that Academies deliver the complete syllabus for each particular subject. However Academies are welcome to include other material in their subjects, as they see fit.

The first program offered within the CNAP is the Cisco Certified Network Associate (CCNA) qualification. The CCNA is a four semester program which is held in high regard as an introductory level qualification into industry. Completing the four Cisco Semesters does not automatically give the student a CCNA qualification. However, it does ensure that the student has the requisite skills to pass the, separately administered, CCNA examination. The student who has completed an Academy's CCNA program should have the ability to install and maintain a medium sized Local Area Network (LAN), and to connect it to a Wide Area Network (WAN). The CCNA qualification is followed by a further four semesters leading to the externally examined Cisco Certified Network Professional (CCNP) qualification.

In general, when high schools run the CCNA program, they run either the first one or two semesters, or all of it. (To some extent, the amount provided depends upon the level of recognition of these subjects by the relevant State schools authorities.) A number of TAFE colleges run the whole CCNA program. In addition, one Australian college has been designated a Super CATC. As such, they run both CCNA and CCNP programs for students and for instructors.

The University of Technology, Sydney's (UTS) Faculty of Information Technology (FIT) has been running Cisco's CCNA and CCNP program since 1998. Since that time, students in our graduate coursework program in Internetworking have been required to study the entire CCNA program, and have had the opportunity to complete the CCNP program. Since the start of 2002, all of FIT's IT

undergraduate students have been required to complete part of the CCNA program, and given the opportunity to complete the rest of that program. Students from a number of other courses can also take some, or all, of the CCNA program.

### **3. Why do institutions run these programs?**

There a number of reason why an institution might choose to run these programs. The courseware for these programs is, generally, of good quality. (A short critique of the Cisco material and its assessment is given in the Appendix.) There is often the perception that such programs, because they are online, are better in some way. It is also feasible to update the material more frequently than happens with textbooks. So the material is less likely to get out of date than with a textbook (Fage, et al. 2000). Cisco have taken advantage of this flexibility. They have also reacted to feedback from instructors who have been using their material. Their program has had two major (and a number of minor) version changes since it was launched in 1997.

In addition, there is the value added to a normal university program, in that teaching these programs includes preparation of the student for an external, and industry, recognised qualification. In this sense, it parallels gaining a degree which also qualifies the student for accreditation by a professional society.

Institutions are under constant pressure to use their money more effectively. Sometimes an institution may be tempted to move to such materials because they are perceived to be cheaper than preparing the material from scratch. However, this neglects the costs associated with the training of staff to present the material, and the purchase of equipment and software to support these programs.

A minimal equipment package purchased from Cisco with Academy discounts costs about \$A 10400; a more flexible package costs about \$A 18000 (Cisco 2004). This provides a set of six routers and their associated equipment and software, and one year's support. FIT has chosen to provide each laboratory with equipment corresponding to four sets of the larger package, plus some extra equipment. The extra equipment includes an AdTran 550 WAN emulator which comes in two relevant versions, one which is useful for some of the later parts of the CCNA program, and a model which also is useful for the CCNP program (Adtran 2004). These cost about \$A 6200 and \$A 8000, respectively. This implies a cost of about \$A 80000 for equipment per laboratory.

To this must be added the cost of a laboratory of personal computers, and the provision of sufficient permanent cabling and linkage cables. Typically, students need two links from each personal computer to the routers. Also they require external connections to be able to access the online course material and the module tests.

An alternative, less satisfactory, reason for running such programs may be that it is easier to pick up a package and run with it, rather than for an instructor to prepare the material himself, from scratch.

### **4. Is delivering company proprietary programs a suitable role for a University?**

In the late Middle Ages, many universities broke away from being church-based institutions. Since then, university academics have vigourously defended their right to independence from external influences. Running company-based programs can be seen as a challenge to this independence because it requires the university to submit to a syllabus, and operating rules, imposed by the company.

Another consideration is whether conducting such company-based programs is a suitable role for a university. That depends upon what is seen as the proper roles of a university. These are very different in nature from the traditional offerings of the university sector (Montante and Zahira,

2001). Most universities would define their tasks as “teaching and research”. This glib answer does not really explicate things sufficiently. Instead, it leads us to ask what each of these terms mean, especially ‘research’. If research is used in a narrow sense to mean, purely, the production of new knowledge, any university ‘research’ in *any* applied area is automatically excluded as a valid activity<sup>3</sup>.

Using a somewhat less restrictive definition would still lead people in universities which are largely ‘research-centred’, to argue that their teaching must be guided by their research. With this definition, the teaching of company-based programs would be rejected because the impetus is not coming from the instructors’ research. However, even at such institutions, staff are still usually required to deliver introductory subjects, in which the linkage to ‘pure’ research is only tenuous.

In a more applied, or technological, university the decision is less clear. A number of issues then arise. If ‘research’ is used in the wider sense of developing applications, then company-based programs can have greater relevance, especially if these programs are linked to components which extend beyond the boundaries of the company’s program material. If research is used in the sense of teaching students how to ‘research’ i.e. to learn by discovery, there can be a much better justification for using company-based programs, so long as the material is not delivered in a didactic, closed way, which discourages students from enquiring into new phenomena.

## **5. Is company-based material suitable for a university?**

Deciding whether material is ‘suitable’ for study at a university depends upon the perceived role of a university. The issue splits into a number of subordinate questions. Is the material at an intellectual level acceptable for teaching at a university? Should universities be teaching vocational-based programs? How much does delivering material dependent on the company’s products make the institution beholden to the company? Another, similar relationship is between a university and the recognition of its courses granted by external, professional bodies – like the Australian Computer Society or the Institution of Engineers.

It can reasonably be argued that, in an applied university, students must acquire competence in a range of relevant skills, as well as being involved with pure intellectual enquiry. Often the relevance of these skills depends upon the ethos of the field. For example, in some humanities areas gaining relevant practical skills is less emphasized than in more technological areas. An extreme example in the other direction is in the study of medicine where the program provides high level vocational training over an extended period. Company-based programs are vocational, too. It should be feasible for universities to deliver such programs, while still maintaining their own standards.

The question of how much the institution becomes dependent on the company, can be discussed at two levels. First of all, relevant pieces of the company’s equipment and/or software must be acquired before the material can be taught satisfactorily. This does not seem an excessively onerous requirement if the institution has decided that it is willing to teach the company’s material.

Another requirement by the company may be to fit in with company’s mode of delivery. Sensibly, the companies are not usually so prescriptive as to specify completely, how the material is to be delivered. Such an insistence would be rejected by instructors, not just at the university level but also in less exalted places. Rather, the companies permit flexibility in the sequencing and delivery of individual modules, consistent with the instructor accomplishing a subject’s overall objectives.

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<sup>3</sup> This parallels GH Hardy’s toast, “To pure mathematics. May it never be of any use to anyone.”

Another, related issue is whether running proprietary programs for credit e.g. as part of the requirements of options of a coursework degree, is acceptable practise in a university. Can it only be justified so long as the university adds some value to the industry qualification? That leads us to ask what does it mean for a university claim to 'add value'?

Must any extra value be added directly within the subjects, which cover the proprietary programs? Or is it sufficient to embed the proprietary programs within a larger program, so that the wider view is seen from other subjects? It seems reasonable to attempt to cover more issues than are strictly required by a company within the proprietary subjects. However if this does not always occur, it is sufficient to ensure that, over the period of the course, students are exposed to wider contexts than those directly addressed by the proprietary subjects.

There is another difficult balancing act is implied by conducting company-based programs. The university and the company can gain mutual benefits from such programs. The university can gain access to the company's technology while the company gains a potential source of future employees who are highly trained in its technology. However, university staff must try to preserve its independence by resisting pressures to mute criticisms of the company, because of fears that it may affect relationship between the company and the university.

## **6. Is it sufficient to deliver proprietary subjects 'as is'?**

If a university course is to be seen as more than narrowly vocational, it is also important that proprietary subjects do not dominate the whole program. So, the question, here, can be broken down into two questions. Firstly, is it acceptable practice to offer Company-based programs for credit as part of a university course? Secondly, are the proprietary subjects sufficient as university subjects, without embellishment with other material?

Company-based programs can be justified within 'for credit' subjects if the staff of a university can convince themselves that the content and level of the material are suitable for university study. These programs are provided at a range of levels of intellectual rigour. Cisco's material, in particular, are designed to be studied by students in the later years of high school, and above. This means that some of the material directed at an 'audience' at that level. However, later material is more demanding, intellectually. A university can temper this effect by increasing the pace at which the early material is covered when compared with that at high schools, and by setting more demanding assessment tasks, either based upon synthesising from the earlier material or by emphasising later material.

If a university accepts that these programs are of a suitable level and that students who gain those qualifications have had to prepare for material at a corresponding level, it should be willing to promote those company-based qualifications e.g. CCNA, as part of the advertising of its courses. This is also referred to in the next section.

It may be argued that delivering these subjects is similar to preparing a subject, using a textbook as the primary source. There are a number of limitations to this analogy. When using a textbook, the instructor can select what he wants to use. Also the instructor is able to use material, not just from the textbook but from a variety of other sources.

Typically, the company will require institutions to teach the whole syllabus, even if only to prepare students for the company's qualification examination. This means that, unlike when using one or more textbooks, the instructor cannot choose to cover the most relevant topics from the variety of sources. Of course, there is nothing to stop the instructor from using an approach different from

that provided by the company, so long as the material is covered adequately. Also, the instructor can always add topics beyond those required by the company's syllabus.

One way that an instructor can add value to these programs is by adding extra, more demanding components to the delivered material. (It is important to ensure that the extra components are included in the university's subject's assessment). There is a danger that the additional components will be downplayed because of the constraints imposed by the time needed to deliver, and for students to assimilate, the material required by the company's syllabus. This can lead to the components required by the company's syllabus pushing out the less well defined, and potentially, more demanding, components introduced by the instructor.

Cisco, in particular, requires that an institution conducting its Academy Program, support the formal delivery of its material with significant time spent on practical work. This is a stronger requirement than is typical in universities. As such, this is a good thing because it allows students to gain greater understanding of the topics than they would purely from a delivery 'ex cathedra' by the academic, using the principle that practice gives a better understanding of a topic than purely listening to delivery of the material.

## **7. How does a university distinguish itself from other program deliverers?**

Having argued that delivery of proprietary subjects within a university can be justified, we now come to determining whether a university can distinguish itself from other institutions which deliver the same material e.g. secondary schools, TAFE colleges, private colleges.

Part of the reason for attempting to find some contrast, is to ensure that the university is able to distinguish its programs from those offered by the other institutions, and can market that difference to prospective students and employers of its graduates. The distinction becomes more difficult to identify when other institutions are permitted to offer programs with titles similar to those programs originally offered only by universities. In particular a number of TAFE colleges in Victoria now have approval to conduct full degree programs, and some TAFE colleges in New South Wales have been permitted to run associate degree i.e. two year, programs.

It can be argued that the teaching of these courses at a university is, in some ways, better than the delivery at other institutions. Partly this is because of the issues addressed earlier about fitting these proprietary subjects into a wider context. In addition, universities can claim to deliver these subjects at a more advanced level than in the other institutions. This manifests in less use of a 'cookbook' approach and a more significant requirement for students to understand why they are performing particular processes. (As an aside, as part of my institution's articulation arrangements, the author has assessed many students, from a variety of places, for advanced standing into our courses. Prima facie, most students should be sufficiently prepared because of subjects passed at other institutions. Few succeed. Normally, as part of the assessment, I conduct a practical test. Most commonly students do not qualify for advanced standing because they are unable to perform well enough, on problems, equivalent to, differing from their 'cookbook' knowledge.)

Some benefits also accrue to a university because they are delivering these programs. If the institution follows the teaching style imposed by the company, the teaching is probably better than is often encountered at universities. This occurs not only because staff are required to spend more time thinking about what they are delivering but also because of the mix of formal delivery and practical work. Another benefit is that these programs can be leveraged to increase a university's relationship with industry in other ways useful to the faculty/university, other than just as a program deliverer.

From another direction, there is also some pressure building on universities from other universities which have longer established reputations. In the context of this paper, this can come in the form of a debate about why people should want to come to a university when they can obtain a qualification from a university with a wider reputation, purely by online study. The reaction of a university offering some face-to-face learning supported by hands on practical work is to claim that it provides a better educational experience than is provided by purely remote delivery.

## 8. Conclusions

Universities must rise to the challenges imposed by the introduction of company-based programs. These challenges can be met by the university adapting its courses so that they encompass, but are not swamped by, these external programs.

The author thanks David Veal for help in locating relevant reference material.

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## Appendix: How good is the Cisco Academy course material?

Since 1998, the original material has gone through two major rewrites. These version changes have

also updated the content. The Cisco course material provides a good coverage of a range of topics.

Very little in the first CCNA subject is Cisco specific. However, unsurprisingly, Cisco uses their equipment as examples. In later subjects, the material, generally, introduces each topic with a section about the general processes. This section is followed by sections showing how Cisco equipment can be used and programmed for this topic. As a result, the material becomes more and more Cisco specific as students progress through the program.

The material can suffer from the limitations of any, linearly delivered material, whether online or not. This manifests in the problem that it is often hard to distinguish the critically important material from the less important. Aside from having a single web page which introduces each Module, briefly, there is little 'light and shade' between concepts of differing levels of importance and/or difficulty.

Each Module is assessed separately, online, by tests which are, by default, equally weighted. This means that there is some pressure to make all modules of similar size. Sometimes this is accomplished by lumping together two or more topics which are not closely related. In contrast, a book can have short chapters side by side with longer chapters when the material warrants it.

The assessment required for each module is by a set of multiple choice questions, which are presented to the student from an Assessment Server provided by Cisco. The tests are supposed to be conducted in class, and proctored. The tests suffer from problems typical of multiple choice questions, and of online assessment. These include the problem that, unless all instructors worldwide are equally vigilant, the questions within a module test quickly become known around the Internet<sup>4</sup>. Soon after, answers become widely available. So the value of the tests, as an independent assessment tool, is diminished.

Supporting tests from a central site leads to the danger of a single point of failure. This means that when there is a failure at the Assessment Server site, or there is traffic congestion on the data path to the university, students are unable to take tests because the servers are unavailable.

Each test consists of a mixture of multiple choice single answer questions, and multiple choice multiple answer questions. The module tests suffer, in varying degrees, from the well known problem that multiple choice tend to test breadth of knowledge at expense of depth. So, correctly answering a number of questions can depend upon an exact reading of the text in the course, whether the concept is important or not.

The questions on the tests have been prepared by people, different from the people who wrote the syllabi. The test developers worked from an early specification of the syllabus without reference to the detailed material which had been prepared by the subjects' authors. (More recently, the testers have been required to take note of input from the users of their tests.) The lack of correspondence between course authors and test setters manifests itself in some test questions where the 'correct' answers depends upon choosing an option which uses exact wording from the course material, when things could have been better expressed in both the course material and in the tests. Some questions also are deficient because, while they may be correct in the context of what has been covered in the course material, students with wider knowledge can come to better, valid answers.

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<sup>4</sup> Students have employed a variety of techniques to get hold of copies of test questions. Initially this seems to have been done by copying and pasting screen shots into files. These files were then copied onto floppy discs or, latterly, memory sticks. Quickly, versions of the questions became widely available.

A colleague of mine investigated one institution. He found that the directories on the institution's file system contained 'suspicious' files in about 1/6<sup>th</sup> of the students attempting Cisco subjects. More recently, Cisco have taken measures to make copying of tests more difficult.