

Mistakes? We've seen a few

John Shepherd
Macquarie University, Sydney
john.shepherd@efs.mq.edu.au

Abstract

As the actuarial profession in North America moves towards recognition of university studies for the purpose of professional qualification, it is timely to consider what may be learned from the Australian experience. Professional bodies have been accrediting Australian university actuarial programs since 1969. This paper examines the Australian actuarial qualification process from the perspective of what makes a good education system, and notes that there are a number of constraints imposed by the profession that impair the quality of students' learning outcomes. The paper goes on to suggest how these pitfalls might be avoided in the interests of providing future actuaries with an opportunity to develop the attributes they will need for their professional careers.

1 Introduction

“The Institute [of Actuaries of Australia] is regarded by many of our international colleagues as having an outstanding actuarial education system.”

Institute of Actuaries of Australia (IAAust) President Graham Rogers made this observation (2003), which was echoed by his successor Andrew Gale a year later (2004):

“The Australian actuarial education system is recognised as world’s best practice for its high quality and particular relevance to contemporary business environments.”

Perhaps the Australian actuarial qualification process does compare favourably with its counterparts in the UK and North America. Is this comparison, however, an adequate and appropriate benchmark? If all that the Australian profession wants is a qualification process that is lengthy and tough, and that limits entry to the profession, then it may be good enough to be able to say that the process is better than those overseas.

However, if an actuarial professional body wants a qualification process that educates future actuaries, that prepares future actuaries for a working lifetime of professional practice by equipping them with the necessary intellectual, attitudinal and behavioural attributes, then the comparison is inadequate.

An educational system should be evaluated in the light of what is known about effective tertiary education in a professional discipline. This paper evaluates aspects of the Australian actuarial qualification process (Parts I and II) as an educational system, concludes that it is not firmly grounded in generally accepted educational principles and practice, and suggests ways in which the North American profession can avoid similar mistakes.

2 Key priority: education system or qualification process?

Like its counterparts in Australia and the UK, the North American profession needs to decide whether it wants an education system or simply a qualification process. The response to this choice is the key determinant of an approach to educating future actuaries.

Let us assume for the purpose of this article that the priority is to develop an education system that focuses on educating future actuaries – developing in actuarial students the range of attributes they will need to begin their careers as newly qualified professional actuaries. These attributes will include generic, or transferable, skills. Examples include:

- communication skills (written, oral, listening)
- personal skills (self-management, independence, ethical thinking & behaviour, flexibility, reflection)
- interpersonal skills (negotiating, teamwork, peer review)
- creative (divergent) thinking
- information technology skills
- problem solving skills (identify, define and analyse problems in context, and recommend solutions)
- research skills (gathering and analysing data/information, evaluating and applying results)

3 What makes a good education system?

A good education system is one which is conceived, designed, implemented and monitored in the light of accepted principles of learning and teaching. A good education program focuses on promoting quality learning by its students. A good education program is grounded in what is known, from research and scholarship, about student learning and about teaching for quality learning.

What are the accepted principles of teaching and learning? This article is not the place to attempt a comprehensive survey, so let's focus on two paradigms that have significantly influenced teaching in higher education over the last two to three decades, and that capture the essence of sound practice.

The two paradigms, to be outlined briefly in the next two sections, are:

- student approaches to learning
- constructive alignment

3.1 Student approaches to learning

The notions of deep and surface approaches to learning derived from original empirical research in Sweden in the 1970's, and were elaborated by further research in both the UK and Australia. Broadly speaking, a student taking a "deep" approach to learning is engaging in appropriate learning activities with the intention of making meaningful sense of what is being studied, while a student taking a "surface" approach is using inappropriate learning activities with the intention merely to satisfy course requirements.

This table of characteristics associated with each approach, reproduced from Ramsden (1992, p46), clearly outlines both surface and deep approaches:

Surface approach	Deep approach
• Intention only to complete task requirements	• Intention to understand
• Focus on 'the symbols' (eg words, formulae), unthinkingly	• Focus on meaning of 'the symbols'
• Focus on unrelated parts of the task	• Relate previous knowledge to new knowledge
• Memorise information for assessments	• Relate knowledge from different subjects
• Associate facts and concepts ineffectively	• Relate theory to everyday experience
• Fail to distinguish principles from examples	• Relate and distinguish evidence and argument
• Treat task as an external imposition	• Organise and structure content into a coherent whole

It is important to understand that "approach to learning" is not a stable characteristic of an individual learner (in the sense that a personality trait is stable). Students vary their approaches to learning as their learning context varies. An "approach" is a response to a student's perception of the

circumstances, and is influenced by a range of factors. Highly influential factors usually include assessment, workload, approach to teaching, clarity of learning objectives and intrinsic interest in the subject.

Ramsden (1992, p187) emphasises the critical influence of assessment on approach to learning when he reminds us that:

“From our students’ point of view, assessment always defines the actual curriculum.”

3.2 Constructive alignment

Learning takes place in a complex environment. There are many factors interacting –student characteristics, teaching methods, curriculum, what is being learned, the institutional setting – and they form a system. If there is an imbalance in the system it will be resolved, and for many students this will often be in terms of a surface approach. For example, a test that allows students to respond in a way that is inconsistent with learning objectives (perhaps by quoting back chunks of text, or reproducing standard processes, or plugging numbers into a memorised formula), or a classroom climate that generates fear in students, will encourage many students into a surface approach.

If we want students to focus on understanding meaning, on developing high level cognitive skills like analysis and synthesis, then the learning activities we design and the assessment tasks we set have to be consistent with those objectives.

In an effective education system, all elements work to support the goal of meaningful and robust learning by each student. When there is alignment (consistency) between what we want students to learn, how we teach and how we assess, teaching is much, much more effective than when there is no alignment.

John Biggs uses the term “constructive alignment” (1999, p26) to describe this consistency. The term reflects both the fact that learners create their own learning (constructivism) and the need for learning objectives, learning activities and assessment to be aligned (consistent).

3.3 Conceptions of learning and teaching

Biggs (1999, p21) identifies three conceptions of teaching and learning:

1 Learning is a function of individual differences between students.

2 Learning is a function of teaching.

3 Learning is the result of students’ learning-focused activities, which are engaged by students as a result both of their own perceptions and inputs, and of the total teaching context.

These “theories” of teaching and learning form a hierarchy, in increasing order of sophistication. In a level 1 view, there are “good” students and “poor” students, and differences in learning outcomes are seen as an inevitable consequence of those student differences. Teachers must know the content well, and explain it clearly. Students should attend classes, listen carefully, take notes, read the textbook, do the exercises, and regurgitate it accurately in an exam.

At level 2, knowledge is still seen as transmitted but there's a greater emphasis on teaching skills – developing a range of communication techniques for getting the message across more effectively. What the teacher does is the central focus, rather than the capacities of the students. Teaching competencies are seen as important.

At level 3, teaching is seen to support learning. There is a realization that expert teaching techniques, while important, are of no value if no learning takes place. This leads to careful consideration of just what learning means – what it means to “understand”, what kinds of teaching/learning activities might enable students to reach that understanding, and what methods might be used to determine whether or not understanding has been achieved. The focus at level 3 is the student, and learning is seen as the outcome of each student's own activities.

As Biggs puts it (1999, p24), at level 3:

“No longer is it possible to say: ‘I taught them, but they didn't learn.’”

Biggs (1999) noted that teachers tend to subscribe to these three theories at different stages in their teaching careers. Beginning teachers tend to operate on the basis of a level 1 view. Some teachers achieve level 3 later in their careers. Others stay at level 1 or level 2.

4 Actuarial profession's view of learning and teaching

It is illuminating to examine IAAust's view of learning and teaching. It would be a useful exercise for readers more familiar with the North American qualification process to identify its implied conception of learning and teaching in the light of Biggs' three levels.

What is the IAAust's “theory” of learning and teaching? As far as the author is aware, there is no explicit statement. However, the Institute's “theory” is implicit in its approach to education, summarised in various documents dealing with the qualification process and with the role of universities within that process.

4.1 IAAust's view of learning and teaching

For example, in the IAAust accreditation policy for universities offering Part I and/or Part II, the criteria do not address teaching quality at all. There are no requirements relating to the teaching qualifications, teaching experience or teaching performance of those who teach actuarial students. The only reference to qualifications is to actuarial qualifications – FIAA (or equivalent) or AIAA (or equivalent). It seems, on the basis of the accreditation criteria, that the IAAust is happy to have people who are unqualified or even incompetent teachers so long as they are actuaries!

Perhaps this policy rests on a view that everyone can teach well, or at least teach competently. This view is naïve and not grounded in reality. Anyone who has ever been a university student knows from personal experience that good teaching – even competent teaching – is not universal. Good teaching is rare, competent teaching is the norm, mediocre teaching is common, and poor teaching is far too prevalent.

Perhaps this policy rests on a view of teaching as a transmission process. Teachers give lectures and write course notes, which are soaked up by students, who thus acquire the transmitted knowledge. The

more the teacher teaches, the more the students will learn. If this view was credible, it would be sufficient to put any talking actuary in front of a class. Being a content expert would be the sole requirement.

Teaching is not a transmission process. Each learner constructs their own understanding. At the end of a shared group learning experience each learner can take away a different conception of what was taught. The different constructions can arise because each learner perceives what is taught through a different system of filters, each has different expectations of and levels of interest in what is taught, and each relates what is new to a different existing knowledge “data base”. An effective teacher needs to understand how and why students learn or don’t learn.

If the primary objective of university courses in actuarial studies is to educate future actuaries, then the quality of teaching should be very important to the profession. In the IAAust’s accreditation criteria teaching quality is not mentioned at all.

In requiring only actuarial (that is, content) qualifications of teachers in accredited programs, IAAust’s thinking about learning is consistent with level 1. Is there other evidence consistent with this view?

In monitoring Part II, IAAust (2005, page 4) says that it:

“... monitors educational standards through an accreditation process that reviews syllabus coverage and marking, grade distribution and exemption level at each university.”

This is consistent with level 1 thinking about learning and teaching. Has the syllabus been covered? Was the marking tough? Is the grade distribution consistent with what it has been in the past, and with that of other universities? These questions have little to do with learning outcomes.

A common focus in IAAust discussions of education in universities is the minimum standard for entry, usually expressed in terms of some index of performance at secondary school. This is typical of level 1 thinking: ‘We will have a good program if we can attract “good” students. “Poor” students are unlikely to become actuaries’. There has even been discussion of a minimum entry standard as an accreditation criterion for universities. Ironically, the minimum entry standard suggested is such that, if it had applied since the inception of university actuarial programs in 1968 at Macquarie University, many current Australian actuaries would have been denied entry!

5 Shortcomings of the Australian process

This section briefly outlines some of the features of the Australian actuarial qualification process that inhibit quality learning and innovative curriculum development.

5.1 Creating two classes of subject

Part I exemptions are granted by IAAust on a subject by subject basis. Typically, students gain exemption for one IAAust subject on the basis of their performance (grade) in one or two university subjects deemed to “cover” the same syllabus. Not all university subjects “count” for exemption purposes. For example, in the most popular four-year full time program at Macquarie University (Bachelor of Commerce in Actuarial Studies and Bachelor of Applied Finance), students take at least 30 subjects (that is, 30 one-semester course units), of which just 15 “count” for exemption purposes.

In the perceptions of students this creates two classes of subject – “exemption subjects”, where the result determines partly or wholly the outcome of one exemption, and “non-exemption subjects” where the result has no direct effect on an exemption outcome.

The mere fact that there are exemption and non-exemption subjects increases the likelihood that students will adopt a surface approach, especially in non-exemption subjects. The implicit message is that they are less important. They don’t count towards qualification as an actuary. They are there to pad out the degree program so that it meets the university’s requirements, but they cut no mustard with the profession.

5.2 Content overload

The amount of content in most IAAust syllabuses is excessive. Teachers are under pressure to “cover” the syllabus, and students are under pressure to understand too many complex and difficult concepts in the time available. Students are very likely to take a surface approach when confronted by an excessive workload, so the quality of their learning suffers. An overloaded syllabus is a classic example of asking students to jump high hurdles that are placed too close together. It makes survival tough, but in an arbitrary and unfruitful way.

It is a common fallacy that more and more content makes the program more difficult and raises “standards”. It “sorts out” the students. In reality it means that most students don’t have the time or the opportunity to focus on understanding what they are learning, and resort to survival strategies like rote memorization (that is, they take a surface approach). Coverage is the enemy of understanding.

Content overload, when associated with a level 1 or level 2 conception of teaching, means that the syllabus will be “covered” at all costs. And the costs can be great in terms of learning quality. There will be no opportunities to integrate activities that foster generic skills development.

Understanding of content in mathematically and numerically based subjects is also enhanced by opportunities to explain that understanding to others through written assignments and oral presentations. There is a double benefit – better understanding of content plus enhanced skills.

5.3 Narrow and inflexible assessment methods

The IAAust requires that traditional 3-hour written, closed book examinations be the major assessment method for exemption subjects. For example, its requirement for Part II (Actuarial Control Cycle) assessment is (“Part II – Actuarial Education Program”, page 4) summarised as follows:

“There are two types of assessment used in the Part II (Actuarial Control Cycle) course:

- *Coursework (assignments, projects and, where applicable, class presentations)*
- *A three-hour examination at the end of each semester (at least 70% of the assessment is based on examination)*

The Institute monitors educational standards through an accreditation process that reviews syllabus coverage and marking, grade distribution and exemption level at each university.”

This strong focus on assessment by examination is mirrored throughout the qualification process. Conventional written examinations with time constraints may be familiar and convenient. However, they allow assessment of very few attributes that are relevant to developing actuaries. Question “spotting”, memorising checklists, studying past examination papers, focusing on “the correct answers”, and assessing the “mark-value” of problems and questions and potential answers (rather than on good solutions) are some common student behaviours engendered by exams. The “skills” that students are thus honing are not relevant to their future professional lives.

The types of assessment task that would encourage and allow actuarial students to demonstrate that they are developing the attributes required of a professional actuary include:

- research projects (including literature reviews)
- using models to solve business problems
- oral presentations (to peers or to clients)
- essay and report writing
- case studies
- writing reflective journals
- field work

5.4 Ignoring student diversity

Consider four students about to embark on professional education programs at university. One aims to be a doctor, one a lawyer, one an engineer and one an actuary. Which student is likely to have the fuzziest notion of what she will be doing when she finally qualifies for professional practice?

If, broadly speaking, we make sense of new knowledge by relating it to what we already know, then actuarial students are at a disadvantage, educationally, when they start their studies. At the beginning they probably have no clear cognitive concept for “actuary”, to which they can relate the mathematical and statistical theory and processes they will soon be asked to learn.

6 Avoiding the pitfalls

“Instead of encouraging the student to devote himself to his studies for the sake of studying, instead of encouraging in him a real love for his subject and for inquiry, he is encouraged to study for the sake of his personal career; he is led to acquire only such knowledge as is serviceable in getting him over the hurdles which he must clear for the sake of his advancement.”

How can we avoid this climate, described so clearly by Karl Popper (1966)? The following guidelines are suggested for avoiding some of the problems inherent in the Australian approach to utilizing university actuarial programs.

6.1 Lay sound foundations

Develop an education system that is grounded in what is known from higher education research and scholarship about student learning and about teaching for quality learning. Construct a curriculum that is more than a list of syllabus topics – one that incorporates the attributes a newly qualified actuary

needs to bring to the start of a professional career (including the generic skills identified earlier). Start the learning process not with calculus or algebra or financial mathematics but with an opportunity for students to understand the roles of actuaries. They will learn better as they pass through their actuarial course if they have, from the beginning, a sound concept of “actuary” to which they can relate new actuarial knowledge and skills.

6.2 Recognise the importance of teaching

Encourage actuarial faculty to recognise that they operate at the intersection of two disciplines – education and actuarial science – and so they need to develop their knowledge and skills in both disciplines. Include in university accreditation requirements criteria that reflect teaching quality; for example, faculty educational qualifications, faculty teaching awards and student evaluations of teaching.

6.3 Accredite whole university programs

When you move to exemptions for core actuarial science studies, focus on whole programs and not on individual subjects or small clusters of subjects. This holistic approach will avoid creating two classes of subject within programs, and will leave room for diversity, flexibility and innovation. It is in the profession’s best interests to accredit a range of university programs which produce graduates with the same core attributes but with possibly differing emphases. For example, one school’s program may have a financial economics flavour, while another’s program is spiced with enterprise risk management, yet both can foster in students the same core capabilities.

6.4 Ensure alignment of goals, assessment and activities

Demand that accredited university programs demonstrate alignment between the profession’s learning objectives, the program’s assessment regime and the teaching and learning activities provided for students to help them achieve those learning objectives.

6.5 Encourage valid assessment

A few years ago the author met a class of postgraduate actuarial students at one of China’s top three universities. One student, who had passed several Society of Actuaries examinations, explained how he had learned in the process to carry out a wide range of mathematical processes. He confessed to having no idea, however, why he was leaning to perform those mathematical processes.

There is little doubt that the exams he had passed were reliable but were they valid?

In the author’s view actuarial professional bodies that operate education programs tend to place undue emphasis on assessment reliability at the expense of validity. The former property concerns whether or not we can rely on assessment results, while the latter relates to whether or not assessment is assessing what it should be assessing.

Actuaries are very numerate people, so it is no surprise that they tend to see assessment as a measurement process. Just what is being measured, however, is not clear. Multiple choice questions may have surface appeal because they lend themselves to analysis of reliability – test-retest, split-half, internal consistency, etc. Learning, however, is dynamic, not static. The learning that we should be

encouraging involves change in the way our students understand the world in which they will operate. Assessments that are “reliable” tend to be insensitive to change.

The validity of an assessment task is its ability to assess what it is supposed to assess. If we want future actuaries who can explain technical concepts to lay people without using jargon then a multiple choice exam will not give a valid assessment of that skill. Ramsden reminds us (1992, p212) to:

“Be suspicious of the objectivity and accuracy of all measures of student ability and conscious that human judgement is the most important element in every indicator of achievement.”

7 Conclusion

Actuarial qualification processes ought to educate future actuaries. All professional bodies have a choice. We can continue with a tough qualification processes that impede quality learning, or we can move towards a rigorous education system that prepares future actuaries for a world of change, challenge and complexity.

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