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An Action Research Approach to Developing an Information Systems Academic Subject that Facilitates Lifelong Learning

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Abstract
There is increasing demand for more effective tertiary teaching of IS subjects in the light of changing demands on IT professionals and discontinuous change in the Australian University sector. We review the impact of lifelong learning on various knowledge-based professional practices, and some pedagogic approaches that facilitate this attribute. We report, in terms of an action research framework (ARF), an ongoing project to facilitate the evolution of the approach to teaching an IS final year undergraduate and postgraduate subject, from a conventional content-focused approach, to one that guides students through a process of reflection-in-action by means of assessable milestones.

Keywords
Action research, reflective practice, lifelong learning, critical thinking

INTRODUCTION
From the early 1990s, the climate of tertiary education has changed (Bhattacharya 2000, Fantin & Ravalli 2001, Hand & Rowe 2001, Jerlock & Severinssen 2003) due to:

- Escalating demand for demonstration of the effectiveness of education provision
- An increased emphasis on soliciting feedback
- Emphasis on a development approach to improve future learning experiences
- Use of reflection-in-action and action research methods to progressively enhance teaching and learning

The typical Australian University student profile is increasingly diverse, e.g., in terms of ethnic background, age, level of prior learning and expectations of the teaching and learning environment (Fantin & Ravalli 2001). Teaching of information systems (IS) related topics presents particular challenges due to the fact that the discipline of IS contains a number of opposing forces (McBride & Hackney 2003) that the teacher must combine in order to prepare graduates for the information technology (IT) workplace. These include:

- The analytic methods needed, e.g., to decompose business processes, versus storytelling and discursive approaches to identifying systems requirements
- Resolving the certainty needed to deal with computers with the uncertainty derived from the complex organisational relationships and human interventions with which information systems interact.
- Facing people problems versus facing technology problems
- The need for awareness of specialist aspects of technologies, tools and techniques versus awareness of the public concerns and demands re the impact of IT

The demands on the teacher of IS need to be placed in the context of increasing demand, by business and government, for the provision of tertiary education that facilitates lifelong learning across many disciplines.

This paper is structured as follows. We first discuss the nature of reflective professional practice and its dependence on lifelong learning. We then identify some graduate attributes that are held to facilitate lifelong learning, and identify the role of assessment in optimizing desirable graduate outcomes. We introduce the role of student-centred action learning in a broader framework of action research and describe, drawing examples from academic professional practice, an action research framework (ARF).

The academic subject now entitled ‘Information Technology-a Critical Review’ has evolved, since the early
PROFESSIONAL PRACTICE ENHANCED BY LIFELONG LEARNING

Reflective professional practice

The idea of the reflective practitioner was first proposed by Donald Schön, who distinguished between institutional practice, based on rigorous adherence to technical rationality (Schön 1984, pp. 23-42), and reflection-in-action, which incorporates the idea of knowing-in-action, because ‘Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say that our knowledge is in our action’ (Schön 1984, p.49).

This idea was taken up by a number of researchers who stressed that knowledge creation originated in the tacit knowledge of individuals, which needed to be harnessed in order to facilitate organizational knowledge management for strategic advantage. The concept of reflection-in-action was embraced by the teaching profession earlier than in many other academically-based professions (See Rømer 2003) discussing the influence of Donald Schön; and reached a mature stage in recent years. Petrides proposed (2002, p. 78) that teachers should be

‘active professionals who take responsibility for their own work and its subsequent impact and take action in continuous improvement … In a research culture environment, the improvement of teaching and learning is intentional and ongoing.’ (2002, p. 78).

The idea of reflective practice as a form of inquiry (as defined by Dewey 1938) was synthesized with organizational development research to produce and report the concept of organizational learning (Argyris and Schön 1996). In this organizational context, James and Smith (1998) cited Argyris and Schön (1996) who claimed to ‘turn the researcher/practitioner relationship on its head’, arguing that: ‘we can reframe the conventional view of their relationship in a way that promotes both usable knowledge and robust research’, defining the researcher/practitioner relationship as a: ‘collaboration between types of inquirers who occupy different roles and rely on different but complementary skills and methods’ (1996, p. 30).

Levin & Greenwood (2001) defined current University teaching structure as: ‘a process of the student learning to imitate the professor's thoughts rather than as the engagement of the student in a critical and reflective learning process that integrates teachers and students in a joint inquiry process’ (Levin and Greenwood 2001, p. 103). They identified pressures such as globalization that ‘privilege contextualized knowledge production and dynamic learning organisations’, placing pressures on Universities to facilitate production of graduates that could participate in the required continuous learning. (2001, p. 103). This view is also supported by Fischer (1999).

The nature of lifelong learning

Lifelong learning involves having students learn new skills such as ‘how to acquire knowledge’ teaching skills such as critical thinking, and ‘making the learning proactive and self-initiated’ (Brandt 1991 cited in Parkinson 1999). It ‘creates the challenge to understand, explore, and support new essential dimensions of learning such as: (1) self-directed learning, (2) learning on demand, (3) informal learning, and (4) collaborative and organizational learning’ (Fischer 1999, p. 1).

‘The objective of lifelong learning is to fundamentally rethink learning, teaching, and education for the information age in attempting to change mindsets’ (1999, p. 1)

Graduate outcomes that facilitate lifelong learning

Fischer (1999) describes a world of work in which ‘knowledge is distributed among many stakeholder and “the answer” does not exist or is not known’ (1999, p. 2).

‘Professionals must then be able to apply more than ... conventionally acknowledged knowledge ..., i.e. be able to exploit knowledge-in-action and reflection-in-action (thinking what they are doing while they are doing it).’ (Maudsley and Strivens 2000, p. 544) Jerlock & Severinssen (2003) described, for academic nursing education,
pedagogic approach that sought to ‘facilitate the integration of theory, research and practice’. They identified three core concepts (Professional stance, Reflective processes and problem-solving processes, and Practical skills). For each core concept they developed a set of desirable graduate attributes at four levels (Introductory, Intermediate, Advanced level I, Advanced level II). The academic subject we describe in this paper focuses on the core concepts of reflective processes and critical evaluation (further discussed).

The role of evaluation and assessment in optimizing desirable graduate outcomes

Biggs & Moore (1993) describe evaluation as ‘involving judgement at all stages of the learning with the intention of making substantive changes in the quality of the learning, and hence in our relationship with the world’ (1993, p.380). Taras (2002) identified assessment and feedback as the weakest link identified by quality assurance of factors contributing to lifelong learning, and cited Cross (1996) to emphasise the importance of feedback for learners. The conditions for effective feedback include a knowledge of standards, the necessity to compare these standards to one’s own work, and taking action to close the gap (Taras 2002). Thomas and Harri-Augstein (2001) place reflective learning in an action research context in which the action researcher (teacher) provides the means by which the client (student) ‘are enabled to reflect on their own experience, i.e. to provide a mirror in which they can see their activities and a conversational framework within which they can become more aware of their ongoing thoughts, feelings and perceptions’ (2001, p. 933). In the case study described, we similarly place student learning in the context of action learning cycles in the broader framework of action research for subject enhancement.

AN ACTION RESEARCH APPROACH TO SUBJECT DEVELOPMENT

The nature of action research

This interaction of research and practice is defined variously as action learning and/or action research (AR). McKay & Marshall (2001) described AR as ‘committed to the production of new knowledge through the seeking of solutions or improvements to "real-life" practical problem situations’ (2001, p. 47).

Some researchers express concern regarding lack of scientific rigour in AR (Kock et al. 1998, Remenyi et al. 1998) and do not fully support the interchangeability of research and practice proposed by Argyris and Schön (1996) and discussed (in the context of the IS discipline) in James and Smith (1998).

Action research in education

There is a body of literature in education research that does not demand the separation of research and practice. Hand and Rowe (2001) define AR methodology in an education context as:

‘collaborative enquiry by . . . academics . . . into their own teaching practice, into problems of student learning, and into curriculum problems . . . . A practitioner … is gathering evidence on his/her practice, and reflecting on that evidence with a view to making improvements at two levels: (1) the student experience of the module; and (2) the quality of feedback gained about the learning experience (2001, p. 148)

Bhattacharya (2000) describe a continuum of educational research ‘where the distinction between the stages is based on the transferability of the findings, rather than being a fundamental difference in terms of character’ (2000, p. 316). The progression of stages is identified as feedback, formative evaluation, action research and full educational research. Bhattacharya distinguishes between the latter two stages as follows:

‘It could perhaps be argued that the key distinction between full educational research and action research is, that in the former the researcher is not an agent in the process that is being researched but operates in a detached manner; while in the latter the researcher explores his/her own practice. Proponents of action research, … argue … that the only effective way of promoting change is through involving the practitioners in the research process.’ (2000, p. 316)

We further discuss a somewhat arbitrary distinction between AR and action learning.

An action research framework (ARF)

The work of James and Smith (1998) was followed up to propose an action research framework (ARF) to study the interaction of research and practice in the IS discipline (James and Smith 1999). The rationale for such an approach is the commonality of all forms of knowledge-creating inquiry as ‘the intertwining of thought and action that proceeds from doubt to the resolution of doubt’ (Argyris and Schön 1996, p. 11 after Dewey 1938).

The work of Argyris and Schön (1996) is the basis for the claim by James and Smith (1999) that research and
reflective practice exist on a continuum of inquiry. In order to accommodate study of projects across the whole of the research to reflective practice spectrum, the Argyris and Schön (1996) model of continuous reflection-in-action (which we define as action learning) was synthesized with the AR framework of Checkland (1992).

This approach demands prior declaration of the area of application (A), a variety of possible models or ideas frameworks (F) and the (research or professional practice) methodology (M), e.g., qualitative research or online academic subject delivery. Checkland (1992) makes this prior declaration a determining factor that distinguishes between AR and ongoing action learning, although both exist on a continuum of inquiry. James and Smith (1999) made a distinction between Fa, the specific framework that influences the action, e.g., an academic subject plan, and the various Fe, the disciplined-based explanatory frameworks which inform the interpretation, e.g., of the academic subject plan. In an academic setting these would include the pedagogic principles applied as well as the theories that inform the topics to be taught.

The ARF 'unpacks' the idea of learning that leads to enhancements to M (research or professional practice - methodology), Fa (the specific framework that influences the action) and Fe, as well as intervention in A. It also provides for acknowledgement of the influence of A on the selection of a specific Fa, e.g., some academics may require a plan for an M to deliver distance education. See figure 1 for a schematic representation of cycles of intervention in A. These may be instances of instrumental practice, i.e., the teaching method is applied as specified by the subject plan, or by custom, without reflection on the impact of the intervention.

Figure 1: Synthesis of idea of reflection-in-action and Checkland's action research concepts (from James and Smith 1999)
On the other hand, a reflective practitioner (Schön 1984) continually monitors the impact of interventions on the context of $A$ allowing for the possibility of ‘doubt leading to the resolution of doubt’, as described by Argyris and Schön (1996). The resolution of such doubt may lead to enhancements in $Fa$ or $M$. Unresolved doubt may lead to questioning and possible enhancements to a $F$, such as the underlying pedagogic theory. Table 1 provides examples of these constructs from the case study reported.

<table>
<thead>
<tr>
<th>ARF construct</th>
<th>Case study example</th>
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<tr>
<td>$A$ Area of application</td>
<td>Academic subject delivery, development and enhancement in a particular context</td>
</tr>
<tr>
<td>$Fa$ Framework for action</td>
<td>Broadly-based explicit or implicit subject plan specifying content and (sometimes) teaching method</td>
</tr>
<tr>
<td>$Fe$ Frameworks of ideas</td>
<td>Relevant pedagogic theories</td>
</tr>
<tr>
<td>$M$ Espoused methodology</td>
<td>Teaching method prescribed by subject plan or implied by organizational culture</td>
</tr>
<tr>
<td>Methodology-in-action</td>
<td>The teaching method actually applied in a specific context</td>
</tr>
<tr>
<td>Intervention</td>
<td>An instance of subject delivery, e.g., assessing a student assignment</td>
</tr>
<tr>
<td>Reflection-in-action</td>
<td>The teacher continually observes and reflects upon each assessment outcome.</td>
</tr>
<tr>
<td>Doubt about ideas or method</td>
<td>Interpretation of the observed outcome leads to questioning of the teaching method applied and the rationale for its application</td>
</tr>
<tr>
<td>Investigation-of-ideas-and-method</td>
<td>The teaching panel evaluates (preferably with objective measurement) the outcomes produced by application of the principles and methods applied</td>
</tr>
<tr>
<td>Doubt about concepts</td>
<td>The rationale for, or applicability of, such principles and methods do not offer a satisfactory explanation for the observed outcomes.</td>
</tr>
<tr>
<td>Framework enhancement</td>
<td>$Fe$ is enhanced, e.g. the extent or level of subject content is modified</td>
</tr>
<tr>
<td>Methodology enhancement</td>
<td>$M$ is enhanced, e.g., the method of assessment is modified</td>
</tr>
<tr>
<td>Doubt about concepts</td>
<td>The doubt is more fundamental than can be explained by application of a particular $Fa$ or $M$</td>
</tr>
<tr>
<td>Investigation of concepts</td>
<td>One or more $Fe$ are questioned, e.g. the explanations offered by current pedagogic theory may be inadequate. New theory may result</td>
</tr>
</tbody>
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Table 1: Examples of ARF constructs from the reported case study

Ethnomethodologists hold that ‘The only absolute ... is that meaning will be made and that the meaning will depend on how we connect the actions and the context’ (Feldman 1995, p. 11).

In the ARF, the $Fa$, the various $Fe$ and the $M$, collectively represent the context for action, as illustrated in figure 2. The inquirer’s perception of this context is also known as the ethnomethodological schema. Observation and interpretation are encapsulated in a ‘strip of observation’, which may include any kind of research or professional practice method or technique. Strips are interpreted given available schemas. When observations yielded by the strip cannot be explained by the inquirer’s schema, a breakdown occurs and resolution is called for. If the interpretation of the strip casts doubt on the current schema, schema resolution may be undertaken. This may lead to an iterative process whereby the current schema is modified, and further strips applied, until breakdown ceases (James & Smith 1998 after Agar 1986). Note that all kinds of inquiry can be described in terms of the ARF, although at the action learning end of the continuum, $Fa$, the various $Fe$ and the $M$ may be less consciously articulated.
Figure 2: A simplified representation of the concept of schema modification based on breakdown of strips of observation in the context of the action learning cycle (from James and Smith 1999).

An end-of-semester subject review is an example of a strip of inquiry. It provides an opportunity to reflect on, and resolve doubt regarding the schema informing the subject content and delivery. Both quantitative and qualitative methods of observation and interpretation may be encapsulated in the strip. These include utilization of student survey data, quantitative analysis of student results, and phenomenological methods utilizing student process reports and journals (Frantz, Ferreira & Thambiratam 1997).

The ARF documentation provides a record of factors associated with precise description of a subject so that such changes may be explicitly described. A particular area of application is always associated with the involvement of particular actor(s), e.g. academic staff, taking a particular role, e.g. teaching panel member, in a particular sphere-of-activity (SoA), e.g. academic subject development. It also provides to document participant interaction of involvements (actors playing roles in SoAs), e.g., among academic staff acting a teaching panel members, or between tutors and their students. An area of participation may interface with one or more systems, e.g. a student administration system. In order to produce research results of sufficient validity to suggest enhancement to an Fe, all the contextual factors must be carefully documented, particularly since a breakdown of an academic’s schema, may not be due to deficiencies in the schema, but to externally influenced changes in efforts. But the emphasis on context, in the action research described, goes further than this. As Flyvbjerg (2001) asserts: ‘Just as the people studied are part of a context, research itself also constitutes a context, and the researchers are a part of it. The researchers' self-understanding and concepts do not exist in a vacuum, but must be understood in relation to this context. Context both determines and is determined by the researchers' self-understanding.’ (2001, p. 33)

In this research we observe, using phenomenological methods, the action learning of students as ‘strips of observation’ for the action research cycles of the academic researchers /reflective (academic) practitioners, each within their own context. A useful way to conceptualise this process is a hermeneutic circle (James and Smith 1998 citing Myers 1995, p.57) as illustrated in figure 3.
These hermeneutic cycles can be illustrated, in an academic setting, as follows. As academic subject teaching panels seek continuous improvements in lifelong learning outcomes, they assess known pedagogic principles and, in a hermeneutic sense, interpret these principles to provide an explanatory framework for their evolving action research framework. In the case we describe, the outcome prescribed by our framework for action is to continually foster action learning in the student cohort. Our ‘schema’ of understanding of the action learning process is subject to ‘strips of observation’ of student outcomes. Such observation may lead to questioning of this understanding, in some cases leading to adaptation and/or enhancement of the pedagogic principles applied. We illustrate this process as follows.

CYCLES OF ACTION LEARNING AND ACTION RESEARCH IN STUDENT CENTERED SUBJECT DEVELOPMENT

Background

During the period under review the development of the subject that we discuss was impacted by:

- major structural change to the institution (socio-cultural CoA),
- a progressive change towards an online learning environment (technological CoA), and
- changes to the academic programs in which the subject was included (interfacing academic accreditation system).

The ARF described above can record these influences and their impact, but in this paper we describe only those influences which resulted in a major change to the teaching methods for subject and the pedagogic principles underlying the methods used; i.e. when breakdown of any component of the existing schema ($F_a$, $F_e$ and $M$) led to investigation and modification of the schema applied. For this purpose we divide the process of continuous evolution into the commencement of the following discrete stages$^1$, to be defined as action research cycles:

$^1$ The acronyms reflect the changing title of the subject, i.e. from Systems Development Strategies (SDS) via Information Technology Strategies (ITS), to Information Technology: a Critical Review (ITCR). The first two
The theory that underlies the development of the ARF is fully described in James and Smith 1998 and 1999. The ARF is illustrated by example in James, Ha and Smith 2000, and James and Scheepers 2000.

**Action research cycles**

For the overall process of subject development and enhancement (A), the ‘schema’ that encompasses the F (subject plan) the various F (pedagogic theories and theories informing content) and the M (the method of subject delivery) was subjected to multiple strips of observation during the progress of each semester and the major, semester end, strips of observation (subject review). In many cases schema resolution was required because these major strips observation revealed breakdown of the schema.

The teaching panel have sufficient data to track all the schema modifications that launched new action research cycles, but the full interpretation of these data is resource intensive. While, in the light of changing theory, subject content was progressively updated, the most significant schema modifications involved changes to the pedagogic principles, with resulting changes to subject delivery method. We provide examples of some of the most significant cycle transitions.

Reflection on the subject content, process and outcome of cycle SDS1 led to the interpretation that the aim of providing a ‘capstone’ subject to prepare students for the IT workplace was not being achieved as the students were not high enough on Bloom’s taxonomy of cognitive skills (Bloom 1964) to make judgments on IT issues. In particular, the students lacked skills of critical evaluation. The remedy was to apply well-known pedagogic principles by changing the emphasis, in SDS2, from subject content to evaluative process. This was achieved by setting an assessable goal of critical evaluation of a contentious proposition, in which the embedded contentions addressed IT issues that were the subject of some disputation. All subsequent schema modifications were directed to achieve this overriding goal of fostering skills of critical evaluation, under increasingly difficult external pressures. At stage SDS2 the only assessable milestone was a review by tutors of a full draft of each student’s final 5000 word response to the assigned contentious proposition. By mid 1997 during phase SDS3, the staff workload involved in applying this approach to an increasing number of students of declining average ability became unmanageable, due to above mentioned changes in contexts of activity. A series of assessable milestones series were progressively introduced, with accompanying ‘achieving the milestones’ tutorial material available through Blackboard (the education portal utilized).

**Student action learning cycles**

This concept of a progressive emphasis on milestone achievement is consistent with the views of Taras (2002) on the role of assessment feedback in facilitating students’ action learning. Through each of the above-mentioned action research cycles of subject development, greater emphasis was placed on materializing a set of distinct action learning cycles which each student must negotiate to achieve the final assessable milestone. The 2005 semester 1 subject delivery is used as a vehicle to illustrate this principle.

All of the assessment, as described, e.g. in FICT 2005a, is directed towards satisfactory completion by each student of a critical evaluation report in response to one only of three contentious propositions that embody contentious claims regarding major IT issues. There are three assessable milestones (worth 10 marks each) that guide the student towards this goal. For each milestone, individual written feedback is provided against each (pre-published) assessment criterion. Success, as measured against the milestone criteria, means that an individual student has progressed towards the final goal, and that their mental schema derived from the ‘Achieving the milestones’ teaching needs no modification. In the case of ‘breakdown’ (failure to fulfill one or more criteria), the student has the opportunity to modify the schema applied. In this sense each assessable milestone can be regarded as an action learning cycle. The assessable milestones are:
• finding at most three contentions in a single, individual allocated, journal article relevant to subject content, and evaluating the author’s arguments
• Presenting evidence-based arguments for and/or against an allocated contention
• Preparing, in point form, an outline of the final critical evaluation of a contentious proposition

Throughout the semester, students are required to keep a journal that specifically reports on the way in which the assessable milestones contributed to their action learning. The journals, which are retained, together with the milestone feedback, are a rich source of research data that can form the basis for ongoing research.

CONCLUDING REMARKS

We have shown that academic professional practice exists on a continuum of inquiry as defined by Argyris and Schöen (1996) after Dewey (1938) and that academic subject development can be viewed as action research utilizing the ARF described. We have drawn on some literature that commends the use of action research, in pedagogic professional practice, to enhance graduate attributes that can facilitate lifelong learning.

We have introduced the ARF as a means of comprehensively defining the context and process of instances of inquiry. This includes academic research and professional practice, which we hold as existing on a continuum of inquiry. We have described some of the theory that justifies the concept of the ARF, and illustrated use of its constructs to describe the context and evolving process of an IS curriculum subject. We have traced this evolution, utilizing the ARF idea of teacher-initiated action research cycles, towards the current stage of development. The aim at this stage is to guide student through a series of action learning cycles that facilitate graduate attributes directed at lifelong learning. These student-centred action learning cycles can also be defined in terms of the ARF.

We commend such an action research approach that minimizes any artificial distinction between ‘research’ and professional practice. Our research is ongoing. The phenomenological data that we have collected can make a contribution to further understanding of the pedagogical principles that underlie effective IS tertiary education.

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EBSCOhost


**ACKNOWLEDGEMENTS**

The authors would like to express their gratitude to Assoc. Prof. Judy Mckay for acting as a patient ‘sounding board’ and wise counsellor during the preparation of this paper for submission.

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