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Think different:
Preface

Philip Machanick, Overall Chair: SAICSIT’99

Running SAICSIT’99, the annual research conference of the South African Institute for Computer Scientists and Information Technologists, has been quite an experience.

SAICSIT represents Computer Science and Information Systems academics and professionals, mainly those with an interest in research. When I took over as SAICSIT president at the end of 1998, the conference had not previously been run as an international event. I decided that South African academics had enough international contacts to put together an international programme committee, and a South African conference would be of interest to the rest of the world.

I felt that we could make this transition at relatively low cost, given that we could advertise via mailing lists, and encourage electronic submission of papers (to reduce costs of redistributing papers for review).

The first prediction turned out to be correct, and we were able to put together a strong programme committee.

As a result, we had an unprecedented flood of papers: 100 submitted from 21 countries. As papers started to come in, it became apparent that we needed more reviewers. It was then that the value of the combination of old-fashioned networking (people who know people) and new-fashioned networking (the Internet) became apparent. While the Internet made it possible to convert SAICSIT into an international event at relatively low cost, the unexpected number of papers made it essential to find many additional reviewers on short notice. Without the speed of e-mail to track people down and to distribute papers for review, the review process would have taken weeks longer, and it would have been much more difficult to track down as many new reviewers in so little time.

Even so, the number of referees who were willing to help on short notice was a pleasant surprise.

The accepted papers cover an interesting range of subjects, from management-interest Information Systems, to theoretical Computer Science, with subjects including database, Java, temporal logic and implications of e-commerce for tax.

In addition, we were very fortunate in being able to invite the president of the ACM, Barbara Simons as a keynote speaker. Consequently, the programme for SAICSIT’99 should be very interesting to a wide range of participants.

We were only able to find place in the proceedings for 36 papers out of the 100 submitted, of which only 24 are full research papers. While this number of papers is in line with our expectation of how many papers would be accepted in each category, we did not have a hard cut-off on the number of papers, but accepted all papers which were good enough, based on the reviews. Final selection was made by myself as Programme Chair, and Derrick Kourie, as editor of the South African Computer Journal. Additional papers are published via the conference web site.

We believe that we have put together a quality programme, and hope you will agree.

Acknowledgments

I would like to thank the South African Computer Journal production team, Andries Engelbrecht and Herna Viktor, respectively from the Department of Computer Science and Informatics, University of Victoria, for their work on producing the proceedings.

The reviewers listed overleaf did an excellent job: many wrote very detailed reports, sometimes after being called in on very short notice. Inevitably, there were some glitches resulting from the unexpected workload, but the buck stops with the programme chair: I promise to do better next time.

I would also like to thank my own department for putting up with the extra work and expense that running a conference entails. I tried not to burden them with too much extra work, but our secretaries, Zahn Gowar and Leanne Reddy, inevitably had to take on some extra work. John Ostrowick provided valuable assistance with design of our web pages and call for papers poster. Carol Kernick, who handles our finances and membership records, did a fine job of keeping up with the demands of the conference.

Finally, I would like to thank our sponsors, whose contribution made this conference been possible:

- PricewaterhouseCoopers – sponsored generous prizes and the conference banquet
- National Research Foundation (NRF) – provided financial support
- University of the Witwatersrand – provided financial support
- Programme for Highly Dependable Systems, University of the Witwatersrand – provided financial support
- Standard Bank – provided financial support
Editorial

- Apple Computer – provided equipment for the conference
- Qualica – provided technical support including helping with the conference website

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For more information about SAICSIT, including a pointer to the conference site, see <http://www.saicsit.org.za>.

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Active Learning: Issues & Challenges for Information Systems & Technology

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Abstract

Changes following South Africa's first democratic election when Nelson Mandela was elected President, have stimulated reviews of many economic, political and social structures including those in national education. One of the many challenges facing tertiary education is the need to transform the classroom into a place of learning rather than merely a place of teaching to ensure our graduating students are competitive in the job market. Many educational methods, including that known as active or deep learning, are available as part of this transformation.

Active learning requires students to engage in:

- Activities (such as reading, writing, discussing or problem-solving) and
- Higher-order thinking (demonstrated in tasks requiring application, analysis, synthesis or evaluation)

to help them develop adaptability, self-sufficiency and problem-solving skills.

In this paper, the authors review several studies of active learning and develop a framework outlining practical approaches to active learning. The authors apply this framework to courses currently offered within the Department of Information Systems & Technology at the University of Durban-Westville (UDW), South Africa, and discuss its relevance to the use of active learning therein. Finally, a way forward for further use of the active learning approach is suggested.

Keywords: Information Systems Education, Active Learning, Deep Learning

Computing Review Categories: K3.2

1 Introduction

South Africa's transition from apartheid and minority rule to democracy in 1994 meant that existing practices, institutions and values were viewed anew and rethought in terms of their fitness for the new era [36]. Many studies have addressed the issue of the transformation of education, covering the areas of governance of institutions, syllabus, curriculum and research [28, 31, 35].

Educators are being challenged to review their approach to education in order to address the articulation gap between learners' school attainment and the intellectual demands of higher education programmes (see [36]).

Current significant pressures on tertiary education include:

- Skilled academics in the Information Systems and Technology (IS&T) environments are a scarce and dwindling resource,
- Funding for departments and skilled staff in particular is limited,
- Student numbers are exceptionally high (leading to large classes),
- Industry requirements are volatile and demanding,
- Pressures to improve pass rates continue, and
- Government subsidies for tertiary education are declining.

These circumstances could give rise to a poorly educated and possibly unemployable generation of IS&T graduates.

This is consistent with international attitudes toward graduate skills. Edith Cowan University [9] has identified the following desirable exit characteristics for its graduates: "...thinks critically, reasons logically and has well developed problem-solving skills; has good interpersonal skills and is able to work as a member of a team and organization; and has the desire and the skills for continued intellectual development, creativity and enterprise."

Ramsden [31] approaches this issue from another angle: "...Evidence of inadequate skills in working co-operatively to solve problems, over-dependence on teachers as sources of information, and a lack of that self-critical awareness of one's own ignorance in a subject area that is the only true precursor of further enquiry- together these indicate that the standards achieved by our graduates in relation to the resources invested in educating them are often less than satisfactory."

In line with local and international attitudes to—
towards this issue, the Information Systems and Technology (IS&T) Department at the University of Durban-Westville (UDW) sees the challenge as developing a graduate who is typically an "adaptable, self-sufficient, problem-solver with crisp thinking" and who is an employable professional in the IS&T industry [1].

Over the decades this highly desirable profile has been described in consistent terms:

"[Businesspeople must be able] to meet in action the problems arising out of new situations of an ever-changing environment. Education, accordingly, would consist of acquiring facility to act in the presence of new experience." [8]

"...In many other aspects of society, learning is not the central purpose for any given activity, but a by-product of attempts to solve problems that arise when trying to conduct that activity." [23]

One aim of a new education policy is: "...to produce graduates with the skills and competencies that build the foundations for lifelong learning, including, critical, analytical, problem-solving and communication skills..." [36]

How do we orchestrate resources and techniques to meet this challenge?

Desirable exit characteristics are supported and encouraged by active learning approaches, also referred to as deep learning approaches [31]. This paper discusses interactions that occur between the student, lecturer and course and develops a framework for using active learning methodologies in the tertiary education curriculum. It then explores some practical approaches available to foster active learning within a tertiary education environment, and their use within IS&T at UDW.

1.1 Active Learning

The literature on approaches to learning is extensive within the fields of psychology and education. The first approach, deep learning, is defined by an intention to seek understanding by linking existing knowledge, new information and experience. Active learning is aimed at enhancing the occurrence of deep learning. A second approach, the surface approach to learning, focuses on memorizing factual information and reproducing what is thought to be required. The third approach, known as the strategic or achieving approach is aimed at achieving the highest possible marks by adopting a combination of surface and deep approaches [3, 7, 10, 11, 31].

Active learning is well documented as an important approach within a formal learning environment: Gutek [19] states, "Theory without practice is insufficient; practice unguided by theory is aimless". [34]

"Knowledge does not increase at a significant rate during extensive learning. Knowledge increases only when the individuals start applying (learn by doing) concepts". [37]

"To have knowledge is to make it, to construct it, not to record, absorb or memorize it. Teaching is not simply telling". [2]

Active learning is not well-defined [34]. Bonwell and Eison [4] propose that active learning is more than being alert and "listening". It requires that students be engaged in:

(a) activities such as reading, writing, discussing, or problem-solving, and

(b) Higher order thinking demonstrated in application, analysis, synthesis, or evaluation.

Active learning involves thinking about doing things as well as doing them.

Candy et al. [6] provide a practical list of basic goals for active learning: "(Active learning) is used as a strategy to link university learning with the workplace by making tasks more comparable to those experienced in the work environment, to develop transferable skills such as teamwork, time management, communication and interpersonal skills, to enhance "deep learning" and overall to improve the learning outcomes of students. Problem-based group research projects have the ability to develop critical thinking, interpersonal and communication skills".

1.2 Congruency Of Learning Objectives,
Teaching Approaches And Assessment

The basic goals of active learning cannot be met if there is a lack of congruency between stated learning objectives, educational approaches and assessment procedures [7, 11, 25, 27, 31, 34]. For example, if the teaching approach and objectives have stressed the importance of higher order cognitive skills while assessment is based on lower order cognitive skills the students will be quick to discern the discrepancy. Students could then react by focussing on what the examiner requires rather than stated objectives and are likely to ignore course components or skill development which are not directly assessed. This approach to learning is the focus of the strategic/achieving learning approach.

Learning occurs where students are in a little over their heads [5] and students need to be continually challenged rather than being allowed to dwell in an ability comfort zone. "Nias [29] notes that the culture of teaching tends to be one of agreement. Where challenge is perceived as uncomfortable, pleasant as this may be, it can serve to preserve poor practices, inequity and entrenched attitudes" [21].

Tough value judgements regarding content need to be made, as it is often not practical to increase student contact hours. This can result in subject content being seen to have been sacrificed for broader student development activity [30]. The correct use of handbooks, notes and materials on a local area network (LAN) can help resolve this dilemma [15]. Seeler et al. [34] suggest that increased structure may be required to ensure that educational aims are met in an active learning environment. They place the responsibility for the conduct and quality of the course firmly in the
The process of active learning deals directly with how the individual student (or group of students) relates to their educational environment.

The authors categorize these active learning interactions based on the relationships that define them and use this categorization as a step in the development of their framework, summarized in Table 2. The relationships considered included:

(a) **Personal reflective** (Relationship with “self”). Reflective activities, such as reading and writing allow the student time to internalize learning and place it in a frame of reference [5, 15, 16, 21, 34].

(b) **Interaction with a lecturer or facilitator**. The student is seen to interact with the facilitator on a one-to-one or many-to-one basis. The literature suggests numerous ways in which active learning can be stimulated in a standard lecture format. These focus on approaches designed to create mini-interactive sessions [5, 15, 16, 21, 30, 32, 34].

(c) **A cooperative learning environment**. (Also known as collaborative, team learning, learning cells or peer learning) The students engage each other on a one-to-one, one-to-many, many-to-one or many-to-many basis. The focus is on the learning experience being peer group-based and collaborative. The major challenges appear to revolve around assessment and dealing with the “free-ri der” problem [16, 21, 27, 30].

(d) **An experiential learning environment**. The student or group of students engage with a specific environment that is considered to be representative of a real-world situation [30].

The environment in which active learning occurs does not define the approach. It is defined by the relationship it represents. For example, cooperative learning is not defined as a tutorial, but rather as peer-based learning, even though peer-based learning is more likely to occur in a tutorial than in a formal lecture, it could occur in both. This is in agreement with the findings of Chalmers and Fuller [7].

Kolb [24] suggests that learning, experience and reflection are all one train of thought and should be seen as different facets of the same process. If students are not provided with the opportunities to actively engage in learning, attempt things and evaluate their attempts i.e. involve themselves in their education and take ownership of the process, one has to question whether they have truly learnt at all.

### 2 A Framework For The Description Of Active Learning In Practice

The authors have developed a framework that combines three issues suggested within the literature. These three issues are:

1. What type of information does the student preferentially perceive? (sensory - intuitive)
2. Through which modality is sensory information most effectively perceived? (visual verbal)
3. With which form of organization of information is the student most comfortable? (inductive deductive)
4. How does the student prefer to process information? (actively reflectively)
5. How does the student progress towards understanding? (sequentially globally)

A student’s preference on any of these scales may be strong, moderate, or non-existent and may change over time, dependent on subject or learning environment.

Most lecture courses lean heavily towards intuitive, verbal, deductive, reflective and sequential learners [15].

### 1.3 Felder’s Learning Styles

Much work has been done on the models for, and the existence of, multiple learning styles [20, 24, 26]. Felder [14] suggests it is not critical which learning style model is used as long as the model dimensions meet the learning need of all students in a student class. This paper uses Felder [15] as a framework for the discussion of the characteristics of learning styles.

Felder [15] suggests that the major problems in the transfer of information and knowledge to students can be traced to the style of teaching used. In many cases the style of delivery does not correspond with the learning styles of some (or many) of the students being taught.

Felder’s learning styles consist of five dimensions (characteristics) that are defined by the answers to five questions and summarized in Table 1 below:

<table>
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<th>Description</th>
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<td>Through which modality is sensory information most effectively perceived? (visual verbal)</td>
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<td>With which form of organization of information is the student most comfortable? (inductive deductive)</td>
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<tr>
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<tr>
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Most lecture courses lean heavily towards intuitive, verbal, deductive, reflective and sequential learners [15].
Table 1: The dichotomous dimensions of Felder’s Learning Style Model [15]

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<tr>
<td>1. Sensory (Observations)</td>
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<td>2. Visual (Pictures, demonstrations)</td>
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<tr>
<td>3. Inductive (Facts given, principles inferred)</td>
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<td>4. Actively (Through physical activity or discussion)</td>
</tr>
<tr>
<td>5. Sequentially (Progression of small steps)</td>
</tr>
</tbody>
</table>

1. **Congruency**: It is important to ensure congruency between the objectives of a course, the mode of delivery of course material, and the means of assessment used. Lack of consistency and commitment to the active learning approach will not serve the aims of the student, lecturer or faculty. Students rapidly identify this lack of commitment and will treat the course with disdain. Emphasis on revisiting and perhaps redesigning all three aspects of the process must therefore be undertaken simultaneously [31, 34].

2. **Active learning activities**: The different active learning activities (approaches) which can be built into a course [30]. These are modified to include personal reflective approaches.

3. **Learning styles**: Felder’s [15] learning styles have been used to categorize each approach to allow the identification of learners most favoured by each activity.

The authors’ developed framework is summarized in Table 2.

4. **Discussion Of Case Study**

Each year of study within the three-year major in Information Systems and Technology was categorized according to the framework components outlined in Table 2 namely, learning objectives, practical active learning approaches, and assessment.

A summary table highlighting the active learning approaches used within each year of study is presented as Appendix A.

### 4.1 Differences Between Years Of IS&T Study At UDW

Exposure to, and the development of knowledge, is incremental over the three years of IS&T study. Each year has a distinct nature and role to play in the growth of students’ maturity in the subject. Different aspects of the provision of active learning and the recognition of different learning styles are evident in each of the years of study and are discussed separately below.

#### 4.1.1 ISI (First Year)

The departmental philosophy of creating adaptable, self-sufficient problem-solvers with crisp thinking is distilled into three distinct types of student product coinciding with each year of study within the three year major. In the first year an **Informed User** learns computer fundamentals, the role of computers as a tool in resolving business problems, fundamental practical computer skills, and an awareness of terms and concepts as part of a problem-solving process [1].

Chalmers and Fuller [7] suggest that the lack of appropriate learning strategies at university level may be as a result of schools focusing on teaching the student to reproduce information, thereby encouraging passive, surface learning. In the first year emphasis is placed on stressing the distinction between school and university learning environments. An attempt is made to equip students with some of the learning skills (tools) they may be lacking, such as active listening, basic mind maps, categorization, Venn diagrams etc. These skills are presented in the context of the course material in order to encourage deep learning [25]. Students in their first year are more likely to adopt learning strategies that foster deep learning than third-year students who rarely change their approach to learning [17].

Participation and personal responsibility is stressed from the outset and students are made responsible for arranging their own practical and tutorial sessions, within the constraints of the IS&T timetable. They are informed at the...
outset of course requirements. These are then strictly enforced. For example: Practical work saved under the incorrect naming convention is not assessed and students are excluded from discussion sessions if they have not completed the necessary written preparation. Although an attendance requirement was set for DP (Duly Performed) purposes, this requirement was lowered in the first semester of 1999 due to administrative problems. These requirements are geared to engendering a sense of responsibility and recognition that this is a worthwhile course. Their first lectures (and handbooks) stress “You cannot pass this course by accident!” This sense of professionalism (purpose) and commitment is strengthened throughout the three-year course.

Personal reflective learning is strongly encouraged through the course material. The textbook, and Practical and Tutorial handbook are designed to require interaction with the text prior to, during, and after, a formal classroom session.

Lectures rely heavily on concrete examples and the development of concepts through solving practical problems. “Business Computing: An African Perspective” [13] is ideally structured for this purpose, but does have the limitation that a lecturer has to learn appropriate use of the text. Perhaps additional lecturer guidelines and a lecturer handbook would be useful to bridge this gap. Saljo [33] suggests that "modern textbooks with frequent underlinings and heavy use of bold-type have left very little to learning except memorizing and reproducing (encouraging surface learning of, added by authors) discrete units of information."

It is impractical to expect any particular lecturing approach to succeed unless the responsible academic staff have a personal commitment to the selected approach. Brent's [5] comment about learning only occurring out of one's comfort zone can equally be applied to the learner and the lecturer! In this sense the course is sensory rather than intuitive and inductive rather than deductive. Students are also drawn into discussion in tutorial sessions by ensuring that they have had adequate opportunity to prepare for the discussion and can then present their opinions to the class [16]. It is recognised that at this level students are less able to react spontaneously and hence are given the opportunity to prepare their opinions.

4.1.2 IS2 (Second Year)

The focus of the first year of study is used as a foundation to produce a Developer who has acquired the tools necessary to form part of an IS&T Team; either as a developer or manager, at the end of the second year of study [1]. This is in agreement with Seeler et al. [34] who recognize that more, rather than less, structure is often required to foster active learning. In a sense, if there is any way for a student to avoid active learning s/he will! More emphasis is placed on working in groups. Students are required to write a literature review in pairs. Only 1 of the expected 125 pairs submitted work which indicated their difference of opinion and the opposing viewpoints they each held in relation to the topic explored. In fact, 170 assignments were submitted as students requested permission from the lecturer to submit individually. As cooperative learning is incorporated, so too is group assessment incorporated as part of the course. Approaches perceived to require more maturity and a theoretical foundation, such as Brainstorming [16, 34] and the Socratic approach [34] are also introduced from the second year onwards.

4.1.3 IS3 (Third Year)

The third year focuses on Project groups and IS management but is strongly group and vocation driven (often re-
lating to the programming, analyst, field-specialist or management streams within the industry) [1]. The most notable aspect of the third year course is that formal lectures are avoided as far as possible and the course begins to acquire the characteristics more often associated with postgraduate study. Group work, adopting cooperative and experiential learning approaches, is prevalent. Issues are debated and students are placed in the role of "teacher" as often as possible. Although the department is committed to mentoring students within the course, this only truly becomes a reality at this level where student numbers become more manageable.

4.2 Similarities Linking The Years Of IS&T Study At UDW

4.2.1 Reflective Learning and Lecture-based Approaches

The use of reading and writing as a reflective learning process is encouraged. Within lectures concrete examples and group participation occurs. Feedback [34] and Discovery [16] techniques occur at all levels. These encourage students to prepare for lectures and discussions in advance, and to explore open-ended, novel situations within set constraints, respectively. Seele et al. [34] found that 80% of students preferred the Feedback approach above other approaches. The disadvantage to the lecturer is that it requires extensive planning. Structured controversy (Debate) [16, 21, 34] is also used. In the first 2 years of study students are expected to motivate/defend a particular viewpoint within tests. In third year, they are required to defend particular standpoints during class sessions.

4.2.2 Cooperative Learning

Cooperative learning is used throughout, and although lecturers feel they have ownership and commitment to the objectives of active learning it is unsure if this applies to the tutors as well. The tutors are committed to the approach from the second year onwards but it appears this may not apply in the first year. As part of a general course evaluation for IS1 (20 May 1999) students volunteered comments such as:

"The tutor spoon-feeds us."

"Tutors move too quickly."

"Not enough tutors to help students."

Perhaps tutors are sympathetic to the students who are being forced out of their comfort zone (the contrast being greatest in the first year). It may also be the tutors' perception that they cannot allow the students time to develop their own understanding because of the pressure created by them needing to assist large numbers of students.

4.2.3 Congruency

Structurally, all years reflect a congruency between the objectives, approaches and means of assessment used. Emphasis is also placed on exposing students to the current mindset within the field. However:

- There is the danger of trying to stereotype the students' thinking based on the personal approaches of the academics within the department, and
- Students may try to form a "structure" which reflects this thinking and apply it uniformly [18]. This cannot then be seen to reflect active learning or problem solving, in the true sense of the terms and may instead encourage a strategic approach to learning.

George [16] highlights demonstration of the style of thinking applied in the discipline as an important mentorship function.

5 Challenges

A number of the approaches identified during the study of active learning implementation (Appendix A) were unknown to the IS&T academic staff (or forgotten?!) and stimulated a fresh and new perspective on ways of involving students and enlivening classes.

5.1 Approaches for inclusion in Active Learning

The active learning approaches for future inclusion [16] are indicated by a # in the left most column of Appendix A. These are:

- JOURNAL/LEARNING LOG: A daily journal/learning log is kept to reflect students' understanding of work relating to the course. Alternatively it is used as a means of review and identification of interesting issues. The use of journals is being assessed for inter-lecturer communication for multiple-lecturer courses.
- 3 x 5" CARDS: Students provide a summary of key points and a question on a 3 x 5" card at the end of the lecture.
- INK SHEDDING: Students write a response to a specific question (or reading), read the comments of some of their fellow students and then briefly discusses common points raised etc.
- FREE WRITING: (This approach is similar to brainstorming.) Ideas are written down and then shared with fellow students.
- WRITTEN CONVERSATION: (This is similar to free writing.) Each student reads the written points, comments on them, and suggests answers to the questions raised.
5.2 Assessment

Seeler et al. [34] suggest the use of tests and quizzes should be reconsidered based on the degree of retention that is fostered by them. "Students recall 62% after a lecture, only 45% is recalled by students after 3-4 days and in 8 weeks only 24% of the information is recalled. If a quiz or exam was administered after the lecture, recall was doubled at the 8-week period" [4]. Although quizzes are used in the first year they are irregular and students can see them as a means of obtaining an attendance list for a large class. These assessment approaches should be used more extensively at first and second levels where assessment still incorporates a degree of lower level cognitive questions. Students can also be asked to provide a precis of a reading or lecture, with a certain word limit, such as 25 words, which can be graded [16].

5.3 Course Content

Both second and third year course leaders indicate that insufficient content is covered within these courses. The reasons given are:

- In the first semester of second year the lecturer is dealing with an inherited problem of students who have adequate knowledge to pass a first year, introductory course, but who lack exposure to the necessary skills to cope with second year. At the end of the first semester students are considered to have reached the level of competency which would be expected at the end of the first term. This situation could indicate that an entry requirement should be created for the second year.

- In the third year of study the inadequacy perceived in the content is related to a lack of appropriately qualified staff and specialized facilities required to mount a broad range of topics. Addressing this problem appears to be outside the immediate jurisdiction of the Faculty and can only be addressed at an institutional level.

Felder [15], Northern Iowa [30] and Seeler et al. [34] highlight academics' concern that active learning approaches could result in academic content being sacrificed. In this case study the constraints enforced by large classes and limited resources are identified as major challenges in the determination of course content.

5.4 Student reaction

Student reaction to the course design was volunteered in a general course evaluation for IS1 (20 May 1999). Approximately 45% of the class (166 of 368 officially registered students) completed a questionnaire. Some examples of the volunteered comments, extracted from the responses to the questionnaire, are:

"Shy in the beginning but the practical work helped."

"Suggestion to make the course compulsory to ALL students."

"Could not always complete discussion."

"The tut (tutorial) periods are too short."

These comments suggest students are becoming actively involved, and are responding positively to the course. Lecturers often face difficulties in stimulating the students to become involved in discussions [11, 16]. In the comments quoted, students seem to be showing more involvement in the course (overcoming shyness) and suggesting increased benefit from extended discussion time. On the other hand, some respondents' comments suggested a negative reaction. For example:

"Boring module- Module should be divided into first quarter theory and second quarter prac"

"Not beneficial (because) I still failed"

"DP should be the two best marks'"

"Change the textbook (maybe to (a textbook) with question standards at the end of the chapter)"

It is difficult to assess the validity of these statements because they appear to be directed at reverting to a comfortable and non-challenging status quo [5, 7].

6 Conclusion

- Education is about personal relationships, communication and respect rather than the mere successful transfer of knowledge and attitudes [11, 37]. This implies the commitment from staff to the active learning process is critical. The demands on staff are high, requiring new skills and attitudes, an understanding of students' views, desires and interests, more planning, tougher value judgements on content, and more complex forms of assessment. It also suggests a willingness to make a personal commitment, to be open to new ideas and to be tolerant and non-judgmental [16].

- The approach an IS&T department adopts depends on the degree to which the academic staff feel they are part of a common, well defined goal. Programmes involving teams have been more successful than those developed by individuals working in isolation [7, 17, 31]. Once academic staff are committed to a particular process students' commitment to it can be encouraged. Students require leadership, and recognize a lack of commitment to a plan of action. Therefore committed academics should select an approach for which they can motivate and stimulate commitment.

- Implementing an active learning approach with a student audience steeped in passive approaches is a major challenge to academic staff and requires their strong commitment and perseverance. The academic staff
need to closely monitor both the process and the effectiveness of the active learning implementation. Students often have a preference for a comfortable and non-challenging educational process but the authors believe that is not a strategy for the growth and development of future leaders.

References


[22] IS&T, Summary of IS&T @ UDW, (25 January 1999), http://is.udw.ac.za/DEPT/Summary.htm (1 July 1999).


[34] DC Seeler, GH Turnwald and KS Bull, *From Teaching to Learning: PartIII*, Lectures and Approaches to Active Learning, JI of Veterinary Medical Education, 21(1), (Spring 1994).


## A Framework Of Active Learning Approaches

<table>
<thead>
<tr>
<th>LEARNING OBJECTIVES</th>
<th>IS1 = Informed User</th>
<th>IS2 = Developer/Manager</th>
<th>IS3 = Project grp/ Management</th>
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</thead>
<tbody>
<tr>
<td>Adaptable, Self-sufficient</td>
<td></td>
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<tr>
<td>Problem-solver/Crisp thinker</td>
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<td>Employable</td>
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<thead>
<tr>
<th>APPROACHES</th>
<th>IS1</th>
<th>IS2</th>
<th>IS3</th>
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<tbody>
<tr>
<td>2.1 Personal reflective</td>
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<tr>
<td>Reading</td>
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<tr>
<td>Writing-assessed</td>
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<tr>
<td>Writing- not assessed</td>
<td>Y</td>
<td>Y</td>
<td></td>
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<tr>
<td>Precis</td>
<td></td>
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<td>Y</td>
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<tr>
<td># Journal/ learning log</td>
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<tr>
<td>2.2 Lectures</td>
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<tr>
<td>Concrete examples/ case study</td>
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<tr>
<td>Start with a question to answer</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Intriguing title</td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td>Mini-interactive/ anecdote</td>
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<tr>
<td>#3x5&quot; cards at end</td>
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<td>Y</td>
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<tr>
<td>Student summarises lecture</td>
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<tr>
<td>SPECIFIC APPROACHES</td>
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<tr>
<td>Pausing</td>
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<tr>
<td>Guided Lecture</td>
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<td>Feedback</td>
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<td>Responsive</td>
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<tr>
<td>Brainstorming</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td># Free writing</td>
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<td># Written conversation</td>
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<tr>
<td># Ink Shading</td>
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<tr>
<td>Discovery</td>
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<tr>
<td>Socratic (guide through questions)</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Structured Controversy/ Debate</td>
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<tr>
<td>Students as Teachers: Each grp prepares different work</td>
<td>Y</td>
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<tr>
<td>Expert Panel : answers questions from the floor</td>
<td></td>
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<tr>
<td>Allowing the students to be the teachers (1 to many)</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Turn the lecture into a group discussion</td>
<td></td>
<td>Y</td>
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<tr>
<td>2.3 Cooperative learning</td>
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<tr>
<td>max of 5 members</td>
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<tr>
<td>Tasks compartmentalised?</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Commitment from students?</td>
<td>?</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>Commitment from Lecturers?</td>
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<tr>
<td>Commitment from Tutors?</td>
<td>?</td>
<td>Y</td>
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<tr>
<td>Commitment from Demonstrators?</td>
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<td>2.4 Experiential learning</td>
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<td>Field-based:</td>
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<tr>
<td>Internship</td>
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<td>Practica</td>
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<td>service project</td>
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<td>Classroom based:</td>
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<tr>
<td>Demonstrations</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>role playing</td>
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<td>Y</td>
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<tr>
<td>Simulations of corporate practices</td>
<td>Y</td>
<td>Y</td>
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<td>Credit for life experience :</td>
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<tr>
<td>2.5 Other issues:</td>
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<tr>
<td>Content still adequate</td>
<td>Y</td>
<td></td>
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<tr>
<td>Use of notes/LAN etc</td>
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<tr>
<td>Objectives/assessment process outlined in intro lecture</td>
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<tr>
<td>Demonstrate the &quot;thinking&quot; in your discipline?</td>
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<tr>
<td>3 ASSESSMENT</td>
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<tr>
<td>Writing-assessed</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Journal/ learning log-reviewed</td>
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<tr>
<td># Precis</td>
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<tr>
<td>Ask a student to supply a summary of the lecture</td>
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<tr>
<td>Tests - LOW LEVEL/reca:</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Tests - HIGH LEVEL/application</td>
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<tr>
<td># Quizzes</td>
<td>Y</td>
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<tr>
<td>Group accountability in assessment</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Individual accountability in assessment</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Congruency in presentation and assessment styles</td>
<td></td>
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</tbody>
</table>

PLEASE NOTE: "Y" = Yes and "N" = No

# is used to indicate suggestions for future inclusion (see 5. Challenges)

GREY indicates approaches common to all years of study
Notes for Contributors

The prime purpose of the journal is to publish original research papers in the fields of Computer Science and Information Systems, as well as shorter technical research notes. However, non-refereed review and exploratory articles of interest to the journal’s readers will be considered for publication under sections marked as Communications of Viewpoints. While English is the preferred language of the journal, papers in Afrikaans will also be accepted. Typed manuscripts for review should be submitted in triplicate to the editor.

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- Use wide margins and 1\frac{1}{2} or double spacing.
- The first page should include:
  - the title (as brief as possible)
  - the author’s initials and surname
  - the author’s affiliation and address
- an abstract of less than 200 words
- an appropriate keyword list
- a list of relevant Computing Review Categories
- Tables and figures should be numbered and titled.
- References should be listed at the end of the text in alphabetic order of the (first) author’s surname, and should be cited in the text according to the Harvard method. References should also be according to the Harvard method.

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