1. **TITLE**

Using the Technique of Blended Learning to teach Software Development.

2. **CONTEXT**

A literature survey on “Blended Learning” provides substantial information on the progress made in this discipline of education. In fact it has become the fastest-growing segment of education and training. The application of web-based courses or e-learning is very beneficial to full – time and part – time students due to the fact that it provides flexibility, reduces travel and enhances brain based learning and greater interaction amongst students as discussed by Dziuban, Hartman and Moskal in their Research Bulletin Volume 2004, Issue 7. Kathleen M Frankle in her paper Blended Learning: The Key to Successful Web Based Training and Education discusses how consortia of universities together with industry associations provide an integrated curriculum that is comprehensive with modules from basic to advanced that are all delivered in an interactive web-based format that is available 24 hours a day and seven days a week. The aforementioned example is an excellent medium for industry professionals to engage in continuing education studies where industry and universities collaborate to provide relevant training. The study modules range from providing basic level understanding of a particular subject through to advanced courses for specialists in that particular discipline.

3. **CHALLENGES**

Blended learning combines face to face lecture room instruction with online and reduced lecture, room contact. The key challenge according to Dziuban and others is to proportion the number of lecture contact hours to on-line learning time hours in a manner that will deliver the maximum benefit to the learner. This approach can however only be reviewed once this form of instructional model matures through use.

From DUT’s perspective the fundamental challenge is to provide reinforcement to students who are slow learners. Unfortunately the manner in which primary and secondary education was rolled-out in the black community especially with respect to mathematics and sciences created a cohort of pupils that did not possess a reasonable level of readiness to tackle tertiary level curricula. Hence the theoretical concepts discussed by various researchers have to be modified to suit a very peculiar set of circumstances, as described above. In other words to reinforce learning concepts that may appear to be above the learning capacity of many students, a short lecture on basics can be introduced as a link to a
particular learning concept for previously disadvantaged students to obtain a better understanding of the study material. These students can go online at any time to familiarize themselves with curriculum content that they found difficult comprehending first time round. Students will also have the benefit of reading in advance in order to enhance their learning capabilities in the lecture room.

Training and development forms an important part of any organization’s objective to improve the level of skills in the organization. Currently the Durban University of Technology: Computer Studies department has an Information Technology Advisory Board (ITAB) where representatives from industry and academics share ideas on curriculum development in order to provide industry with the appropriate skills. The role of the ITAB can be broadened to facilitate skills development within the industry as suggested by Dziuban and others and Kathleen Frankle. The collaborative effort between DUT and industry can provide customized training for students and industry professionals at a far reduced rate than each company developing its own training needs with a host of different service providers. Hence the skills levy funds that are paid to the Department of Labour can be better utilized. Wang, Fong and Choy from the City University of Honk Kong discuss Blended Learning for programming courses in their paper entitled Blended Learning for Programming Courses: A Case Study of Outcome Based Teaching and Learning. They arrived at the conclusion that general problem solving skills are developed through learning programming and that difficulties are experienced with high-school and university students to adequately develop higher order thinking skills. Related research has shown that computer-assisted instruction technology can be a more effective way of teaching programming courses and that modified forms of blended learning can be introduced in high schools.

4. THEORY

4.1 Blended Learning

Blended learning refers to courses that combine face to face classroom instruction with online learning and reduced classroom contact hours. The change in emphasis is from teacher-centred to student-centred learning. This new model of teaching and learning heightens the success and ability of learners to learn and interact with the teacher and co-learners. Learners have the opportunity to research a subject in advance and to share information by pooling their research. Prior research assists learners to becoming familiar with the subject matter and prompts students who are generally reactive to become more proactive.
4.2 Learning Styles
Learning is defined as a process by which a change in behaviour occurs as a result of practice or experience. Learning occurs throughout one’s life and influences the behaviour in people. Learning styles vary amongst learners and can be generally classified as follows:

i) Visual learners – they learn through seeing. They prefer pictures and images and take detailed notes to absorb the information

ii) Auditory learners – learn through listening e.g. through verbal lectures, discussions and listening to what others say.

iii) Tactile learners – learn through moving, doing and touching i.e. through hands on hands approach.

iv) Logical – where learners use logic and reasoning to understand content.

v) Interpersonal – Learners prefer to learn in groups.

vi) Solitary – learners work alone and use self study.

Although the first three learning styles are dominant, they can be combined with the latter three to possess a mix of learning styles. The aforementioned learning styles lend themselves to Blended Learning.

4.3 Online Assessment
Assessment is an important element of higher education teaching and learning and as such must measure outcomes to protect academic standards. Assessment therefore needs to be integrated into learning activities of students as far as possible. An outcome based teaching and learning methodology would have courses or topics expressed with the intended outcomes for students to learn. Students gain knowledge through appropriate learning activities and the assessment tasks must be aligned to determine if the outcomes have been achieved. Online assessment can provide immediate results and encourages learner engagement and more frequent assessments should learners not achieve the required pass rate. Multiple choice questions if well formulated reveals what the learner knows and understands. Multiple choice questions generally requires proper preparation.

4.4 Online Facilitation
Online facilitation can be described as managing a group of learners and the learning through an online medium. Online facilitation is important as it lacks the visual presence of a tutor and learner especially if the learner is studying remotely. However when combined
with blended learning it eliminates the impersonal aspect and enhances online communication because of having had personal interaction with the teacher or tutor. The online medium facilitates group learning and self-paced learning. Should learners experience difficulties they can post messages and participate in discussion forums. Hence the goal for effective online medium facilitation is to provide a conducive environment for learning and communication exchange for all learners regardless of their prior experience.

5. METHODOLOGY

Action research is a process that allows action in terms of improvement and change, and research in terms of understanding and knowledge. This process occurs simultaneously and involves the repetitive steps of planning, acting, observing and reflecting. The action research methodology requires participants to be collaborative researchers. An action researcher adopts different roles at various stages of a research project that is undertaken and could be a planner/leader, facilitator, teacher/designer, listener/observer or synthesizer reporter. Action research instigates co-learning as a crucial part of the research process.

Action research lends itself to Blended Learning in particular group learning. A task is issued by the tutor/lecturer to a group who would then become gatherers of information through research and post it online e.g. on a discussion board for group interaction and benefit to others. Our group the World Wide Wiz in preparing the Mind Map assignment used this very successfully. The entire e-learning process was one of action research where we assumed role of student, researcher and instructor.

6. DESIGN

6.1 The Vision
To provide a coaching clinic to assist students studying programming in face-to-face tutorials and using the Blackboard Academic Suite to provide instant support after hours. The coaching clinic will comprise of senior students, lecturers and researchers. Limited resources can thus be used more efficiently.

6.2 Active Learning
Active learning means involving students practicing important skills and in applying new knowledge in other words learn by doing. Active methods require us to develop our own conceptualizations of what we are learning. In active learning the lessons usually contain the following element:
• Reviews of previous learning
• The teacher showing the process with explanations.
• Controlled practice – here the class or individuals do it and the teacher checks closely.
• Students doing it individually.
• Students work being checked.
• Homework – assignments and review questions.
• Reviews take place at the beginning and at the end of the lesson to check on understanding of content.

Blackboard would be the course management system that will have communications tools such as chat, e-mail, discussion forums, group workspaces and will also have information placed within the system e.g. media library and web links. A resource tree can be custom developed to provide a graphic interface organizing a large number of resources according to the topic.

6.3 Working Smart

Blackboard can be used for testing e.g. using multiple-choice questions, true and false and fill in the blanks. If students are not happy with their test results they can revise certain aspects and re-test themselves and strive for 100%. This can be done in a very short space of time, leaving more time for face-to-face contact rather than revision.

Assignments can be set and submitted through Blackboard with a due date. The discussion tool can be used to stimulate discussion amongst students. Tutors can be used to supervise many of the aforementioned activities thus reducing the administrative workload of the lecturer.

6.4 Blended Learning can work in two ways:

i) The brighter students can work ahead and consult the lecturer if they are having problems with certain concepts.

ii) The weaker students will rely more on the face-to-face contact with the lecturer and use the virtual classroom as a means of reinforcement and revision thus improving their knowledge outside lecture times. Blended Learning will suit students with different learning styles whilst providing reinforcement to those requiring additional tuition.
7. IMPLEMENTATION

7.1 Pilot Activity
Discussions with colleagues have indicated that using Blackboard can enhance the teaching/learning process. My virtual classroom is aimed at new students who are learning programming for the first time. It allows them repeated opportunities to go into the virtual classroom until they have finally understood the lesson.

7.2 Relevance
Our major challenges is that disadvantaged students are inadequately prepared to pursue tertiary studies and they take longer to learn. By using the virtual classroom they learn at their own pace and consult the lecturer when necessary.

7.3 Feedback
My lesson in the virtual classroom was to do with introduction of Arrays implemented in Visual Basic.Net. My colleagues are enthusiastic to introduce this with their students in the second semester.

8. REFLECTION

8.1 i) That colleagues and students will be excited with the new technology.
ii) That the study material be structured differently i.e. from teacher-centred to student-centred.
iii) The outcomes of the course/lecture must be clearly understood by students.

The major lesson learnt is that assessments are required to test if students understood the outcomes.

8.2 Future Adjustments
The course content must be presented in an outcomes based manner and must be clearly stated at the beginning of the course. Students must have a clear picture of the course structure. Assessments, quizzes and short programming exercises must be aligned to the course outcomes to provide evidence on how well each student achieved the outcomes.
8.3 Impact
This whole intervention requires a paradigm shift in thinking from the institution, department through to the learners. The curriculum requires restructuring as the focus is now student centred. This institution should consider introducing Blended Learning on a pilot basis and have sufficient funds to roll it out.

8.4 Lessons Learnt
During the past twelve months, I was placed in situations where I had to play various roles. I had to change my mindset from being a lecturer at DUT, to being a learner and then again being an online teacher. Being part of a diverse group for the first part of this course was a challenge. It made me realize that each of us had different skills which we contributed to making our group project successful. During the second part of the course, I realized that Blackboard could be used not only as a teaching tool, but also as a management tool, to promote better communication between lecturer and student.
Finally, every once in a while in our lives we experience change. E-learning and in particular Blended Learning would become the fastest growing segment of education and training. If sufficient resources are made available the long term benefit in the cost of producing graduates would actually reduce in real terms. Such is the potential impact of this technological medium because failure rates would drop due to students receiving a more substantial form of learning and reinforcement.
9. BIBLIOGRAPHY


