

Pretoria to Khartoum - how we taught an Internet-supported Masters' programme across national, religious, cultural and linguistic barriers

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ABSTRACT

This article tells the story of the design, development and presentation of eighteen months of coursework for a Master's degree programme in Computer-Integrated education at the Sudan University of Science and Technology in Khartoum from 2002 to 2004. The focus is on what was learnt in adapting a programme presented at the University of Pretoria to cope with the challenges of teaching at an institution thousands of kilometres away, where technological infrastructure, time and policy issues; and even the weather played an often disruptive role. The data sources from which the story is constructed are field notes and preparation material, the project diary, informal discussion both physical and online; interviews and email messages with students, local facilitators, local administrators and presenters; as well as the electronic artefacts produced by the students. A comparison between a synthesis of the literature and the narrative description leads to the identification of seven assumptions that may guide the design, development and presentation of international, cross cultural Internet-supported teaching initiatives.

Keywords

Blended learning, Multi-cultural education, Internet-supported education, Distance education, Computer-assisted education

Introduction

At the beginning of 2000 I was asked to present the University of Pretoria's Masters' degree programme in Computer-Integrated Education at the Sudan University of Science and Technology (SUST) in Khartoum, under the sponsorship of the UNESCO Institute for International Capacity Building in Africa (IICBA). Instead of imposing a foreign degree on the local university I had to help them develop their own sustainable qualification. The SUST senate approved a qualification consisting of ten courses, identical to those of the University of Pretoria Masters' degree, and a mini-dissertation. Twelve exceptional graduates of the four-year Bachelor of education of SUST were recruited in 2002, and were given six months of English language and computer literacy training in preparation for the Masters' programme commencing in January 2003. The presentation mode was a mix of contact and Internet-supported distance education.

This article is a reflection on the eighteen-month process. It relates the successes, failures and practical implications of teaching across national and cultural borders. I was both participant and observer. I participated as programme designer and coordinator, as well as the presenter of a number of the courses, and observed the behaviours of the students, facilitators and administrators, and my colleagues who assisted in teaching some of the courses.

Theoretical underpinning

The programme that is researched and the research itself are rooted in constructivist theory. The programme was designed for students to construct their own meaning, which would be relevant to their own situations, while I present my own reflective construction of what I learnt. It is up to the reader to construct meaning based on an interpretation of all this.

The pedagogical point of departure for the design and presentation of the programme was Merrill's (1991) six guidelines for instructional design: Learning is constructed from the experience of the learner. Interpretation is personal. Based on their own knowledge and experience individual learners make different interpretations of the same material. Learning is an active process whereby experience is converted into knowledge and skills, instead of being "taught". Learners should be given learning tasks that they can only complete by acquiring the prerequisite knowledge and skills. Learning is collaborative and enhanced by multiple perspectives. Knowledge is situated in real life and that is where learning should take place. Testing should be integrated with the task. My

co-presenters and I adhered closely to the five principles of constructivism presented by Brooks and Brooks (1993) who argue that problems must be relevant to students, the curriculum should be founded on primary concepts, teachers should seek to understand and value students' point of view and adapt the curriculum accordingly, and that authentic assessment should serve rather to assist the learner than to determine a grade. Other authors who guided our thinking include Hannafin and Peck (1988), who believe that "learning may be more efficient when the instruction is adapted to the needs and profiles of individual learners" (p. 48), and Papert (1993) who coined the term *constructionism* for the process of assigning tasks from which people learn.

The practical design and execution of the programme took note of Daniels (1999) who points out the advantage of international collaboration in allowing students and instructors to develop enhanced linguistic and cross-cultural skills, and mentions institutional administrative and policy factors as barriers for international cooperation. Administrative aspects that come into play are differences in academic schedules, group sizes, and assessment criteria as well as the challenge of cultural and language barriers.

Research method

This ethnographic case study investigates the socio-cultural and educational context (Ellis & Bochner, 1996) of a clearly delimited group of participants (Yin, 1989). The data sources were my own lived experience, field notes and preparation material, the project diary, informal discussion both physical and online, interviews and email exchange with students, local facilitators, local administrators and my co-presenters; as well as the electronic artefacts produced by the students in the form of essays, term papers, websites, *PowerPoint* presentations, *Authorware* lessons and *Excel* spreadsheets. Data was subjected to a classical analysis (Ryan & Bernard, 2000) involving a scrutiny of all the products to determine the emerging patterns, and to classify them in terms of the assumptions derived from the literature. Member checks (Merriam, 1988) occurred as seminal versions of this article were sent to participants, and comments received were worked in.

A limitation of participatory ethnographic research is that it can be clouded by personal bias (Ellis & Bochner, 1996). Attempts to counter this include multiple sources of data, as well as regular consultation with co-presenters, and discussions with the students. I lay no claim that these results can be generalised, but present them here hoping that they may resonate with similar findings of other researchers (Berg, 1989) and contribute to the body of unfolding stories about international collaboration across national and cultural borders with various blends of contact teaching, co-operative learning and Internet support. The strength of qualitative research lies in rich and thick description (Merriam, 1988). Here follows a detailed narrative account of the history, development and running of the programme and the responses of the participants.

Background

Since 1992 the University of Pretoria (UP) has presented a two-year Masters' Degree programme in Computer-Integrated Education (CIE). The programme is made up of 18 months' coursework and a mini-dissertation. The presentation mode is that we meet once every six weeks on Wednesday and Thursday for feedback and examination of the past course, and on Friday and Saturday to discuss the work for the next course, and workshop essential concepts. All materials are available on the Internet. Between meetings lecturers and students continue discussions on an email discussion list.

Sudan University of Science and Technology has a faculty of Education and a department of Computer Science, as well as a centre for computer-based education, but has never offered any courses in computer use in education. Although Sudan is one of the poorest countries in Africa the university has an excellent computer infrastructure, and Internet connectivity, though with very limited bandwidth. The Sudanese Ministry of Education and Ministry of Technology had been planning the introduction of computers into schools in Sudan, but teacher training was a constraint. It was decided to develop capacity in this region by offering bursaries to promising Bachelor of Education graduates for a Masters' programme in Computer-Integrated Education. Upon completing the programme they would train teachers in Sudan. The UP M.Ed. (CIE) degree was selected for our curriculum, presentation mode, cost considerations and African orientation. An existing cooperation agreement allowed easy exchange of staff and students between UP and SUST. Both institutions have British colonial roots and have a typically British academic "look and feel" and structure.

The Republic of Sudan is the country with the largest surface area in Africa. It is also one of the poorest. It forms the meeting place between the Afro-Arabic states to the north, and Coptic Christian states to the south. For many

years it has been plunged in a civil war, which means that much of the little financial resources it does have, are spent on the military. Apart from the obvious poverty there is no evidence of war in the capital, Khartoum, which is a typical African metropolis with a few exclusive and expensive Western-style hotels flanked on all sides by indigenous hotels, small businesses and housing.

Project description

The preparatory visit

I visited Khartoum for the first time for four days in August 2002 to meet with the role players. I met the Sudanese ministers of Education and of Technology, the Vice-Chancellor of SUST, the Dean of the Education Faculty, the programme steering committee, programme facilitator and tutors; and prospective students. The facilitator was a Caucasian American Muslim who was also their professor of English and Research Methodology. The two part-time computer literacy tutors were full time students on the M.Sc. Computer Science programme of SUST.

The presentation mode was that a Pretoria instructor would spend four or five days on a contact visit with the students every eight weeks and then support them via the Internet in the intervening period. The local facilitator and tutors would meet the students weekly and see to their day-to-day needs. For the first visit we would spend a total of four days getting to know one another, exchanging expectations about the programme, doing general administration and introducing the first two courses. All subsequent face-to-face meetings would also be four or five days long. The first few days would be spent completing the current course, while the last days would be for introducing the students to their next course.

I went on an extensive tour of the campus, saw various computer laboratories, and attended examination sessions where computer science students demonstrated their final year projects. The standard of teaching and the computer facilities were excellent, but bandwidth constraints made Internet access during class time almost impossible.

We planned the presentation schedule for 2003 and 2004 and drew up a provisional timetable. Fitting the programme into a two-year calendar seemed ridiculously easy. SUST has a timetable-based undergraduate programme, but graduate students attend throughout the year. There was no need to fit in with the rest of the university, besides which it was impossible to obtain a copy of the official university undergraduate timetable, which would have enabled me to slot some of my classes into times when the undergraduates were off campus and not using bandwidth. We therefore negotiated with the students to have contact sessions on Friday – the Sudanese (Muslim) holiday – and they could take another day off for their holiday. The students, having been selected for their high levels of motivation, performance and dedication, agreed. Furthermore, I could not find a record of Sudanese national holidays on which it may be improper to teach. I therefore labelled my timetable “provisional”, and returned to South Africa.

A few days before the official commencement of the programme I obtained email addresses for all students and the facilitator and registered them on a *Yahoo groups* discussion list. I put the course objectives and learning tasks on the Internet, providing links to provisional readings and to all the websites students would need to perform the tasks.

The first academic visit

Upon booking my flights for the visit I learnt that the earliest return flight would be at 03:40 on Wednesday morning. The visit would be for five days. We would cover the contact work for two courses: *Evaluation of software and its effect on learning* and *Learning theory for computers in education*.

I had timetabled the first session to start at 08:00 on Friday January 10, 2003. When I was collected from the airport the Thursday night I heard that the students used public transport and could not make it before 09:00. The prescribed textbook (Alessi & Trollip, 2001) had been obtained, but would only be available on the Saturday, as Friday was the national day of rest.

On the first day we registered all participants on *Yahoo groups*, our principal means of communication between contact sessions. At 11:00 “breakfast” arrived, in the form of a platter of refreshments. This was unexpected. I

did not know that 11:00 was breakfast. I had no idea of the rhythm of a Sudanese working day. I had planned to break for lunch at the traditional South African time of 13:00. After breakfast we discussed our mutual expectations, and I handed out the work for the next three days. Students had to present individual lectures on various topics concerning learning theory for computers in education, and evaluation of software. At some stage students disappeared for prayers, and returned a short while later. We continued some more and ended the day at 14:30 to allow them to prepare at home.

The second day, Saturday, we workshoped the presentations that they would do on Sunday. It was becoming clear that they were very uncomfortable with the degree of freedom they were allowed in terms of what I expected of them. So much for flexibility! They wanted clear guidelines, but, working from a constructivist, learner-centred perspective I was not going to give it to them. They had to continue discovering valid information and process it into units that were palatable to their peers.

We broke for lunch at 13:00 and some of students and I went to the student canteen together with the facilitator and tutors. During this informal discussion it became clear that students felt it wrong that someone from outside, with no local knowledge, was teaching them. My explanation that I was providing the core, and that they had to add local relevance, did not satisfy them. I therefore suspended the activities of the third day, Sunday and replaced it with a field trip. A committee of students determined the itinerary, and arranged a full-day tour of Khartoum to introduce a foreign education consultant to the diversity of the situation.

We visited the University of Khartoum school of Art and Music, a number of state-run junior and high schools for boys and girls, and we visited a brand new private high school that had just been constructed. Figure one shows scenes from two computer laboratories in such schools.



Figure 1: School computer labs in Khartoum

I learnt how to say *Salaam alaikum* (peace be with you) and *sookran*, (thank you) and generally socialized with the students. We also visited two of their homes – one in a well-to-do area on the banks of the Nile, the other in an average area. Thus more trust was built up between the students and me, and their anxiety levels were considerably reduced.

The students' first learning task was to evaluate educational software of their choice on a target population of their choice. They had to conduct static evaluations on three pieces of software in groups of three, but give individual feedback, each on one program. They had to make recommendations about implementing the program in their situation. The students spent Monday morning presenting their mini workshops on the general topics given to them, and the afternoon evaluating software for their feedback sessions on Tuesday. Their confidence increased considerably as they received affirmative feedback on their workshop presentations.

There are a number of Sudanese programs on the market, and the SUST multimedia section had already developed some of their own, but the students nevertheless opted to use programs I had brought along. These were regular commercial titles from the Davidson, Dorling Kindersley and Jumpstart stables, as well as a few titles produced by my own students as part of their *Authorware* courses in previous years.

The screen captures of the students' *PowerPoint* presentations, illustrated in Figure two show that they conformed rigorously to the framework that they were given but the actual written assignments showed substantial flexibility in their approach to using international software that might not necessarily be suitable for Sudanese use. A student evaluating *Magic School Bus* found that it would be useful for Sudanese learners across the economic and gender spectrum, with minor revisions to language, since 35% found the language acceptable

and 50% found it “too easy”. Two students independently evaluating *Reader Rabbit* found it to be motivational and useful for Sudanese learners. Both commented that the pictures should be more carefully matched to the text, but had no problem with the ethnic biases of the pictures. One recommended that the program should allow temporary termination, and the other that the teacher be present to support slower learners.



Figure 2: Screen captures from PowerPoint evaluation presentations

For their final project – an essay reporting on a dynamic evaluation of a piece of software of their choice – I realized I had to give more scaffolding than I would have given to my South African students. I therefore developed a template essay and a spreadsheet-based assessment rubric. I divided the students into support groups so that they could assess one another’s projects before hand-in. We re-negotiated hand-in dates as well as the times of my next visit.

I took them through a sample essay of a South African student and worked through the assessment rubric. The self-assessment and peer assessment had to accompany the final document. In this way I was hoping to achieve the highest level, *evaluation*, on Bloom’s (1956) taxonomy without causing distress to the students.

The plan was that the students would complete their evaluation assignments and submit them after four weeks. Then they would meet with their local facilitators and start with the theoretical work for the learning theory course in preparation for my next visit. We finished late on Tuesday afternoon and I departed for Pretoria at 03:40 on Wednesday morning.

Most of the student assignments arrived on time via email. A few assignments were handed in late on account of technical problems in Sudan such as non-availability of computers and Internet downtime. All had assessment rubrics as attachments. Table one shows the grades they gave themselves, and the grades I gave them.

In most cases the students were slightly more generous with grades than I was, but in only two cases was the discrepancy higher than 5% , and in both cases the students under-evaluated themselves. The two candidates in question, Ta and Om were among the stronger ones. Subsequent interviews and reflection revealed that one, a very diligent female student, did not believe she could achieve so high a grade, and went back and brought some assessments down. The other student, who calls himself “the naughty one”, had similar doubts about his performance. Nevertheless these two students found the experience a valuable lesson in meta-cognition, and in taking responsibility for their own learning.

The high degree of correlation was due mainly to the mechanical nature of the rubric, which consisted of 54 items to be checked on a scale that ranged between two and five points. The advantage of the system was that

students felt comfortable with the way in which they were assessed. The disadvantage was that, at Masters' level, I felt uncomfortable with the equally mechanical quality of the work that was produced.

Table 1: Student self-assessment compared to my assessment

Student	Own grade	My grade	Difference
Id	76	76	0
Md	83	86	-3
Ab	70	68	2
Ha	75	75	0
Ma	74	69	5
Ta	68	82	-14
Ka	53	51	2
Ib	70	73	-3
Yo	91	86	5
Om	70	82	-12
Ia	70	67	3
Et	89	85	4

The second academic visit

On my arrival on Saturday, 22 March I learnt that a computer laboratory that was promised specifically for our students had not materialized, and the very luxurious, high-bandwidth facilities of a private institution, the Khartoum Academy of Technology (KAT), had been rented for our use.

Much of the second visit was spent catching up on work that should have been done while I was away. The second course, dealing with learning theory for computers in education should have started in my absence. The plan had been that I would finish it off with them and start on the third. I had emailed work to the facilitator to distribute among the students, but computer laboratory constraints prevented them from working, so they had done very little preparation and I had to help them catch up.

Students expressed extreme dissatisfaction with the lack of support that they were getting from their own institution. Nevertheless, once their anxieties about their unfinished work for the second course had been addressed and new deadlines had been negotiated they seemed to be more at ease.

I also realized that I would have to spend more time on their third course – one on tutorials, drills, simulations and games – during this contact session to avoid our falling behind again. I therefore dealt with the contact work of both courses during the one visit. We lengthened our contact sessions and met from 09:00 to 21:00 instead of 09:00 to 16:00.

Learning theory for computers in education

For the learning theory course students had to design a computer-integrated co-operative learning (Johnson, Johnson & Smith, 1991) event along *instructivist* principles, in particular Gagne's (1987) events of instruction and try and reach as high a level as possible on Bloom's (1956) taxonomy of the cognitive domain. However, the catch was that they were to allow the lesson to occur in a *constructivist* fashion. They were to present this learning event to a target population of their choice, record the event with a digital camera, debrief the learners on the event, assess the learning that had taken place and write up what they had learnt in a paper of 3000 words. They were also to edit the video to ten minutes and embed it in a *PowerPoint* slideshow.

Although they had dealt with constructivism in their undergraduate years, they were *taught* about constructivism during typical *instructivist* lessons. Apart from the work that they had done with me for the previous course they had no experience of constructivism. I would have to monitor their progress carefully to avoid their slipping into "chalk and talk" reinforced by computer-based drill and practice. Thus we spent a day discussing the possible

learning events that they may present, and sharing ideas of how to improve these, working in small groups. Then they presented their plans individually to the class and to me. Once they had received feedback, they drafted learning event protocols according to a template I provided.

In the time before our next contact session, they would email me their learning event protocols as well as any spreadsheets, worksheets and slideshows that they would use in the lesson. I would critique them publicly via the class *Yahoo groups* discussion list. They could fix it up and re-submit, concentrating on improvement, rather than on the grade they wanted. The students were happy that they could submit their lesson protocols for comment before presenting the lessons.

Our third contact session would be devoted to their oral feedback, illustrated with the video-embedded *PowerPoint* shows. I wanted them to see what their lessons looked like. Table two is an example of an initial protocol that was submitted for discussion.

Table 2: Example of a learning event protocol

Subject area: French grammar “Le passé composé”				
Expected outcomes: After this learning event, students should be able to: Identify the rules of forming the past participle of French verbs from first, second and third group. Construct the past participle of French verbs from first, second and third group. Distinguish between the past “passé composé” form and the present form. Identify the structure (rule) of “passé composé”. Utilize the passé composé in real or different contexts. Identify the verbs that are used with auxiliary être (to be in English). Make the « accord » of verbs with subject when the auxiliary ‘être’ is used.				
Time	Learner activity	Facilitator activity	Resource	Rationale
10 min	Do an exercise as pretest.	Observe, asses for comprehension level	Written exercise (pre test).	Assess students’ comprehension extent about the lesson.
5 min	Listen to introduction about the lesson objectives, procedures & procedure (plan).	Introduce the lesson objectives, procedures & activities (plan)	Verbal information	Make students aware about the lesson objectives, procedure & activities.
5 min	Read & discuss a list of given verbs (from 1 st , 2 ^d , 3 rd group) and their past participles through a table.	Observe, animate the discussion, and check for accuracy.	Table on word processor. List of verbs from different groups	Make students aware about the difference in forming past participle of verbs from 1 st , 2 ^d & 3 rd groups.
5 min	Complete the given table by giving the P.P of the rest of verbs from each group.	Observe, encourages students to work and provide feedback.	The previous table of verbs	Encourage the students to know the rules of forming the ‘P.P’ of verbs from different groups and applicate these rules.

Drills, tutorials, simulations and games

Despite the six-month intensive language course, students struggled to express themselves in English. The grading of their previous essays showed that their academic skills and subject knowledge were securely in place, but their English writing skills were a barrier. I decided to work around that by letting them do projects that would involve much reading and thinking, but little writing. I designed embedded assessment strategies focused on measuring their understanding of teaching with computers, rather than their knowledge of English.

Students were placed into co-operative learning groups designed according to Johnson, Johnson & Smith’s (1991) “jig saw” model. They had to read through the chapters in Alessi & Trollip (1991) about tutorials, drills, simulations and games. Then they had to compile an *Excel* spreadsheet with check box responses to sixty questions. Based on the answers to those questions the spreadsheet should prescribe the extent to which a given learning need would be best served by either a tutorial, drill, simulation or game. The twelve students were divided into expert groups each concentrating on one of the four modalities, and home groups consisting of a designer, a spreadsheet programmer and a writer. Thus they would focus on primary concepts, but the group members would bring multiple collaborative perspectives. The spreadsheets were completed during the contact session.

The spreadsheet tasks completed under my close supervision were of very high quality both technically and in terms of content, though the English language usage of the questions was still poor. Essentially the four groups produced spreadsheets that asked the same questions, because the expert groups formulated them together. The

sheets differed in the weighting of each statement, as the home groups negotiated this. The individual designs of the spreadsheets also differed according to group preferences (See Figure three).

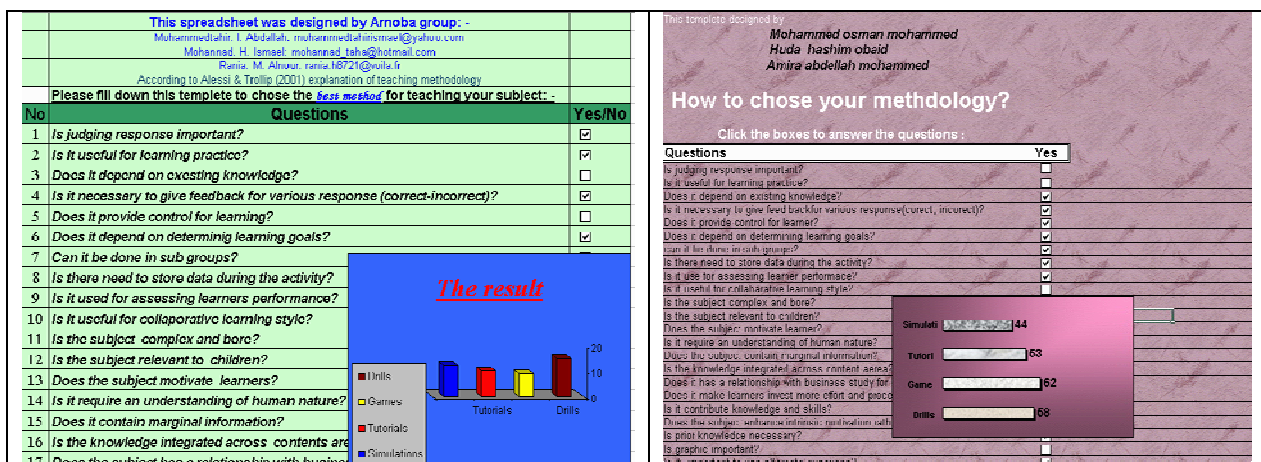


Figure 3: Spreadsheets of two groups showing different interpretations of the same task

The second task was for students individually to design a *PowerPoint* tutorial of sixty screens that would teach about tutorials, drills, simulations and games in their subject area or work environment – to allow personal interpretation of primary concepts. The slideshows were to be submitted to me via email.

We ended the visit with an evening picnic on the banks of the Nile, eating American-style pizza, and drinking African Muslim style non-alcoholic bottled sodas.

The work I received via email was excellent. Students submitted lesson protocols as *Word* documents with sound clips inserted. They designed worksheets in the form of macro-enabled *Excel* spreadsheets and interactive *PowerPoint* slideshows. Most work arrived punctually and students who asked for extensions met their revised deadlines. An analysis of the work showed clearly that the students had constructed their own learning from their own points of view.

The third academic visit

The third contact visit, starting on 24 May and held once again at KAT, was uneventful, but the temperature was 41 degrees Celsius and very humid. The annual Khartoum rain had fallen the previous day. All over the city people were using air conditioners, leading to frequent power cuts. We could hardly use our air conditioning, computers or data projector. We spent the first two days debriefing students on their lessons, watching and discussing their movie clips, and giving feedback on their *PowerPoint* shows on tutorials, drills, simulations and games.

Instructional design

The fourth course had to prepare students for the fifth course, which, according to our agreement, would be a locally delivered course on developing educational multimedia with *Macromedia Authorware*.

Students had to prepare needs assessment documents, design specifications, instructional design blueprints, and a *PowerPoint* mock-up of the project that they would produce for course five. On account of the power cuts we did this with paper and wax crayons. They emailed their electronic design specifications, blueprints and other documentation for me to critique via the *Yahoo groups* distribution list, so that all could learn from my feedback on each individual submission. Then they set about collecting material for the *Authorware* sessions.

Two more visits

Many emails from dissatisfied students indicated that they were unhappy with the locally delivered *Authorware* course, so I asked a colleague and *Authorware* expert, Dr Dolf Steyn, to present course six on project management starting on 14 August. We re-curriculated it to include a revision of *Authorware*. Students, in two

project teams of six members each, had to run a project in which they designed and constructed yet another program in *Authorware*. They were highly satisfied with the course and requested Dr Steyn as presenter for course seven starting on 2 October. For this course on learning with databases they had to construct relational databases that yielded bibliographical information about literature on constructivism and computers, objectivism and computers, computers and individual learning, and computers and cooperative learning. The rationale for this task was to reinforce the course on learning theory that was skimmed over owing to time constraints earlier in the year.

An unanticipated break

Course eight, on Internet-based education, should have started towards the end of November, but when we discussed a date with the students they said that couldn't do any work in the month of Ramad'an (November) as they would be tired from fasting all day. This information had not been shared with me in the planning stages in January, and I had to deviate once again from the "ridiculously easy", "provisional" timetable. I could not go in December since increased air traffic over the festive season made it impossible to find reasonably priced air tickets. I therefore ran course eight on "Internet-based education" *via* the Internet during December and the first half of January. For this course they had to construct an annotated webliography on Internet-based learning, and design their own websites with portfolios of all the work they had done thus far.

The last two contact sessions

We presented the contact sessions for the last two courses in Khartoum from 15 to 22 January 2004. Course nine was about implementing computers in schools, and course ten on computer use in classrooms. The two were presented in tandem and with the help of Prof. Seugnet Bignaut of the University of Pretoria.

Strategic planning for computers in schools

The contact session for course nine consisted of a two-day seminar on effective computing in schools attended by delegates from the Ministry of education, as well as principals of local schools. We took the delegates through the process of analyzing, planning and implementing computers in schools from a strategic, tactical and operational perspective.

During this seminar I learnt my most valuable lesson in teaching across national and cultural borders - the importance of presenting *core* material rather than application. I suggested that before a school could determine an implementation policy it would have to take note of government policy. What is government's purpose with education? Once you know that, you can determine the role of computers in helping your school achieve government's purpose. In my country, I said, the purpose of education is economic empowerment: To help people get jobs and make money. I added that it was probably the aim of all education. A representative from the Ministry of education interrupted me. "In this country," he said, "The purpose of education is to teach people to live together in peace and harmony". This was greeted with much enthusiasm from the audience. I had forgotten that in their war-torn country, they had more important things than money on their minds.

After the two-day seminar the students had to go to one of the schools whose principals had also attended and, in co-operation with the principal, develop an implementation plan for the school.

Computers in the classroom

For course ten, students had to use *PowerPoint* to develop a "mindtool" for use in the classroom, and perform a formative evaluation of the tool. In this way the final course linked up with the first one on evaluation of software and its effect on learning. Students were encouraged to use the mindtool as the basis for their three-month mini-dissertations that they would write in Arabic under local supervision. Prof. Bignaut also presented a two-day workshop on writing a research proposal and conducting development research. She undertook the last contact visit when she debriefed the students on their experiences, graded the presentation for course nine and ten, and refined their proposals with them.

Finishing off

On completion of the ten courses there was time for students to complete any unfinished projects. While processing the grades I learnt that the pass mark for a Masters' course was 60% and not 50% as in South Africa, and there was no distinction. Thus I had to moderate some results.

Then the chair of the programme steering committee told me that students were only allowed to start their dissertations once I certified that their coursework was complete – another piece of new information. Instead of submitting all their results in one batch I therefore had to submit in drips and drabs over a period of four days as they completed their unfinished tasks. I eventually gave them 24 hours to finish all outstanding work – and they did. One student had health and personal problems and finished a month after the rest, but on 5 July 2004, eighteen months after the official beginning of the programme, I submitted the last grades. The duration of the taught component of the programme had been exactly the same as the one run in Pretoria.

Conclusions and recommendations

This section presents some of the conclusions reached during an analysis of the project data, against a synthesis of the theoretical principles and guidelines for constructivist learning (Brooks & Brooks 1993, Merrill 1991).

The synthesis presents some clear correlations, but also some apparent contradictions. While it is essential to create relevant experiences from which the learner can construct learning, tension develops between the need to ground work on primary concepts while allowing personal interpretation. This is exacerbated when learning is to be enhanced by the multiple perspectives that come with collaborative learning. Finally, moving learning into the real world, while integrating the task and the test in such a way that it benefits the learner rather than just producing a grade requires a great deal of flexibility, both in terms of content area, learning task and deadlines.

The relationship between the two sets of principles can be seen more clearly when they are plotted on a matrix. Table 3 shows a synthesis of the two perspectives, with areas of commonality indicated with ✓, contradictions with #, and aspects that are exactly on target for this study with ⊙.

Table 3: Synthesis of principles and guidelines

	Curriculum relevant to students	Focused on primary concepts	Value students' point of view	Adapt curriculum	Authentic assessment	Assessment o support rather than grade
Learning is constructed	⊙			✓	✓	✓
Interpretation is personal	✓	#	⊙		✓	
Learning is active and converts experience into skills	✓	✓	✓	✓	⊙	
Collaboration enhances with multiple perspectives		⊙	✓			✓
Learning should be in real life			✓	⊙	✓	✓
Testing should be integrated	✓	#		✓	✓	⊙

Assumptions

From the “targets” in Table three a number of assumptions can be distilled. They form the basis of the interpretation that follows:

1. The curriculum should be designed in such a way that it provides relevant experiences from which students can construct their own learning.
2. Interpretation is personal and the student's point of view must be valued, but not at the expense of primary concepts.

3. Active learning tasks should incorporate assessment strategies that determine the extent to which experience has been converted into skills.
4. Multiple collaborative perspectives should be focused on primary concepts.
5. The curriculum should be adapted “on the fly” if the real-life situation demands it.
6. Testing should be unobtrusive and focused on determining areas where the student should improve.

The assumptions above seem good on paper, but give rise to practical problems. As they stand they call for a high level of administrative flexibility, which is further complicated when one works across national borders (Daniels, 1999), particularly in a country that is five hours’ flying time away. Thus another assumption needs to be added:

1. Administrative flexibility should be designed into the system from the outset.
2. These seven assumptions formed the basis of this interpretation of the findings and will be used as sub-headings.

Assumption one: The curriculum should be designed in such a way that it provides relevant experiences from which students can construct their own learning.

The value of the day-trip with the students to schools and other institutions of note cannot be underestimated. Although the programme was designed from the outset to provide scaffolding of primary concepts the instructors had to develop a feeling for the environment where the students operate. Students had to develop confidence in the instructors’ willingness to allow them to construct their own relevant learning.

The pictures of school computer laboratories captured from the videos of lessons from course two, or contained in the strategic planning documents of course nine give us some indication of the real world in which the students operate. It became increasingly necessary for the instructors to act as *facilitators* of students’ understanding of the situation within the wider context as their mastery of the subject content increased.

Students showed much appreciation for the fact that they could test software on their own pupils, design lessons for their own learners, make spreadsheets to test the appropriateness of drills, tutorials, simulations or games in their own environment, develop *Authorware* lessons for Sudanese learners, and write implementation plans for schools in Khartoum.

Assumption two: Interpretation is personal and the student’s point of view must be valued, but not at the expense of primary concepts.

Presenting *core* material is essential. The stated government policy on the purpose of education differs radically from the South African one, nevertheless, my initial (core) statement remained valid: you have to know what the policy of government (your employer) is, before you can set up your own.

The software evaluation projects showed that, with the fundamentals in place, and primary concepts established, students could add value with personal interpretation.

The self-assessment rubric kept primary concepts in tact, while students explored their own interpretation in their essays.

Assumption three: Active learning tasks should incorporate assessment strategies that determine the extent to which experience has been converted into skills.

Self-assessment and peer assessment rubrics teach students to assess. The embedded assessment strategies in the spreadsheet task, lesson videos and *Authorware* projects emphasized their understanding of teaching with computers, rather than their knowledge of English.

Assumption four: Multiple collaborative perspectives should be focused on primary concepts.

The co-operative learning in the spreadsheet tasks showed they could focus on primary concepts, yet bring multiple perspectives.

Internet-based feedback on student projects delivered between contact sessions was usually presented to the whole group via a mailing list. Students objected to individual feedback as they felt that they might miss valuable information that could be relevant to their own work.

Assumption five: The curriculum should be adapted “on the fly” if the real-life situation demands it.

The excursion added the curriculum of the first visit built trust the students and me, and reduced their anxiety levels.

The spreadsheet exercise shows how the learning task was adjusted without affecting the curriculum outcomes.

Wax crayons and paper are excellent alternative tools for making instructional design sketches and prototypes.

Other examples of the curriculum changing as we went along include repeating the *Authorware* course as part of the project management course.

Adapting the curriculum for logistical reasons by moving the Web-based learning course entirely online had the happy consequence of giving the students a completely online experience of online learning.

Assumption six: Testing should be unobtrusive and focused on determining areas where the student should improve.

The self-assessment rubrics, iterative assessment of learning event protocols, and video assessment of the constructivist learning events are examples of unobtrusive testing focused on improvement rather than grades.

Assumption seven: Administrative flexibility should be designed into the system from the outset.

Administrative flexibility is probably the most complex issue, but also the most important. In the eighteen months of this programme my two colleagues and I had to contend with the minimum information about schedules and timetables, as well as obscure policy and academic procedures. We learnt about prayer times, late breakfasts, transport problems, slow construction times and painfully slow Internet connections. Public holidays intervened. We had to moderate our assessment at the last minute

While we were extending deadlines to accommodate administrative and logistical delays, the institution mandated that they could not continue with their theses unless the coursework had been completed. Our administrative flexibility was, ironically, holding our students back. Flexibility also meant that one sometimes had to be rigorous where others may have been lenient.

Most importantly, what we learnt was that flexibility bred flexibility. Students were prepared to work on their holidays because we would work on ours. Students were prepared to work under pressure of 24 hours completion time, because they knew they had been given extension beyond the reasonable dates.

Finally

To me the greatest success of the programme lay in its 100% completion rate. We completed the programme exactly on schedule, although we had to miss out a two-month period in the middle. Two students got married during the year, and some lost loved ones. Yet all of them finished and the final results compared well with those of their South African counterparts. I cannot say how much of the success is attributable to the assumptions above, and how much of it is due to institutional factors such as bursaries, contractual obligations, rigorous selection or career opportunities, but what I do know is that, if asked, I will do it again.

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