International Journal of Latest Research in Science and Technology **ISSN (Online):2278-5299**
Volume 6, Issue 5: Page No. 04-16,September-October 2017
https://www.mnkpublication.com/journal/ijlrst/index.php

CASE STUDY: EVALUATION OF THE RAISING AWARENESS PROFESSIONAL DEVELOPMENT PROGRAM

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Abstract – ***The evaluation of the professional development program is based on data collected from 36 participants on the effectiveness of training. Evaluation was also conducted on professional development in the use of software and hardware that can be used to support and improve teaching and learning in mathematics. One participant in the professional development program was selected to provide a case study of an individual lecturer provided with additional support and mentoring in the use of the Tablet in lectures and the production video resources for use with students. Lectures from Oman and Malaysia had positive perspectives as to their future use of the Tablet PC, their own production of resources and how to use learning design in the eLearning.***

Keywords— Tablet PCs technology, video resources, professional development, mathematics education

1.1 INTRODUCTION

The characteristics that make a variety of tablets, and in particular Tablet PCs, extremely useful in mathematics education is the ability to alternate between writing on the screen with a stylus and using a keyboard and mouse (Gill, 2007). Writing with a pen on a touch sensitive screen is an important characteristic of the Tablet PC (Fisher at el., 2007).

The Tablet PC is able to support the teaching and learning process. When lecturing, the tablet offers three advantages: the ease of writing and erasing which allows the lecture slides to be annotated as the instructor lectures, the ability to save annotations, and the ability to send annotated lectures to students. The Tablet PC also enables a simple but important pedagogical strategy of allowing the lecturer to face students when writing in lectures (Porter & Denney, 2011), a particularly important advance for mathematicians who hitherto have engaged in writing solutions on whiteboards, with their backs to the audience. Screen capture abilities mean that real-time annotated lectures can be captured and streamed over the Internet, and feedback can be provided to students on assignments and resources/videos/podcasts created (Dekkers, et al., 2011). One advantage of digital inking is that it provides an option for handwriting comments on a student's electronic document allowing precise and efficient feedback (Steinweg et al., 2010). Further, it is relatively easy to provide a voice over for the annotated documents, allowing students to gain feedback in two modalities, written and aural (Boffey et al., 2013). These annotated files can be returned to students rapidly via email after marking. Tablet PC also allow students to get help with long and complicated calculations and they can also use computers and software to simulate and model complex situations described by mathematical structures (Chawla & Mittal, 2013). The potential of the Tablet PC is significant and positive in terms of influencing students' attitudes towards mathematics and their work habits, while also affording them the opportunity to understand the relevance and application of mathematics (Dekkers et al., 2012). Further, the facilities that allow video capture also enable development of a wide range of learning resources, which can be distributed through eLearning and for pedagogical changes such as flipped classrooms, which benefit from such video based resources.

The major technology used in developing countries is the PC. The experience with the use of Tablet PCs reveals flexibility in delivery, an ability to support active learning and provide an exciting learning environment for students. With regard to the use of the Tablet PC in teaching, the Head of School at SMAS reported on the use of Tablet PCs by lecturers as follows:

I consider the shift from computer presentations to the use of tablets to be at least as significant as the shift from overheads to computer presentations. The best and most awarded teachers in the School appear to agree with me; they have been specifically asking for tablets as their computers come up for renewal. This in itself is a stronger endorsement than any I could make as an individual (Porter & Denny, 2011, p. 36).

One lecturer reported on student feedback: "*students find this immensely helpful as they can concentrate on the discussion, rather than try to write down everything I write down to make sense of later*". "*Tablet PCs are also extremely useful for the creation of resources and the capture of classroom teaching".* Student feedback regarding the use of the Tablet PC in mathematics is positive, with comments such as the *"the presentation method is very helpful. His method of presentation which uses the computer tablet is very effective when explaining examples and drawing diagrams".* A switch to adopting the Tablet PC rather than a PC would

Publication History
Manuscript Received : 11 September 2017
Manuscript Accepted : 20 October 2017
Revision Received : 25 October 2017
Manuscript Published : 31 October 2017

require a shift in policy in Libya, although it is plausible that staff when seeing these, as many did at UOW, will seek to shift to the tablet technology when renewing their university-provided computers (Porter & Denny, 2011).

In this case study the staff in one Middle Eastern country were provided with professional development in the use of software and hardware that can be used to support and improve teaching and learning in mathematics. The researcher addressed if the provision of better tools for mathematics education and the effective use of these tools were to be acquired by staff in developing Middle Eastern countries.

The case study involved identification for the trial of the staff development program and its development, implementation and evaluation. The model for professional development could be described involving training aspects, follow-up support, focus on tools and the needs in technology training and need to know about technology tools to change classroom practices. The basis of the staff development program was seminar/workshops which were designed to introduce staff to learning designs, tablet technology, video resource creation and construction of html web pages. Follow-up support was provided. These seminars were followed by an investigation of staff interests in further professional development allowing them to be initiated into whatever technology they desired. This was the start of their professional development process. Issues arising that pertain to staff development in developing countries were identified and addressed to provide a model for sustainable staff development in these countries.

1.2 RESOURCES

Of particular interest to this paper is open educational resources (OERs) that increase access to education, improve quality, and reduce the cost of education (Kanwar et al., 2010). These OER resources are "digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research"(OECD, 2007, p. 10). Educators can access a broad range of learning resources that in many cases are peer reviewed, which they can use and adapt for their own personal learning. They may also be an incorporated into their own units, reducing teaching preparation time, so they can concentrate their efforts on making students' learning a better experience (Willems & Bossu, 2012).

Many such OER resources have been created through podcasting with media sharing facilities such as YouTube 'Reteachers' and 'TeacherTube' (Conole & Alevizou, 2010) which contain a wealth of scientific and educational videos (Sugimoto & Thelwall, 2013). A podcast can be thought of as "any digital media file, or series of files, distributed over the Internet for playback on portable media players and personal computers" (Lonn & Teasley, 2009). As such podcasts encompass videos of an earlier era.

In higher education many lecturers have used podcasting as an effective teaching tool, allowing students to download a series of audio or video broadcasts (files) onto a digital media player via a computer. Recorded lectures are seen as helpful for students, with students using lectures for revision and review, because of timetable clashes, and /or work and family commitments, with some students preferring to download rather than attend the lectures (Willams & Fardon, 2007). Other studies suggest that students find podcasts to be efficient, effective, engaging and easily received learning tools for revision (Bongey et al., 2006; Baird & Fisher, 2006; Edirisingha & Salmon, 2007; Evans, 2007). Podcasting appears to enhance the revision process for overseas students, whose first language is not English, with students benefiting from the ability to replay lectures multiple times and, as such, podcasts may also have a significant effect broadening and deepening students' understanding (McGarr, 2009, Panke, 2011). Students believe their learning experience is improved by podcasts (Robson & Greensmith, 2010). Staff can develop a wide range of support resources, often short excerpts, for students learning mathematics to help them identify general mathematical principles and to make connections between concepts.

Different genres of videos can include:

- demonstrations to provide guidance to students on practical work (Carvalho et al., 2009);
- worked examples involving the provision of a problem and then step-by-step cues explicitly stating the steps in the development of a solution (Algarni, 2013);
- feedback and instructions in alternative modes (Carvalho et al., 2009; Shim et al., 2006; Dekkers, 2012);
- theory overviews review material previously learned and needed for a topic (Summertime Math http://www.math.uow.edu.au/subjects/summer/topics/fractions.html);
- orientation videos orientating students to a particular unit of study within a subject or to learning objectives or reducing student worries and angst before entering the classroom (Chan & Lee, 2005);
- stimulus clips to initiate thought or discussion of a particular topic or developing students' study skills through collaborative learning (Carvalho et al., 2009, Porter & Denny, 2011).

A variety of commercial software tools for PCs with varying features and ease of use can be used to create videos and podcasts that allow teachers to make lessons interesting and more effective for students. One of these is Camtasia Studio (http://www.techsmith.com/camtasia.html), which has been used on a PC in the mathematics school at the UOW. This is a screen capture program which allows the user to record everything happening on their computer monitor and as such is useful for the creation of a variety of video genre. Key features identified for video development include;

1. The speed of the computer processor. Not all brands of tablet pcs run at the speed required to smoothly use screen capture facilities.
2. At least one of pdf Annotator, Word, PowerPoint or Beamer is recommended for inking/writing with the stylus.
3. For use with mobile devices and across platforms mp4 files provide maximum access.
4. Small files are important for both storage and for fast web access and for maintaining student attention.

5. Storyboards allow developers to quickly add screen recordings, transitions and title slides to the video sequences.
6. A variety of input formats allow other file formats such mov files, created from a video camera, to be imported.
7. The use of builds and graphics give videos a more professional edge than hand written solutions, although handwriting is popular with students.
8. Strategies can be used to overcome difficulties in removing errors or frames during post-filming production.

Of particular interest to developing Middle Eastern countries are software tools to create videos that are freely available (refer, Table 1) or widely available across computer systems such as PowerPoint on the Mac and PC to produce basic podcasts combining narration and slides (Bilbao et al., 2010). Freely available tools are also available for the Mac (for example, Copernicus) and the iPad (for example, Educreations and ScreenChomp) although these technologies are less prevalent in developing countries.

Table 1 Free software tools to create videos

PC	
Animoto http://www.animato.com/	Offers an interactive environment, allowing students to design & construct their own learning experiences, setting video slide shows to music that appear professionally done. Images text slides can be added, & music selected (Lightle, 2011).
CamStudio http://camstudio.org/	Allows capturing screen & audio activity on computer & creating AVI video files & exporting to SWF. CamStudio has an easy-to-use interface & includes a video annotation feature, custom cursors & selected screen region recording. (http://camstudio.org/ , 2013)
Debut http://www.nchsoftware.com/capture/	Capture video directly to your hard drive & record videos as avi, wmv, flv, mpg, mp4, mov & more video formats. Capture video from a webcam, network IP camera or video input device (e.g., VHS recorder). Screen capture software records the entire screen, a single window or any selected portion. Record video alone or video & audio simultaneously. Create photo snapshots of a video.
EZvid http://www.ezvid.com	Easy-to-use, fast, simple, drag-n-drop, & hassle. Records voice along with the video, comes with an intuitive design & it has the drag-n-drop feature to make creating & editing your slideshow or movie easy
AviScreen http://aviscreen-classic.en.softonic.com/	Captures screen activity in the form of AVI video or bitmap images. It has feature called "follow the cursor" which can produce a video or image of relatively small dimensions while covering all mouse activity over the whole screen area.
Webinaria http://www.webinaria.com/	Easily create screen records as .avi file & turn them in to .FLV file, add voice & edit the recorded file later.
PC & Mac	
Jing http://www.techsmith.com/jing.html	Allows teachers to take screenshots as images, record up to five minutes or videos then edit & share them. Techsmith

While students may use podcast materials for reviewing concepts and issues raised in lectures and the instructors and the students agree that podcasts help students learn, the students are less sure about whether podcasts improve instructors' teaching (Lonn & Teasley, 2009). It may be that for improved pedagogy "the true potential of podcasting technology lies in its knowledge creation value, and its use as a vehicle for disseminating learner generated content" (Lee et al., 2008, p. 504). As such podcasts can help instructors change face-to-face instruction from traditional didactic lectures to more constructivist learning practices (Lonn &Teasley, 2009). Alternatively use of such resources can allow teachers to flip the classroom so that students may review "lecture" clips prior to class and in class undertake activities that relate to the video clips or content.

1.3 MODEL FOR PROFESSIONAL DEVELOPMENT

Academic staff learn in a diversity of ways such as in discussions with their colleagues (Baume 1999; Viskovic, 2006), reflection by considering their own experiences (Lawler & King 2003) and in-service training. Indeed, academic staff are willing to participate in and have positive attitudes toward participating in any course, seminar, and workshop about technology usage, which reveals the need for professional development Gülbahar (2008). Ferman (2002) and Baume (1999) recognized a variety of collaborative and individual activities for professional development in higher education. These activities involve working with an educational designer, attending workshops, discussions with peers, presenting at conferences, being mentored and undertaking professional reading. Development can also take place through committees, working groups, professional work, job shadowing and exchange (Baume, 1999), professional interactions, networking, consulting experts, personal research, learning by doing, and learning by teaching Becher (1996). Hudson (2012) drew attention to three different foci for professional development: 1) tools for mathematics teaching 2) the needs in technology training and need to know about technology tools, and 3) change in classroom practices (use and non-use of technology).

There are several approaches to professional development ranging from a focus on showing staff how to operate equipment and software to showing how to integrate technologies into instruction. The focus, in terms of outcomes, of such programs can also vary. Littlejohn (2002) suggests that where professional development is offered it needs to encourage academics to concentrate on the educational design process, that is, on course outcomes rather than content, placing dialogue and feedback central to course design, and incorporating current educational theory. This may be achieved through project-based support, in which academics focus their efforts on how students learn. Three approaches to professional development have been canvassed: community of practice, the Ellis model and follow up support.

1.3.1 Community of Practice

Community of practice is defined by Eckert and McConnell-Ginet (1992) as,

> *A community of practice is an aggregate of people who come together around mutual engagement in an*

endeavor. Ways of doing things, ways of talking, beliefs, values, power relations-in short, practices-emerge in the course of this mutual endeavor. As a social construct, a community of practice is different from the traditional community, primarily because it is defined simultaneously by its membership and by the practice in which that membership engages (p. 466).

Lesser and Prusak (2000) argue that communities of practice are "*the major building blocks in creating, sharing, and applying organizational knowledge which is a necessary condition for knowledge creation, sharing, and use*" (p. 124). A community's purpose and goals is to inform the appropriate activities and technologies that should support it. Many virtual communities of practice depend on face-to-face meetings and Web-based collaborative environments to communicate, connect, and conduct community activities (Cambridge et al., 2005). It encourages formal change in professional practice (Wenger, 1998).

1.3.2 Ellis Model

Many models describe a four-stage approach to professional development, with respect to online learning. This approach distinguishes the need for a different level of support for individual staff members who are interested in developing expertise in online teaching or who are independently updating their knowledge and skills (Ellis, in press). The first stage involves activities that aim to increase the interest and motivation of individual staff members as to the possibility of being involved in online course development. This includes assistance in mastering appropriate hardware and software, provision of access to resource sites in their discipline or interest area and provision of short seminars on current online activities within the institution, and lessening the learning from visiting experts.

The second stage involves supporting the staff members' development by training in instructional design, addressing issues of online pedagogy and technical training with appropriate software products and course management. In the delivery of newly developed materials some implementation issues arise and revision is useful, allowing support staff to review and modify the developed material on the basis of experience and feedback provided. The third stage involves further development and extension of staff members' skills by challenging them to extend their work into more complex areas. The final stage involves acknowledgment of the staff member's new skills and expertise and encouraging them in turn to mentor and train other staff members at Stage 1.

1.3.3 Follow up support

Polly et al. (2011) identified three elements for current professional development: activities which include tool-based workshops, follow-up support, and, faculty interest (refer, Figure 1). The tool-base workshops include how to integrate different tools into teaching. The follow-up support involves in time support, or structures including individual faculty support, support within colleges and department-level support, faculty interest and belief in the professional development

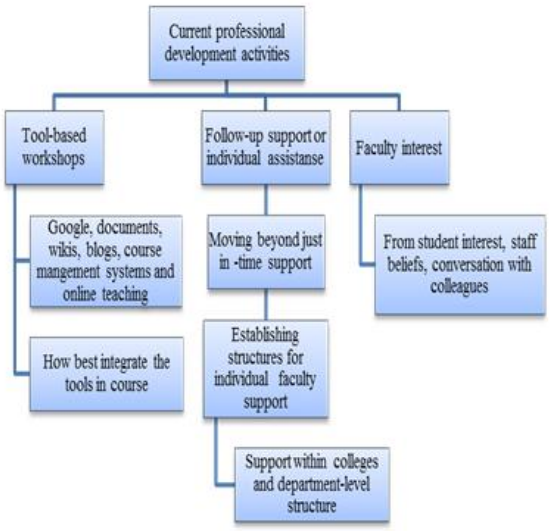


Figure 1 Professional development activities

1.4 PURPOSE

The broad aims of this study were to raise awareness of the importance of technology for improving students' learning outcomes and to create a broader culture of technology use in one Middle Eastern country so as to facilitate the development of a supportive community of practice. More specifically the aims were as follows.

1. Engage staff in a Middle Eastern country with a view to trialling a professional development program designed to introduce current approaches, as identified in the Australian context, to using technology their classrooms.
2. The program was to provide information to participants regarding resources and technologies that can be used to improve mathematics learning outcomes. It was also to teach tools and show how to integrate technology with good pedagogical practice. Further, it was to introduce staff to Tablet PC technology and the use of the tablet in lectures and the creation of learning resources.
3. Evaluate and suggest further refinement for the professional development program.

1.5 SAMPLE SELECTION

The Sultan Qaboos University (SQU), in the Sultanate of Oman (Oman), was the site for the trial of the professional development program. This university was chosen as an accessible Middle Eastern higher education institution. Insight into issues in Libya together with identification of current western practices led to the development of a professional development package for staff in Libya. This program, after examination of the Omani context, was implemented in Oman.

One staff member was selected to trial the teaching tools within one of their subjects. This lecturer along with their 35 students, were asked for their experiences with the use of Tablet PC technology over a one week trial period. Students were asked to complete a paper evaluation survey. The aim of

the survey was to evaluate the effectiveness of the tablet technology and resources produced with it.

1.6 ETHICAL CONSIDERATION

The collection of data in this study, involved review for ethics clearance from the UOW Human Research Ethics Committee (HREC), Australia, and from the Office of the Adviser for Academic Affairs at SQU, Oman. As for participants in the earlier case studies, lecturers and postgraduate students were informed of the purpose of the study through a Participant Information Sheet and signed, a consent form documenting their agreement for the interview to be recorded. Staff also gave permission for interview excerpts to be included in this thesis and/or any publications to come from the research, with the understanding that quotations would be either confidential or attributed to them only with their review and approval.

1.7 DATA TOOLS

The data tools were Evaluation/feedback of workshops and Paper based evaluation survey of undergraduate.

1.7.1 Evaluation model for workshops

Participants completed the training evaluation forms collected at the end of the workshop in spring (February / March) 2012. This form, in accordance with Parry and Berdie evaluation model (2004), was used to obtain feedback on the quality and relevance of the training, the development and delivery of the training including the documentation of subject structures, and evaluation of the program. The form gathered staff *reactions* to the use of the Tablet PC in lectures and its use in producing video resources with the Camtasia Studio software. Evaluations were also used to suggest changes and refinements to the staff development program (refer, Table 2).

Parry and Berdie (2004), evaluate for each Course level *Satisfaction*, *Opinion*, *Knowledge Acquisition*, *Knowledge Comprehension*, *Skill Demonstration.* The last level is *Skill Transfer* focusing on evaluating the trainees' performance on the job. This level requires the trainee to apply new knowledge and skills in situations explained in the next sections.

Table 2 Training Evaluation Form

Q1. Was your interest held? *(Satisfaction)*
Q2. Did the course give you ideas about how to: *(Knowledge Acquisition)*
Integrate the Tablet PC into the teaching process
Produce video resources by using Camtasia software.
Combine learning resources using Learning design
Use Summertime Math DVD / or similar.
Use Evidence based evaluation to guide change
Q8. Overall, how would you rate the course? *(Satisfaction)*
Q9. What things from this workshop do you think you would like to apply to your academic work? (*Knowledge Comprehension)*
Q10. What would you recommend changing about the training? *Skill Demonstration.*
Q11. What additional training (if any) would be helpful? *Opinion*.
Q13. Do you have any further comments, observations or suggestions *Opinion*

Note: Classification of question in italics not included on form

1.7.2 Student surveys and staff reflection

Students taught by a staff member chosen to trial the teaching tools within one of their subjects were asked to complete a survey. The staff member and 35 students were asked for their experiences with the use of Tablet PC technology over the one-week trial period. The aim of the student survey was to evaluate the effectiveness of the tablet technology and resources produced with it, albeit in the short term. As per ethics requirements, students were informed that the primary purpose of the survey was to provide feedback that could assist in the development of the subject for future students and that the aim of this innovative use of the technology was to improve mathematics learning. The survey asked questions regarding the lecturer's use of the Tablet PC and its best features (refer, Table 3).

Table 3 Student sample survey regarding the use of a Tablet PC

1. The lecturer's use of the Tablet PC
    a) Supported or enhanced my learning
    b) Helped me actively engage with learning in the class
    c) Greatly improved visual or PowerPoint presentations.
    d) Helped me learn the subject content more easily
    e) Tablet was a really effective medium for teaching
    f) It aided learning as it clearly showed how to reach solutions
    g) Other. Please specify

The survey included open-ended questions about the innovation, the use of Maple during lectures and, more general questions as to, how to improve the subject in accord with this aspect of the Parry and Berdie (2004) model (refer, Table 4).

Table 4 Student survey: Open-ended questions

Q1. Did the lecturer's use of Maple to demonstrate the Newton method aide your understanding
Q2. Can the course be improved by incorporating the use of a software package such as Maple?
Q3. Is there a better structure for the subject that could help you to learn more effectively or efficiently?
Q4. Is there one thing you would like to see improved in the design and delivery of this subject? What would it be?
Q5. Are there any other comments about the use of the tablet or anything that could be used in this subject to make it easy to learn?

Taking advantage of what has been learned elsewhere is important if the education gap between developing and developed nations is to be closed. The identification of current technologies and uses of technologies in mathematics at UOW was used and through this to identify topics suitable for inclusion in staff development in two Middle Eastern countries. This was followed by development and delivery of a professional development package in Oman.

1.8 PREPARATION: PROFESSIONAL DEVELOPMENT PACKAGE

The planning of the package was made after an investigation of the Libyan context. The Omani educational context was then examined and it was considered that the package planned for Libya would be appropriate for delivery in Oman. The training workshops were designed to raise awareness of new technology for inclusion in teaching in the mathematics discipline.

The first part of the professional development program, *Raising Awareness*, introduced staff to a blend of tools and a pedagogy base so as to raise the awareness of Libyan staff, both mathematics and professional developer staff. The second part was to work closely with an individual member

of staff, to help them introduce teaching tools into their subject. Evaluation followed both raising awareness workshops and the introduction of technology to one teacher's classroom (refer, Table 5).

At the end of the workshop participants, in accordance with the Parry and Berdie model, completed a training evaluation form. This form is used to obtain feedback on the satisfaction, opinion, knowledge acquisition, knowledge comprehension, skill demonstration and skill transfer of the training. The form gathered staff feedback on the use of the Tablet PC in lectures and its use in producing video resources with the Camtasia Studio software. As suggested by the Kirkpatrick model, evaluations were also used to identify changes and refinements to the staff development program.

The last level of Parry and Berdie model, skill transfer, focuses on evaluating the application by the trainee of new knowledge and skills, in this case in the classroom. Therefore a staff member was chosen to trial the teaching tools within one of their subjects.

Table 5 Workshops process

Aims	1. To make staff aware of the significance of technology for student learning outcomes 2. To initiate the development of skills and approaches for the use of technology in mathematics teaching and learning at SQU 3. To identify a lead innovator, with the intent of preparing that participant for the trial integration of technology into their teaching with a follow-up assessment of the impact on student learning outcomes
Preparation	The preparation followed the identification of the technology used and associated professional development undertaken at UOW (refer, Chapter 5) and an identification in this case study of the technology used by SQU mathematics staff and of the difficulties faced by staff in using technology. In this manner the program for Libyan staff was adopted, but the introduction of SQU staff to new technologies was situated within the SQU context.
Content	The training session and hands-on practice covered four topics. 1. Using a Tablet PC in lectures, a. Introduction to touch-screen tablets; b. Inking (writing) in different software packages such as PowerPoint, Microsoft Word, PDF annotator, Windows Journal and Sticky Notes. 2. Resources Generation The introduction to resource creation involved using the Tablet PC and Camtasia Studio software to create video resources. Subtopics included: a. Introduction to different video genres b. How to record with Camtasia Studio. c. How to edit projects, including features such as zoom-n-pan, split, cut unwanted video and audio on the timeline, add transitions, add a title clips, audio enhancements, save and produce in a variety of formats. 3. Learning design approaches and three examples for the combination of learning resources used in several subjects at UOW and show of Summertime Math DVD as a web-based learning resource 4. Evidence based evaluation to guide change Two examples of evidence based evaluation to guide change.
Material needed	1. Laptop, projector 2. Participants name signs on the table 3. Note books and pens for participants 4. Copies of the agenda for all participants 5. PowerPoint slides with Workshop objectives and copies of the agenda for all participants
Scheduling	1. Notification of the workshops by a flyer sent by email to mathematics staff 2. Multiple two hour workshops scheduled over a two month period, to accommodate staff in groups of up to eight sharing four computers 3. The timetabling of the staff development was based on staff choices, with groups formed based around staff availability
Target Audience	The training is intended for staff in mathematics department or those working in learning development. However, participation from other development areas should be strongly encouraged in order to raise their awareness of the importance of technology in student learning outcomes.

1.9 MATERIALS FOR CONTACTING STAFF

Staff were invited to participate in a survey and an interview by an email sent by the Head of School. Staff were reminded of the invitation by the secretary to the Head of School and asked to nominate a workshop time. The researcher provided a timetable (refer, Figure 2) for the workshop. Staff who then informed the researcher to their desired attendance along with a viable timetable

Improving teaching and learning through the use of technology

Workshop

2012

Sultan Qaboos University

Tablets will be provided at the workshop so places are limited. If you are able to attend the workshop please write which day, date and time you can attend from 28Feb-7 March. You may choose more than one time slot.

Please register and return to the secretary

Name: Email:	10-12	12-2	2-4
Saturday			
Sunday			
Monday			
Tuesday			
Wednesday			

Training Sessions will focus on:

Session 1: Tablet PC technology

- Presentation Integrating Tablet PC technology into the teaching process – why and how

Session 2: Camtasia Studio

- Using Tablet to produce different genres of video resources by using Camtasia software.
- Steps for producing video in the process
- Group exercise

Session 4: Learning design approach

- Learning design approaches for improving the combination of learning resources,
- Evidence based evaluation to guide change
- Group discussion: Positive and negative impacts of technology on development and students learning outcome

Figure 2 Workshop timetable

The researcher organized groups according to their availability and informed them through an email as to the time and location of the workshop. At the end of the workshop the participants were given a certificate of participation.

1.10 EVALUATION

Evaluation were drawn from three groups. The first group comprised twenty two people drawn from the fifty academic staff in the Department of Mathematics and

Statistics (DOMAS).

The second group comprised one professor and alseven master's students from the course Mathematics Education deliver by the College of Education SQU. The students were enrolled in the subject Advanced Methods of Teaching Mathematics taught by the professor in the spring of 2012. This workshop provided participants with background for one of the topics of this subject Using New Trends of Technology in Mathematics Education. The subject includes theoretical aspects of mathematics education, and applications in learning and teaching practices in mathematics curriculum.

The third group contained nine staff from the Center of Educational Technology (CET). The aim of this centre is to enhance teaching and learning at SQU through supporting faculty members and departments with the latest technologies in teaching and encouraging the adoption of best instructional practices (CET, 2013).

1.10.1 The evaluation of the professional development program

The evaluation of the professional development program is based on data collected from 36 participants during the Fall 2012 academic year following the end of the *Raising Awareness* workshops. Eighty-six per cent of lecturers provided an overall positive response to the training with 91% reporting they had been given ideas about how to integrate technology into the classroom, 83% indicating that the workshop held their interest and 75% reporting they were given ideas about the development of resources for teaching and learning (refer, Table 6).

Table 6 Staff ratings of workshop outcomes

Questions	Agree / Strongly Agree	
	N =36	%
1. Overall, positive rating of the course	31	86.2%
2. Interest held	30	83.3 %
3. Participants gained ideas about how to		
• Integrate Tablet PC into the teaching process	33	91.6%
• Produce video resources by using Camtasia software.	27	75.0%
• Combining learning resources using Learning designs	24	66.6%
• Use Evidence based evaluation to guide change	20	55.2%
• Use Summertime Math DVD / or similar	14	38.9%

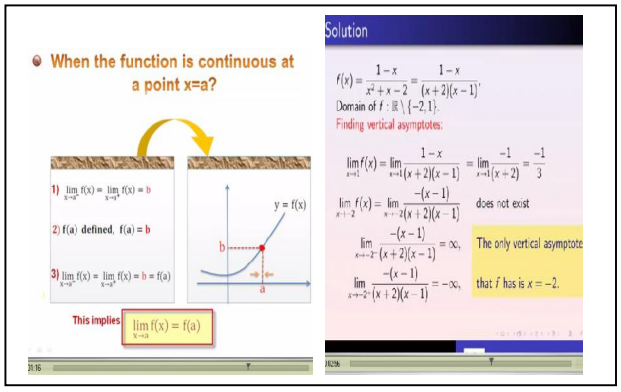
A large number of respondents noted that they would like to try using a Tablet PC in their teaching. However, there was only time for one staff member, Linda, to trial the use of the Tablet in class over a period of a week. The selected lecturer for the case study effectively integrated the Tablet PC technology into her teaching, finding that it was more easily integrated with the learning activities than the use of a whiteboard. Linda stated:

I like my experience about use of tablet. For one week with students in my calculus 1 subject and for two lecturing I like the use of Tablet PC prepared notes in different style and use of programs like Maple or Mathlab. I use most of the features in the pdf Annotator and I like it and with more time I will be more professional. There is benefit for both student and instructor: Saving time for lecturers and if you give them lecture with partially incomplete note they not spend time to write everything and use the time in discussion.

This ease of integration into the classroom is echoed by the comment of the Head of SMAS at UOW about the impact of Tablet technology:

I consider the shift from computer presentations to the use of tablets to be at least as significant as the shift from overheads to computer presentations. (Porter and Denny, 2011, p. 36).

Linda recorded seven video resources on the topic of limits. These included: continuous functions, limits with worked examples, squeeze theory and the Newton method. The production of these involved a range of techniques (refer, Figure 3 and Figure 4).



One of these videos involved the sophisticated inclusion of a graphic animation of Newton's method into the video (refer, Figure 4).

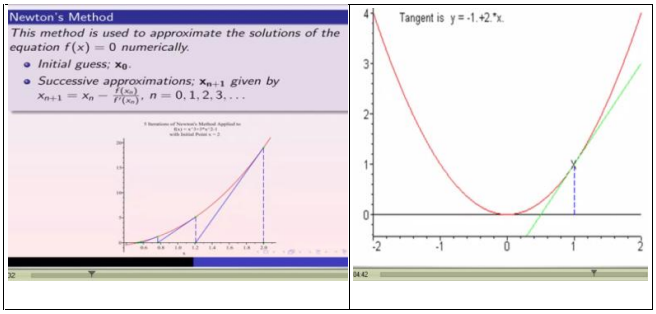


Figure 4 Embedded graphic animation of Newton's method

This lecturer, Linda, has continued to work with members of *The Centre of Educational Technology* to create additional video resources covering all calculus chapters. In Summer 2012 she created a new Moodle page for the course Math 2107 using the new version of Moodle, Moodle 2.2. She also developed e-resources with the aid and support of the *Centre of Educational Technology* and *Teaching and Learning Department.* In addition to videos resources, Linda created online quizzes and a discussion forum. In terms of sustained outcomes and changes to mathematics education she is planning in Spring 2013 to provide student access to the new Moodle page, which will have resources uploaded in to it.

The combination of the workshops with individual coaching has engaged staff to think about ways to improve students' learning leading to positive outcomes. While the training program was considered a success by participants on an

individual level, there are issues with regard to desires to "move the institution" towards better practices. Many members of staff told the researcher that their reason for not attending the training offered was a lack of time, even though they were given the opportunity to choose a time slot that suited them. Others considered that it is not effective to engage in training when there are no Tablet PC s or Camtasia Studio software available in the department for them to use after training. With only four Tablet PCs, and a limit of four persons per session it was time-intensive to train a large number of staff, although this policy ensured that participants received individual attention. The wider audience of DOMAS was not aware that the case study training extended to developing a teaching grant application for the provision of resources.

Analysis of the evaluation of the professional development raised issues about the environment in which staff worked, more so than the professional development program itself. While many of those who responded indicated an interest in additional training in creating resources, 28% of staff (n=8) indicated the need for more time to practice and three staff member recognised that they needed patience to learn. Three of the staff suggested that the presenter should also have and use a Tablet PC in the workshop. In order to integrate technology into mathematics education respondents considered the University needs to cover the costs for the school providing software, updates and technical staff. Currently Tablet technology is not available and technical support is limited. Thus, an action plan to the implement and integrate Tablet technology into teaching mathematics at SQU needs to be developed and perhaps a plan to use open access resources. Staff wanted to apply their professional development in a variety of ways (refer, Table 7).

Table 7Applying professional development and future needs.

One thing from workshop they could apply to their academic work	What additional training if any would be helpful they responded
• Five staff wished to record summaries of units, lectures or tutorials using Camtasia Studio. • Using it in the class room to introduce this technology, • Tablet PC is the best for teaching, Very good program, • Eleven of staff would like to use all features in the class, • One indicated "I would like to use Camtasia studio to produce further videos".	• Two of staff wanted training in the of use PowerPoint to record videos, • Two of staff suggested more training would be helpful for continuous use of the Tablet • One staff wanted training to prepare a complete topic. "I hope to practice the other software such as LaTeX and Mathematica, Maple through the tablet," • Another wanted to "use of the Tablet in a course to enhance practice".

1.10.2 Student evaluation of the use of the Tablet PC in lectures

The first mathematics course for students who will major in mathematics or statistics is Calculus I. Many majors in the College of Science require a pass in Calculus I with a specified grade (C or higher). This subject is compulsory for students in colleges including Agriculture and Marine Sciences and Engineering. Many second year students take this subject after they finish the foundation program. Other students are either repeating the course (3rd, 4th, 5th year students) or passing the exit test of the foundation program (first year students).

Calculus I contains four chapters: limits, derivatives, applications of derivatives and integration. During the autumn term 2012 there were 593 students enrolled in this subject. These were split into twenty groups of students, each with a different lecturer. The number of students in each group ranged from forty-three to forty-five.

Linda trialled the use of the Tablet PC in two lectures in the Autumn term of 2012, The topics covered in the lecturers were linear approximation using tangent lines, Newton's method for finding the solutions of the equation f(x) =0 and L'Hôpital's rule for the evaluation of limits. A survey was distributed to students following the end of the second lecture to examine how receptive they were to the technology.

Eighty-six per cent of respondents (n=31) were male and fourteen per cent were females (n=5). The majority of students had a positive response, finding the teacher well prepared both when using the whiteboard (86.1%, n=31), her usual medium for teaching, and the newly introduced Tablet PC (83.3%, n=30).

Students had a positive response for the use of Tablet PC which had the top ranking as an effective medium for teaching (86.1%, n=31) and it was found to support and enhance learning by (77.8%, n=28) of students (refer, Table 8).

Table 8Usefulness of the Tablet PC in learning mathematics.

The lecturer's use of the Tablet PC	N	% Agree & Strongly Agree
a. Tablet was a really effective medium for teaching	31	86.1
b. Supported or enhanced my learning	28	77.8
c. Helped me learn the subject content more easily	25	69.4
d. Greatly improved visual or PowerPoint presentations.	25	69.4
e. It aided learning as it clearly showed how to reach solutions	24	66.7
f. Helped me actively engage with learning in the class	22	61.1

The best features of the Tablet PC noted in student feedback (refer, Table 10) were the ability to use other types of media in addition to text and drawings (88.9%, n=32), being able to explain concepts using a step by step method (83.3%, n=30), allowing an appropriate amount of material to be presented for the time available (80.6%n=29) and the ability to use editing features to emphasize points (72.2%, n=26).

The highest regarded features of the Tablet PC (refer, Table 9) were the use of colours and other special writing features for notes (83.3%, n=30), the ability of the lecturer to write out working and solutions to in-class questions (80.6%, n=29) and the ability to highlight parts of the lecture material whilst still facing the class (80.6%, n=29).

Table 10 Usefulness of the Tablet PC features in learning mathematics.

The Tablet's best features are:	N	% Agree & Strongly agree
a. Ability to use other types of media besides text and drawings	32	88.9
b. Being able to explain concepts using a Step by Step method	30	83.3
c. Allowing an appropriate amount of material to be presented for the time available	29	80.6
d. Editing features and emphasis by using it to support and emphasise points	26	72.2
e. Provision of Tablet drawings and notes available after lecture	25	69.4
f. Being able to pre-draw graphs before the lecture so they can be filled in the lecture	24	66.7
g. Incorporating the use of Maple into the lecture was useful	19	52.8
h. Can incorporate the use of other packages	13	36.1

Table 9 Ranking of the usefulness of the lecturer's use of the Tablet PC

Regarding the lecturer's use of the Tablet PC specifically	N	% Agree & Strongly Agree
a. The use of colours and other special writing features for notes is helpful	30	83.3
b. The lecturer writing out working and solutions to in-class questions, or highlight parts of the lecture material, whilst still facing the class, has been helpful	29	80.6
c. The use of projected notes with inking capabilities has been helpful	27	75
d. Saves you time	25	69.4
e. Writing type on the projected image increased my engagement with the presentation	23	63.9
f. Use of Tablet makes it easy to learn	23	63.9
g. Allows for a more comfortable interaction between the lecturer and the class	22	61.1
h. The presentation is an integral part of the course	20	55.6

The focus of the survey was to identify possible ways to improve mathematics learning through the use of technology. The feedback received from students regarding the use of Tablet PC (refer, Table 11) showed a mixed response, perhaps expected given the new implementation by a recently trained lecturer. In some instances there was a preference for the Tablet PC along with suggestions for further improvement. For other students the Tablet PC was not preferred.

Table 11 Student comments regarding the use of the Tablet PC in lectures.

Preference for tablet
- Use Tablet PC in all subjects (4)
- Your way (the Tablet) is better for all students
- New techniques motivate students to work hard and to get good grades
- The notes are better than usual writing in notebook: it's more readable, ordered and understandable
- The structure of the materials and the way it is presented was good

Suggested improvements in use of the Tablet
- If the lecturer gives the students the prepared lecture, every lecture by sending the PDF sheet which is solved in the class to our email rather than writing during the class, it would be helpful to use and may be better to focus more when she uses the project to learn and that would save time (2)
- Have explanations written so they can be reviewed at home for more revision and clarification
- It is good but needs more shape and more colours

Difficulties
- The whiteboard is the best method to use and explain math subject (5)
- Delivering was too fast
- It's a good way but it's hard to follow up if you want to take notes or whatever
- The body language is very important, sometimes the lecturer forgets the students as she focused on the technology
- It is not good method to teach using the Tablet

The lecturer liked the use of the Tablet PC and prepared lectures notes in a different style, but the style was not 'tweaked' to the needs of the students. For example, some students said that "delivery was too fast" and given that the lecturer sat to deliver lectures that "the body language is important".

The lecturer, after professional development, extended her teaching style to use programs such as Maple and MATLAB in lectures. The lecturer used many features of the PDF Annotator software and with more time will become more proficient in its use. By use of the Tablet, she provided notes with gaps for worked examples. Students were then given time in the lectures to attempt the examples before they were worked live by the lecturer using Tablet technology. Updated notes were also made available for students. This method differs from other "gaps in lecture" approaches; see for example Aminifar (2007) who identified that some gaps left in lectures were to allow the completion of worked examples, rather than gaps in theory. With the approach adopted, Linda found that students spent less time writing and that this additional time was used to attempt examples and engage in discussion.

Linda noted that, in addition to developing expertise in using the Tablet, the next step to be undertaken was to develop and add more video resources and online quizzes to Moodle. Follow up revealed that she created additional video resources covering all calculus chapters. In terms of embedding the professional development more widely Linda indicated willingness to train colleagues.

1.10.3 Postscript

The opportunity arose to explore the transferability of the workshops through their presentation of two groups of staff and postgraduate students at UiTM (Perak) and UiTM (Malaysia) in Malaysia. Malaysia is also a Muslim society which is considered to be a developing nation. In this instance the presenter was not the researcher and conditions were less than ideal in that 4 computers were used for in excess of 50 and 30 participants respectively. UiTM (Perak) was in the process of purchasing Tablet PC s for all 40 teaching mathematics staff to record their lectures to make them available as resources for students. UiTM (Malaysia) requested a workshop with focus on resources. This is another developing nation seeking support to develop its staff in the use of eLearning and Tablet technologies. It is in accord with the need to develop staff in the Middle East for use of these technologies.

The evaluation of these professional development programs is based on data collected from 41 participants during December 2013 academic year following the end of the workshops. Surveys were completed by 25 participants from UiTM (Perak) and 16 from UiTM (Malaysia). The responses for the two workshops are reasonably consistent across the two locations with 100% reporting their interest was held and that they had been given ideas about how to integrate Tablet PC into the classroom with over 90% reporting an overall positive rating for the course, and that they were given ideas about the development of resources for teaching and learning (refer, Table 12).

Table 12 Malaysian staff ratings of workshop outcomes

Questions	Strongly Agree & Agree Perak		Strongly Agree & Agree Malaysia	
	N =25	%	N=16	%
1. Overall, positive rating of the course	23	92	15	93.8
2. Interest held	25	100	16	100
3. Participants gained ideas about how to				
▪ Integrate Tablet PC into the teaching process	25	100	16	100
▪ Produce video resources by using Camtasia software.	23	92	15	93.8
▪ Combining learning resources using Learning designs	25	100	15	93.8
▪ Use Evidence based evaluation to guide change	25	100	12	75
▪ Use Summertime Math DVD / or similar	22	88	12	75

Staff were asked for their comments regarding things from this workshop that they would like to apply to their own academic work. Their comments showed an interest in teaching using the Tablet PC in class. This is in accord with the intention in Perak to provide all mathematics staff with Tablet PCs. They consider the workshop to be a success as it provided new knowledge about teaching methods (refer, Table 13)

Table 13 Malaysian staff comments

Perak	Malaysia
I would like to apply the learning design approach (2)	Request from the faculty to provide Tablet PC for lecturers who involved to use blended learning
Use of Tablet PC in teaching (5)	More handouts with information (3)
Record my teaching in class using Camtasia software (3)	Assessments and follow up to producing videos
Produce video resources for students(1)	I would like to apply the learning design approach(2)
Save edit and upload my teaching videos into the eLearning (1)	Use of Tablet PC in teaching (3)
Use of eLearning (2)	Learn more about video learning resources
Use of Windows journal	I would like to apply blended teaching and designing materials for lecture (2)
Use iPad for teaching process (2)	The training is good as give a new knowledge about the teaching method (3)
More practical example about the use of Tablet and more about video resources	More practical example about the use of Tablet and more about video resources
The training is good and can be implementing in lecturing (2)	
Provide more techniques in teaching and learning	

The workshops were well received in Malaysia, a developing country, in two locations of an institution that was in the early phases of implementing eLearning. This suggests that this type of workshop would also be suitable and timely for staff in Libya. Based upon the results of the workshops in Malaysia and Oman it can be predicted that the workshop will be better received if Tablet technology is to be provided to staff. Following the workshops it is considered necessary to follow-up with mentoring and support of individual staff along with further workshops. The whole of department adoption of Tablet PCs by all the mathematics lecturers in Perak and the associated plan for all mathematics staff to record lectures and upload them to eLearning is the type of policy decision that would be useful in Oman.

1.11 CONCLUSION

1.11.1 Professional development programs

To design a comprehensive professional development program for developing countries, several factors appear important:

1. Evaluation. Evaluation will determine what the needs are and what is to be achieved. As found in this study, identifying the gap between the best practice and what is available in universities in developing countries is a useful first step to suggest ways to make improvements or to target innovation. As found by Apul and Latham (2009) understanding local needs and conditions involves the evaluation of staff skills and abilities. Such evaluation can also be used to determine standard teaching practices and to provide insight into how to bridge the technology gap. Understanding academic access to and the use of technology is essential for acquiring a sense of future professional development needs. The results show limited availability of more recent forms of technology (Tablet PCs, SMART boards) in Oman. However, tutors and lecturers indicated a desire to have training on these particular resources. Two questions to be answered are: What is the

department's ability to integrate technology into teaching? What skills do staff need to integrate technology into the curriculum? Ongoing evaluation will provide feedback on innovations introduced, on workshops and on training so identifying whether staff needs are being met.

2. Community. Professional development programs need to establish a community throughout the university focused on the integration of technology and creating an atmosphere centred on the university philosophy, mission and goals. Within this type of community staff beliefs and attitudes can be changed while their abilities are expanded. For this to happen support must be provided for academic staff to learn the foundations of how to integrate technology into the curriculum, so that they can begin to blend technology into their teaching. Communities of practice can be used to guide the reform process and support academics across the university. Committees that operate around educational policy and practice provide important avenues for staff to collaborate.
3. Open communication. Use an open communication style to support professional development. Share information and knowledge gathered through evidence based research on teaching and learning or through discussion. Gaining experience can help bring change.
4. Introduce technology. An important step in professional development is an introduction to the use of new technology, including pre-designed foundation seminars or workshops. UOW has an effective method for introducing technology to staff through workshops conducted by in-house and external experts. The introduction of technology begins with the foundations of use of technology and this is systematically followed with contextualizing these foundations in curricular areas and university-wide policies and practices.
5. Workshops. Workshops that provide staff with opportunities to practise in a safe environment and to share ideas with colleagues need to be well designed. The design of guidelines that identify necessary components that should be included in Faculty workshops on the use of technology is required. For example, workshops can involve educating staff on how eLearning can be best used and implemented into a subject. A workshop can show how to improve the use of existing or open sources technology to provide better outcomes for student learning. Such workshops are sufficient for raising awareness, for networking and for providing information and offer staff an opportunity to use, discuss and refine techniques.
6. Support. Support should be provided in different ways such as consultations with experts or self-access online based resources through the website. At UOW print resources are also made available to staff, so that if a staff member cannot attend a face-to-face session, or does not want to, they can take these away or access published information on a website. Resources should include a variety of contact details including phone numbers, email addresses, web URLs and websites allowing academics to explore further according to their expertise.
7. Useful opportunities. Provide faculty and staff with opportunities to continue developing through sharing ideas about their learning and trials in the classroom. Useful options include:
    - A web forum wherein staff can engage in conversation with colleagues on how to best integrate technology, sharing thoughts as to ways to teach with technology in a variety of subject fields.
    - Project work providing academics with opportunities to practice, learn, reflect and accept advice from experts in order to encourage them to exercise and design authentic experiences.
    - Regularly scheduled discussions.
    - Access to publications and other resources.
8. Long-term professional development. Professional development programs need to take a long-term approach to gradually improve staff capability to do a better job. The initial stages involve more intense focus, particularly in providing resources and creating the needed support to faculty as they develop their understanding of integration technology. This involves series of workshops and consultation with experts in fostering the appropriate use of technology into the curriculum.
9. A culture for change. Creating a culture for change and organizing the change process facilitates the introduction of any innovation, including innovation with technology.
10. Time. There is a need to liberate time for training staff as currently staff, lack time to learn new technologies. These conclusions are supported from previous research conducted at SQU across four departments in the College of Applied Sciences by Al-Senaidi et al (2009).
11. Reward and recognition. Reward and recognise lecturers who have good teaching practice. This is an important strategy that is used in career development, providing motivation and promoting good teaching. This will allow staff in developing countries to develop their capacity to innovate and rethink their ideas about the quality of teaching and the nexus with research in their disciplines.
12. Policy. While there are many opportunities for staff to introduce technology, these are often not pursued. One necessary change in developing countries to bring about innovation is the introduction of 'policy' and guidelines to ensure changes.

1.11.2 Follow-up case study

Raising Awareness workshops were considered to be just that, with follow-up support deemed necessary to embed practice. As shown in the trial use of the Tablet PC it is possible to facilitate the integration of technology into

teaching. For example, as happened in the case study of one lecturer with a Tablet PC, the use of Maple and MATLAB in lectures, the use of pdf Annotater software to create resources, the provision of notes with gaps provided live working and capture of examples.

This lecturer extended her use of technology to create a new Moodle page for the mathematics subject including online quizzes and a discussion forum. Furthermore she developed video e-resources across all topics with the aid and support of the *Center of Educational Technology* and *Teaching and Learning Department* in SQU. She was prepared to take on a mentoring role with other staff in the use of technology, an embryonic step toward developing a community of practice.

1.11.3 Interviews and surveys of participants

Lectures from Oman and Malaysia had positive perspectives as to their future use of the Tablet PC, their own production of resources and how to use learning design in the eLearning. Staff in Oman said that "*Tablet PC is the best for teaching*", "*Very good program*". Malaysian Staff indicated that *"training is good and can be important for lecturing"*

Transfer between Middle Eastern nations is quite feasible, because of the connection between regions. Africa, especially North Africa and the Middle East, connection is not only cultural but also in some aspects technological, wherein due to their geographic location, technology can be readily transferred between countries in these regions (Fathurrohman, 2013). What works in one country in areas such as the Middle East, is likely to work in other developing countries from the same region, therefore it is highly likely that professional development programs will transfer successfully from one Middle Eastern country to another.

1.11.4 Transferability

As a Muslim experiencing professional development in an Australian community and delivering professional development in a Muslim community, no differences in planning or delivery appeared necessary. Recipients require well-designed, current materials, presented in an interesting and timely manner. Staff indicated they would like to attend workshops that showed how to integrate computers into the curriculum. Staff needed to understand pedagogies that address different learning styles and teaching needs. They needed to understand where ICTs could facilitate transformation, including what they can do and how ICT can be used. Libyan academic staff, the initial focus of this study, need to be trained in both the use of new technology, so that they become familiar with it, and in the effective use of it in teaching.

That the seminars on eLearning and the use of resources, planned for Libya and delivered in Oman, were requested by two campuses of UiTM in Malaysia, also a developing country with a predominantly Muslim population, suggests that the topics chosen are timely for developing nations. Malaysian mathematics staff in Perak, though a bold policy decision and grant funding, were moved to Tablet PC technology, suggesting possibilities for other nations. In Perak, where the whole of the School changed to Tablet PCs and decisions were made to upload all lectures and class work to the eLearning system, resulted in the beginnings of a community of practice where staff helped each other. The adoption of Tablet PCs by mathematics lecturers in Perak and the associated plan for all mathematics staff to record lectures and upload them to eLearning is the type of policy decision that would be useful in Oman and Libya.

ACKNOWLEDGEMENT

This research was partially supported by University of Benghazi in Libya, The Sultan Qaboos University (SQU), in the Sultanate of Oman (Oman), and the University of Wollongong in Australia. I am thankful to associate professor Anne Porter and associate professor Mark Nelson who provided expertise that greatly assisted the research, and moderated this paper and in that line improved the manuscript significantly.

REFERENCE

[1] Algarni, A. (2013). Comparing Worked Examples and Problem-Solving Methods in Teaching Mathematics to ESL Students at Tertiary Level, Unpublished Ph.D. Thesis, University of Wollongong, Australia.

[2] Aminifar, E. (2007). *Technology and Improvement of Mathematics Education at the Tertiary Level*. Unpublished Ph.D. Thesis, University of Wollongong, Australia.

[3] Apulu, I, Latham, A. (2009). Information and communication technology adoption: Challenges for Nigerian SMEs. *TMC Academic Journal*, 4, 2, 64-80.

[4] Baird, D.E. & Fisher, M. (2006). Neomillennial user experience design strategies: Utilizing social networking media to support ''always on'' learning styles. *Journal of Educational Technology Systems*, 34(1), 5-32.

[5] Baume, C. (1999). Practice Guide 8: Developing as a teacher. The Open University support material for H852 Course Design in Higher Education module of the Postgraduate. *Certificate in Learning & Teaching in Higher Education*

[6] Baume, C. (1999). Practice Guide 8: Developing as a teacher. The Open University support material for H852 Course Design in Higher Education module of the Postgraduate. *Certificate in Learning & Teaching in Higher Education*

[7] Becher, T. (1996).The learning professions. *Studies in Higher Education* 21(1): 43-55

[8] Bilbao, J., Bravo, E., García, O., Varela, C., González, P., Baro, I., & Rodríguez, M. (2010). Use of vodcasting in higher education to improve student learning. *WSEAS Transactions on Mathematics*, 9(2), 100-109.

[9] Bongey, S.B., Cizadlo, G. & Kalnbach, L. (2006). Explorations in course-casting: Podcasts in higher education. *Campus-wide information systems*, 23(5), 350-367.

[10] Boffey, R., Gerrans, P., & Kennedy, S. (2013). Using digital lectures to assist student learning. *eCULTURE*, 3(1), 17.

[11] Carvalho, A.A., Aguiar, C., Santos, H., Oliveira, L., Marques, A. & Maciel, R. (2009). Podcasts in higher education: students' and lecturers' perspectives. *In Education and technology for a better world*, 417-426. Springer Berlin Heidelberg.

[12] Cambridge, D., Kaplan, S. & Suter, V. (2005). Community of Practice Design Guide: A Step-by-Step Guide for Designing & Cultivating Communities of Practice in Higher Education http://net.educause.edu/ir/library/pdf/nli0531.pdf

[13] Chawla, N., Mittal, A, (2013). Pedagogy of mathematics: role of technology in teaching learning mathematics, *Journal of Indian Research*, 1(1), 105-110

[14] Conole, G. & Alevizou, P. (2010). A literature review of the use of Web 2.0 tools in Higher Education. *A report commissioned by The Higher Education Academy*, U.K.

[15] Chan, A. & Lee, M. (2005). An MP3 a day keeps the worries away –

Exploring the use of podcasting to address preconceptions and alleviate pre-class anxiety amongst undergraduate information technology students [online]. *Student experience conference*, Charles Sturt University.

[16] Dekkers, A, Adams, N & Elliott, S. (2011). Using technology to provide a supportive mathematical pathway into university, *Volcanic Delta, the Eighth Southern Hemisphere Conference on the Teaching and Learning of Undergraduate Mathematics and Statistics*, Rotorua, NZ.

[17] Dekkers, A., Howard, P., Adams, N. & Martin, F. (2012). Strategies to remove barriers and increase motivation to use the Tablet PC in formative assessment. In Profession of Engineering Education: Advancing Teaching, Research and Careers, *The 23rd Annual Conference of the Australasian Association for Engineering Education* (2012), (p. 206), Engineers Australia.

[18] Edirisingha, P. & Salmon, G. (2007). Pedagogical models for podcasts in higher education. Leicester, UK. Retrieved from Paper presented at the *Beyond Distance Research Alliance Conference*. Retrieved from https://lra.le.ac.uk/handle/2381/405.

[19] Evans, C. (2007). The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & Education*, 1-8.

[20] Eckert, P. & McConnell-Ginet, S. (1992). Think practically and look locally: Language and gender as community-based practice. *Annual review of anthropology*, 21, 461-490.

[21] Fisher, D., Cornwell, P., Williams, J. (2007). Teaching dynamics using interactive tablet PC instruction software,' *Frontiers In Education Conference - Global Engineering: Knowledge Without Borders*, Retrieved from http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4417887 &isnumber=4417795

[22] Fathurrohman, M., (2013). Creating and modifying mathematical learning resources and learning designs for use in developing countries, Unpublished PhD. Thesis, University of Wollongong, Australia.

[23] Ferman, T. (2002). Academic professional development practice: what lecturers find valuable. *International Journal for Academic Development*. 7 (2), 146-158

[24] Gülbahar, Y. (2008). ICT uSAGE in higher education: A case study on preservice teachers and instructors. *The Turkish Online Journal of Educational Technology*, 7(1), 32-37.

[25] Gill, T.G. (2007). Using the tablet PC for instruction. *Decision Sciences Journal of Innovative Education*, 5(1), 183–190.

[26] Hudson, R. (2012). Modelling Secondary Mathematics Teacher's Use and Non Use of Technology in Teaching, Unpublished Ph.D. Thesis, University of Wollongong, Australia.

[27] Kanwar, A., Kodhandaraman, B. & Umar, A. (2010). Toward sustainable open education resources: A perspective from the global south. *American Journal of Distance Education*, 24, 65–80.

[28] Lawler, P.A. & King, K.P. (2003). Changes, challenges, and the future. New Directions for Adult and Continuing Education, 2003(98), 83-92.

[29] Lesser, E. & Prusak, L. (2000). Communities of practice, social capital and organizational knowledge. In: Lesser, E, Fontaine, M.A, Slusher, J.A. (Eds.), Knowledge and Communities. Butterworth Heinemann, Boston, 123-131.

[30] Lee, M., McLoughlin, C. & Chan, A. (2008). Talk the talk: Learner-generated podcasts as catalysts for knowledge creation. *British Journal of Educational Technology*, 39(3), 501-521

[31] Littlejohn, A.H. (2002). Improving continuing professional development in the use of ICT. *Journal of computer assisted learning*, 18(2), 166-174.

[32] Lonn, S. & Teasley, S.D. (2009). *Podcasting in higher education*: What are the implications for teaching and learning?. The Internet and Higher Education, 12(2), 88-92.

[33] Lonn, S. & Teasley, S.D. (2009). Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems. *Computers & Education*, 53(3), 686-694.

[34] Lightle, K. (2011). More than just the technology. *Science Scope*, 34(9), 6-9.

[35] Lonn, S. & Teasley, S.D. (2009). *Podcasting in higher education*: What are the implications for teaching and learning?. The Internet and Higher Education, 12(2), 88-92.

[36] Lonn, S. & Teasley, S.D. (2009). Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems. *Computers & Education*, 53(3), 686-694.

[37] OECD (2007), Giving Knowledge for Free: the Emergence of Open Educational Resources, Retrieved from http://tinyurl.com/62hjx6.

[38] Porter, A. & Denny, S. (2011). ALTC Final Report: Building leadership capacity for the development and sharing of mathematics learning resources across discipline across universities. Australian Learning and Teaching Council Ltd: NSW, Australia.

[39] Panke, S. (2011). *An expert survey on the barriers and enablers of open educational practices*. eLearning Papers, 23, 1–9. Retrieved from http://www.elearningeuropa.info/files/ media/media25163.pdf

[40] Parry, C., Berdie, J. (2004). Training evaluation framework report. *Contractors to CalSWEC for Child Welfare Training Evaluation*, Retrieved from http://tiny.cc/1fzf7w

[41] Polly, D., Grant, M.M., Gikas, J. (2011). Supporting Technology Integration in Higher Education: The Role of Professional Development. *Technology Integration in Higher Education: Social and Organizational Aspects*, 58.

[42] Robson, N. & Greensmith, J. (2010). Educational podcasts: Some early evidence and thoughts. *The International Journal of Management Education*, 8(3), 107-117.

[43] Shim, J.P., Shropshire, J., Park, S., Harris, H. & Campbell, N. (2006). Perceived Value of Podcasting: Student Communication-Medium Preferences. *Proceedings of the 12th Americas Conference on Information Systems*, Acapulco, Mexico, 2186-2194.

[44] Steinweg, S., Williams, S. & Stapleton, J. (2010). Faculty Use of Tablet PCs in Teacher Education and K-12 Settings', TechTrends, 54(3). Retrieved from http://www.springerlink.com/content/d65q2q6j38555415/fulltext.pdf

[45] Sugimoto, C.R. & Thelwall, M. (2013). Scholars on Soap Boxes: Science Communication and Dissemination in TED videos. *Journal of the American Society for Information Science and Technology*.

[46] Willems, J. & Bossu, C. (2012). Equity considerations for open educational resources in the glocalization of education. *Distance Education*, 33(2), 185-199.

[47] Williams, J. & Fardon, M. (2007). Perpetual connectivity: Lecture recordings and portable media players. In ICT: Providing choices for learners and learning. *Proceedings ASCILITE Singapore* Retrieved from http://www.ASCILITE.org.au/conferences/singapore07/procs/williams-jo.pdf

[48] Wenger, E. (1998). Communities of practice: Learning, meaning and identity. Cambridge: Cambridge University Press.