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A CONSTRUCTIVIST APPROACH TO THE DESIGN AND DELIVERY OF AN ONLINE PROFESSIONAL DEVELOPMENT COURSE: A CASE OF THE iEARN ONLINE COURSE

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This study examined the International Education and Resource Network **Science Technology and Math** (iEARN-STM) online professional development course**.** The study used the constructivist framework as the conceptual model to examine the way in which the constructivist theory has shaped the design and implementation of the course, as reflected by the interactions of a cohort of participants in the course. The participants were 28 educators enrolled in the course, who were either teacher educators or teachers, working in different educational institutions in different countries throughout the world. The purpose of the study was to understand how the iEARN online professional development course supported teachers' learning through effective discourse in an online environment and to identify the constructivist learning principles that were behind the success of the course. The design of the course appeared to have a positive impact on participants' collaboration with peers. Results of the study confirms earlier research findings that the constructivist approach to course design and delivery provides a powerful structure for creating learning environments conducive to the development of professional skills among educators. Results of this study can be used to assist professional development coordinators and administrators to plan effective professional development. The results of the study are also expected to contribute to improvements in the design of professional development course content, instruction, delivery and administration, focusing on factors such as program model, delivery, contextual factors or best practices.

Key Words: online professional development, online course design; constructivist learning, constructivist approach, online course

INTRODUCTION

With the increasing popularity of online professional development courses for educators, it is important that we assess the impact of such courses. As such this paper sought to examine the International Education and Resource Network (iEARN) online professional development course which attempts to foster ICT

integration skills among teachers through the use of a project based learning (PBL) approach. The paper examines the design and implementation of the iEARN online professional development course and identifies successful course design and delivery strategies used in the course. These are examined within the framework of constructivist learning principles. The use of the constructivist framework is critical in gaining insights into how the iEARN professional development course fosters PBL and technology integration skills among in-service teachers. This is offered as a first step towards illuminating best practices and evolving a research agenda based on findings and insights from current online teacher professional development models. It is hoped that the findings of this study will enable future online course designers and implementers to gain a better understanding on how to further improve the design and delivery of online professional development courses.

Statement of the Problem

Online professional development opportunities have dramatically increased in number over the past few years as technology has advanced (Brown & Green, 2003). While such programs are propagating rapidly and consuming substantial resources both fiscally and logistically, few of these courses have made significant improvements in the quality of learning. Instead, they have frequently replicated the traditional face-to-face model of pedagogy rather than taking advantage of technology to create a rich learning environment. As Jackson (1999) argues, the traditional approaches are not working and using powerful technologies to enable educators to take the steps necessary to prepare students for a technology-rich future is a vital first step to insuring that the huge investment in computers and technology is not wasted. The traditional approaches Jackson referred to involve the methods of professional development that have been used in the past to encourage teachers to incorporate technology into their classrooms. It is time to look for new, innovative means to deliver professional development. As such, this study explored how the iEARN online professional development course has integrated the constructivist approach into its course design and delivery in developing teachers' competencies in technology curriculum integration through project based learning (PBL).

Research Questions

The research was guided by the following question: In what ways does the iEARN online professional development course reflect the constructivist approach to course design and delivery?

The study specifically focused on the following research questions:

1. To what extent does the design of the iEARN online professional development course integrate the constructivist approach into online course designs for developing collaborative learning skills among in-service teachers?
2. To what extent does the implementation of iEARN online professional development course incorporate constructivist pedagogical principles?
3. What lessons can be learned from this course and how might these be of assistance to other institutions, researchers and practitioners interested in the use of online professional development to support/enhance teaching and learning?

Significance of the Study

This study provides an insight into the impact of the constructivist approach to online course design and delivery that enhances the development of participants' skills in ICT integration. The research study sought to shade more light on how constructivist approach in online course design and delivery can promote professional development among in-service teachers. The intention was to provoke critical reflection on online teaching and contribute to the development of more robust online professional development courses for in-service teachers. It is hoped that findings from this study will enable online course designers and implementers to gain a better understanding on how to further improve the design and delivery of their courses, since the findings of this research extend their knowledge on best practices in online course design and delivery in a multicultural environment.

The iEARN Online Professional Development Course

The iEARN online professional development courses were first developed in 2001 and continue to be refined whenever necessary. The courses encourage a diverse mix of participants from different geographical, ethnic and operating at different levels of education, while offering multiple opportunities for collaboration in a rich learning environment. They are designed so that by the end of eight weeks, teachers will have outlined how they will use a project with their students, and will have begun work with their students in an international online collaborative project.

Among the course offerings, open to teachers from around the world, are:

- Creative Arts
- Language Arts
- Social Studies, Contemporary Affairs, Geography

- Science, Technology, Math
- Teaching of Foreign and Second Languages
- Learning Circles
- World Youth News: Integrating Journalism skills into the classroom

Each course enrolls a minimum of 25 participants and is facilitated by two facilitators. The two facilitators are employed to ensure speedy feedback and to facilitate a rich discussion and interaction among participants. Facilitators are from different countries to ensure more global perspectives as part of the course implementation.

This paper examines the Science, Technology, Math (STM) course, which the researcher co-facilitates with a colleague. The STM course aims to achieve the following objectives;

- Participants should be able to identify the benefits of international collaboration and global project work
- Participants should be able to learn how to integrate collaborative project-based learning into your teaching practice while addressing local/national educational standards
- Participants should develop a project plan to implement in your Science Technology or Math class
- Participants should learn how to prepare your students for online global project work and evaluate their learning
- Participants should able to network with educators in the course and around the world

The course is offered twice a year, that is, in February- April and September-November. The course is offered on the Moodle learning management system, an open source system that has been designed based on constructivist principles. The course is divided into eight modules (one per week) with readings, discussions, individual and group assignments. Although other Moodle tools are used, the discussion forum serves as the main tool for interaction. Participants communicate with one another through the discussion forums to discuss assignment and readings, and get frequent feedback from the two course facilitators and other participants throughout the course period. Participants attempt the weekly assignments after going through the weekly lessons. They are required to post reflections on what they have learned and respond to at least two postings of their classmates. This requirement is meant to encourage dialogue among participants. A rubric is given during the first week to provide guidance on writing reflections.

Lessons and assignments take participants step-by-step through the process of integrating an online collaborative project into their classroom. In the 8-week course, participating educators are expected to develop strategies for guiding their students in a project-oriented, interdisciplinary approach using action research, traditional scientific methods, and mathematical problem-solving. The project selected should be based on an identified problem in their community and should be relevant to the participant's school curriculum. Participating teachers and their students share their results, conclusions and concerns with their peers around the world. Along with coursemates from around the world, educators choose a project to participate in, develop this topic for students and make plans to share students' work via iEARN's password-protected interactive project spaces. Through this small-scale implementation of a project, course participants see first-hand how to incorporate global project work into their classroom and curriculum.

Theoretical Framework

The theoretical framework for this study arises out of the analysis of issues about the collaborative learning process within constructivist pedagogy. A quick survey of literature reveals that constructivism is one of the most frequently cited theoretical frameworks applied to online course development and teaching (Knabe, 2004). There is a general agreement in literature on online learning and teaching that course design based on a constructivist framework is critical to the success of an online course (Gold, 2001; Ausburn, 2004; Salter, Richards & Carey, 2004; Wiesenberg & Stacey, 2005). As learners move to online and blended instruction, the constructivist approach also transfers to this new medium (Cook, 2004). A constructivist approach to online course design has distinct advantages over other types of approaches, but it is important to focus on the specific dictates of the approach when designing online content.

The question that needs to be answered is: what constitutes successful online course design in a constructivist framework? Past research suggests successful online teaching strategies involve community learning, shared interactions, and meaningful learning experiences. In this respect, the constructivist approach has frameworks to support educators in the construction of an environment for learner collaboration, reflection and designing authentic tasks that enhance learner participation thereby encouraging active learning (Merrill, 1992; Gold, 2001 Savery, Duffy, 2001; Ausburn, 2004). When constructivism is applied to online content creation, it is often considered a "social constructivist experience" (Gulati, 2008: 184). Literature shows that the most prevalent view concerning online learning are mostly related to social constructivism with a focus on collaborative discourse (Bonk & Cunningham, 1998, Jonassen,

Peck & Wilson, 1999) and the individual development of meaning through construction and sharing of texts and other social artefacts (Gergen, 1995).

The social aspect of online education is important to consider in designing online content. Vygotsky (1978) highlighted the critical role played by social interactions and culture in influencing learners about what to pay attention to. Hence, if the course content is related to the learner's particular social context and their cultural and value system, learning is more likely to occur. In addition, Mezirow (1997) reinforces the importance of communication in learning and suggests that the essential mechanisms for learning to occur are experience, reflection and discourse. Helland (2004:619) expands on the idea of social constructivism by stating, "individuals make meaning in dialogues and activities about shared problems or tasks". Learners should be given the opportunity to dialogue with their peers and where possible with experts in the wider academic community to solve learning related problems. In this regard, online learning allows diverse learners to communicate without necessarily being in the same building or even the same country. Learners are able to interact and experience a variety of media from an array of online technologies which include discussion forums, chatrooms, electronic mail and many other resources. Oliver (2000) suggests that technology-based approaches to learning provide ideal opportunities for constructivist learning through their capacity to be resource-based and student-centred and by enabling learning to be relevant to context and practice. There is a surfeit of literature on the use of asynchronous chat sessions or discussion lists to promote student learning. As McLoughlin and Luca (2000) observe, the literature available suggests that discussion lists provides the ultimate learning experience; an interactive environment where learners will engage, build knowledge and apply critical thinking. However, Oliver (2000) warns against blindly accepting such promises and argues that while advanced technology gives on-line courses a favourable appearance, many such courses fail to deliver in terms of teaching and learning quality.

A common criticism of Web-enhanced course design is that online components are bells and whistles tacked onto traditional courses, which are costly to add and only minimally enhance the course content. This criticism may well have merit when online delivery focuses solely on providing course content, but fails to create a learning environment that supports the growth of a community of learners and shared knowledge. If courses are nothing more than content, then all students would need is their textbook. Literature shows that online course design need to foster participatory, authentic and student-centred learning atmosphere in order to promote effective learning and skills development (Salmon, 2002; Hall, 2002; Laurillard, 2002). Online educators should recognize the importance of creating a learning environment that fosters

interaction, dialogue, and mentoring in an effort to produce similar learning outcomes as traditional face-to-face courses. Interaction is a fundamental process in on-line discussion and in collaborative learning. It is also an essential element in the constructivist model of learning. Northover (2002) outlines a number of factors essential to the success of interaction in an on-line discussion. These include:

- value to the student in terms of meeting their learning outcomes
- a discussion that is challenging and of interest
- the student feeling safe when contributing
- feedback from the lecturer that the contributions are worthwhile
- encouragement from the lecturer
- the learning from the discussion board is realistic and meaningful to the student.

Laurillard (1994) also identifies the importance of discussion and reflection during the online learning process but she acknowledges that reflection takes time and effort. She warns that if tutors give little time for reflection, they fail in providing the opportunity for the learner to construct new meaning in relation to the existing meanings, leaving the learning process incomplete. Although the potential for higher order thinking in a discussion list that is grounded in the constructivist model is well acknowledged (McLoughlin & Luca, 2000; McAteer et al., 1997; McLoughlin & Oliver, 2000), McLouglin and Luca (2000) observe that there is limited empirical evidence demonstrating that such higher-order thinking actually occurs. For example, in their analysis of student postings to a discussion list, McLoughlin and Luca (2000) found nominal evidence on the construction of new knowledge. However, what is striking is that despite this, they acknowledge that discussion lists have the potential to achieve higher order thinking, especially when careful facilitation and scaffolding are provided.

Constructivist pedagogy as the critical element of collaborative online course design is also a significant factor in enhancing the quality of learning and teaching online (Salmon, 2002). Within this pedagogy framework, Salmon (2002) highlights eight design principles:

1. learning should take place in authentic and real-world environments;
2. learning should involve social negotiation and mediation;
3. content and skills should be made relevant to the learner;
4. content and skills should be understood within the framework of the learner's prior knowledge;

5. students should be assessed formatively, serving to inform future learning experiences;
6. students should be encouraged to become self-regulatory, self-mediated, and self-aware;
7. tutors serve primarily as guides and facilitators of learning, not instructors;
8. tutors should provide for and encourage multiple perspectives and representations of content.

A study by Salter, Richards & Carey (2004) provides an insight into the complex problem of designing pedagogically sound online course components that support the creation of a learning environment through a collaborative constructivist approach to online learning. The collaborative learning process should allow learners to construct a scaffold for critical thinking and provide an environment in which peers give and receive help from each other, exchange resources and information, give and receive feedback, challenge and encourage each other and jointly reflecting on progress and process (Curtis, Lawson, 2001). Making students who present their views and critically analyse the views of others is the essence of collaborative online learning within the notion of constructivist pedagogy.

With regard to the role of the course facilitators, Hiltz and Turoff (1978) first identified the essential role of the facilitator in creating a stimulating and supportive on-line learning environment. Over the past two decades the role of the facilitator has, according to Tagg (1994: 40) "been variously defined as one that motivates, provides support and stimulates…, guides or 'weaves' the topic in order to keep it on the right track…, provides strong leadership…, coaches students on communication skills…, facilitates discussion…, while simultaneously attempting to 'humanise the technology'". The facilitator in an online learning environment must create opportunities for the learners to interact with the teacher, other learners, and the content (Helland, 2004). Bodomo (2006:694) states "the success of the course design will depend largely on whether the conversation between teacher and learner is such that the learner can increase self-direction and construct new knowledge or not". This element is critical to the success of the course. Knowledge is not constructed in isolation. The learner must interact with someone in order for knowledge to be constructed. Bodomo (2006:695) further characterizes the interaction in three categories: interaction with media, interaction with resources, and interaction with experts. The teacher/facilitator should frame the course as a conversation between instructor and learner.

METHOD

Research Design

In reviewing methodological approaches used in evaluating online courses Mason (1992), reports that the majority of studies came out of a quantitative/positivist paradigm, using techniques such as survey questionnaires, interviews, empirical experimentation and computer-generated statistical manipulations which do not shed much light on the quality of learning taking place. A qualitative approach is the most appropriate research design to in-depth investigation within an online learning context as it would assist the researcher to explore the meanings and experiences and derive better practice within context based on such a technological innovation. This study used qualitative methods in gathering data where the role of the researcher was that of an active participant who was engaging in joint communicative discourse with the participants.

The research approach was underpinned by a constructivist theory of knowledge in which the aim of the inquiry was to investigate and understand how the use of the constructivist approach to course design and implementation has affected the nature of the learning experience in the iEARN on-line course. A constructivist epistemology views knowledge as a construct of individual understands (Guba & Lincoln, 1994). In view of this study which aimed to investigate the processes of social negotiation and co-construction of meaning, this methodology is the most appropriate. In an inductive process, the study explored collaboration among participants and evaluated the perceptions of the participants regarding to constructivist based course design and its effect on skills development of the participants.

The role of the researcher

The research has been a core tutor of the course for a period of 7 years. In the round of the course that was studied, the researcher acted as a participant observer. Initially, the researcher intended to participate as a tutor, but was advised that being in a position of perceived power might affect how participants would relate to and interact with me. In this regard, Adler and Adler (1994) described three categories of qualitative researchers, peripheral - member, active - member, and complete - member researchers. In this research, since I was a active member of the on - line group, I considered myself a active - member researcher. However, my role in the course was restricted to that of researcher-facilitator, who only provided technical support

to participants and interacted with them through email, and sometimes discussion forums, but played no part in the actual teaching of the course. This multiple identity perspective resonates with Blackwood's (1995) conclusion: Because study participants perceive a researcher in different ways at different times, researcher identities in the field are "never stable, never simply defined" (p.70). In other words, the participants in the study and I did not step into fixed and fully defined positions.

Participants

Twenty eight (28) educators, comprising of 13 female and 15 male were enrolled in the course. Their mean age was 35 years. These were Science, Mathematics and Technology teachers drawn from Cameroon, China, Egypt, Indonesia, Iran, Jordan, Lebanon, Nigeria, Oman, Pakistan, Palestine, Romania, United States and Zimbabwe. The participants had different prior knowledge in relation to the use of computers and different teaching experiences. Their teaching experience ranged from less that 1 year to 15 years.

Data Collection Techniques

Data collection included data mining of online activities, discussion forums and e-mails exchanged between course participants and course facilitators. Participants' text-based data of participation in the course was collected, which included online discussion transcripts (2-3 discussions per week for 8 weeks) and email communications with instructors. An additional source of data was the final reflection paper submitted by each participant at the end of the course. This was an essay (2-3 pages) in which participants described their learning experiences during the course and their reflection on their personal development. With these records of interactions in the virtual classroom, the researcher was able to detect potential displays of constructivist elements in the course environment. Course participation data was collected to offer evidence of what participants reported vis-a-vis professional development and intellectual growth. Materials used during the course implementation (readings, videos, etc.) were reviewed. These provided contextual information for interpreting other sources of data and for answering the questions about the elements of course design that appears to promote constructivist learning.

Data Analysis

A holistic approach was used to get an overall feel for the content before moving on to a more detailed analysis (Dey, 1993). Content analysis of students' postings recorded in the learning management system (LMS) and student reflections in their course evaluation forms was done. Analytic

strategies included iterative cycles of reading the data, coding for inductive (Strauss and Corbin 1998) and theoretical concepts (Miles and Huberman 1994), surfacing analytic categories and identifying themes and relationships across the data. Discussion posts were read and reread by the researcher in an attempt to find categories or themes.

RESULTS

A total of 963 postings amounting to over 100,200 words were reported for 28 participant user group and two course facilitators over the 8 weeks course period. The analysis of the data resulted in themes that coincide with the elements of the constructivist framework. The results are presented below under the following themes:

Features that Characterise the iEARN Course Design and Delivery

The iEARN course is offered in a multi-user environment that engages learners in high level interaction. At the heart of iEARN is the principle that participants can be empowered to enhance their learning through interaction. Throughout the course, participants engaged in online conversations through discussion forums. The discussion points were in the form of reading activities and questions on different concepts that allowed participants to create discussions around specific concepts. The facilitators provided materials and resources including scholarly articles, PowerPoint presentations, videos and URLs on each topic.

Although the core materials of the course were provided, the essential element of critical evaluation was left to the participants. Participants were expected to respond to at least two postings by other participants, and to anyone who responds to them. Directions for how to participate in each discussion thread are provided and included guiding questions to help participants focus on inquiry and reflection. It is believed that the opportunity to interact with other participants in sharing, constructing and negotiating leads to knowledge construction. An implied intention appeared to be that sharing ideas, reflecting on one's practice, collaborating, and engaging in dialogue were desirable elements of the iEARN course design and delivery. The course design and delivery centres around the interaction of perspectives with mutual dependency, respect of other points of view and healthy discourses, all factors which are deliberately fostered to improve the quality of learning in the course.

Collaborative Learning Experiences

The delivery of the course appeared to have a positive impact on student learning as far as collaboration with peers is concerned. Analysis of the introduction discussion forum showed participants shared personal information, identifying commonalities, asking clarifying questions, and providing supportive feedback to their colleagues. The introduction activity provided participants an opportunity to build a sense of community and presented a chance to preview participants' netiquette skills. To facilitate meaningful collaboration, facilitators responded to each participant by commenting on a point of interest in the posting as well as asking open-ended questions to encourage additional discussion. The social elements of the discussions were apparent in the results with the total cohort of participants introducing themselves in the first week of the course.

One of the participants, commenting on how he/she was fascinated about collaborating with people from a diverse educational, cultural, and geographical background, said:

> *It's not so easy to imagine and believe that people who have never met, who belong to different systems of education, culture and geographical areas, became close to one another, felt free to express their feelings and had the chance to share their experience between themselves. I can say that the interaction went further than between the members of the course, directly to my students, because during the course I tried to apply some of the things and models I was taught and it proved to be a real success.*

Participants mentioned that they enjoyed the experience and gained technical skills, obtained information and resources, as well as pedagogical knowledge through their interaction with their peers. Evidence of peer learning was found in discussion comments. The following postings are some examples of collaborative /peer-learning that took place within the community:

> *It was an interesting exploration into online courses. I benefited from the experience of interacting with teachers from all over the world.*

> *The global interactive forums are wonderful places to discuss important issues affecting us today. My students benefited from the wide exposure to students around the world and their interpretations of the world.*

Mutual engagement affords sustained participation because it values reciprocity. This is highlighted by one participant who commented.

> *The support I felt...when [they] made the effort to participate, yeah...that was really important because [they] made an effort to make [me] work.*

All of the participants valued the participation of others. They also understood that it was reciprocal in nature. Unless they supported the others, then they were not participating in what was valued. Participant expressed their appreciations after their posting were responded to. The participants valued feedback from each other.

> *Hello (name given)*
>
> *I am glad you enjoyed reading my response; there is a lot we can learn from one another as we share our ideas, I just hope in the process we shall work as a team sharing different objectives, and goals*
>
> *Looking forward to working with you*
>
> *Regards*
>
> ……..

Many participants strongly expressed enjoyment when someone responded to their posting. For example some participants expressed their happiness in the following statements;

> *Hi (name given)*
>
> *Thanks for reading my page. I really feel sad when nobody replied my assignments.*
>
> *Regards....*
>
> ……..

> *How are you? Hope you are feeling good. Thank you for reading my assignments. It's really inspiring to see our weekly activity most especially when somebody replied to our weekly task.*
>
> *Thank you again. God Bless and More Power.*

Participants appreciated the collegiality of the experience, as revealed by a statement by one of the participants:

> *This course has helped me to understand that there are people all over the world that have similarly challenging teaching conditions and sociologically pressing needs in there own country. I would like to be in contact with other iEARN teachers to work and collaborate as there is so much in common.*

Their interaction was mainly informal, friendly and sociable, reflecting the collegial nature of a community. For example, some participant commenting on this aspect said

> *…it was communicative and informal and the high interaction among everyone took away the distance and isolation which I had earlier anticipated.*
>
> *It is always very important to know more about manners of others in the educational training in their country. This knowledge can help us to ameliorate our view of education.*
>
> *Global collaboration using the course forum can allow all students around the world to be like the students of the same teacher, or all students will be together in a virtual classroom.*
>
> *IEARN projects of global collaboration will be no doubt the key of the success in education during this century. This collaboration is the ideal route to share knowledge with others, to know how they think ……..*

Through their friendly exchanges, a feeling of collegiality developed amongst participants, helping to ease the anxiety of geographical and psychological distance and leading them to a sense of a community. However, they also pointed out that the feedback was limited due to late responses by classmates. Some participants became disenfranchised because they had a high expectation that their posts would not be reciprocated. It was evident that participants found it difficult to sustain the number of discussion threads over time due to a lack of "critical mass". One participant gave the example:

> *If one person posts something on a discussion forum and no one responded to it, then it would be like, well, there's no team effort.*
>
> *"it could be days before anyone responded to a posting and sometimes no-one responded."*

This negatively impacted on motivation and social engagement by participants. The limited mutual engagement clearly impacted on community cohesion.

In order to motivate students to respond to their classmates, responding to posting was given an assessment weighting. There was a clear goal for the participants to respond to the discussion forum postings. They would be awarded points for responding to their classmates' postings. Participants were required to respond to at least two postings per discussion topic in a week, in order to gain maximum points in a given week. However, it should be noted that although there was a minimum number of times participant were required to respond, the points awarded were not aligned to quality of their postings. It should be also noted that most students responded more than the minimum number of times specified.

Opportunities for Reflective Learning Experiences

Participants were encouraged to reflect on their learning at all the stages of the course. Combined with opportunities to reflect on their colleagues' postings, readings, videos and PowerPoint presentations, the course participants were given space to reflect on their classroom practice as they planed the different stages of their collaborative project participation. Throughout the course the hypertextuality of the online medium facilitated exploration of multiple perspectives and approaches to PBL.

The course offered participants the opportunity to reflect on their own practice as one participant commented:

> *This course has been a catalyst to my thinking and teaching methods. I had thought about teaching the students about renewable sources of energy (concentrating on wind mills). When I went through the sites, as we were required for outside reading, the whole project started coming together from all the material I was going through.*

When participants interacted with one another and with the readings, this evoked reflection on their own experiences as suggested by one of the participants:

> *The combination of reflecting on your own experiences from the reading, and the reading of other participants experiences is particularly valuable.*

The following discussion forum quotation further illustrates the process of self reflection.

> *The course gave me a fresh impetus to a career that I love, but which I was beginning to become a bit jaded...it made me far more confident in*

> *using the Internet as a research/communication tool...and brought new friendships...\'*

Evidence of reflective thinking was also seen both directly in the comments that participants made on how they had reflected on their colleagues' contributions as well as, *indirectly* in the manner in which participants contributed to the activity room.

In one of the discussion forums, one participant asked other participants to reflect on the role of technology in teaching:

> *What is your opinion to your question? Do you think that students can be taught without teachers in the presence of modern technology and the availability of information on the internet!*

In responding to this question one participant, had this to say;

> *How are you? Hope you're feeling fine....*
>
> *For me, nobody can replace the teachers.....The teachers are the one[s] who guide the quality of education. Modern technology is just a tool. What about you?*

Authentic and Context Based Learning.

To embrace the constructivist model of learning in teaching, McLoughlin and Luca (2000) argue that learning needs to be imbued with authentic contexts. Authentic learning emphasises the importance of context and relevance in the process of knowledge construction. This was achieved in this course with the use of topics that were contemporary, relevant to the individual participant's national educational goals and local environment and social issues. The iEARN course uses multimedia, including videos to capture real life contexts as a way of anchoring learning in an authentic environment. The videos allow learners to work on authentic and realistic tasks that reflect on the real world. The context based learning environment in the iEARN course is also captured in the project based learning (PBL) which is encouraged through the many projects that participants are asked to review and plan for their participation in one of these projects with their students. Participants are required to identify local environmental and social challenges faced by their communities. This was likely to add to the authentic context of the learning as the issues discussed were accessible to the participants in their everyday life and the community in which they lived.

Basing on these challenges participants identify a relevant iEARN project which they wish to participate in with the aim to come up with a solution to the challenge.

One participant observed that:

> *The project I designed has been on my mind for some time. I had then involved the children in the concept planning where they had to find out the damage caused to the environment by thermal (coal burning & gas burning) power generation stations. The students then found out about the advantages, cost and pollution wise, of wind generation of power. We have in our curriculum, study of environment and the dangers posed to the environment by conventional generation methods. Thank you for a lovely experience!!!*

The relationship between real life situations and the school curriculum was also emphasised on. This was reflected in the participants' comments;

> *iEARN stresses a lot of subject integration that students learn in all schools. The ideas that I see myself using in Math is Data management the students are given a task to carry out surveys, collect organize represent and ,interpret (CORI), this is one of Math Strands in a syllabus.*
>
> *Solar cooking project is a part of YouthCan. In our Physics subject, one complete chapter is associated [with] solar energy. It is very much present in our curriculum.*

The course also put emphasis on getting solutions to real-life problems through project based learning. Participant mentioned that:

> *Nowadays in Pakistan we are facing energy crises. Everyone talks about solar energy. If I start with this project then students will understand what is practically possible and how they can contribute to minimize the problem.*
>
> *Regards,*
>
> *……..*
>
> *This Footprints project is really cool, because it allows individual participation from every single student in a learning process that shows them how each person can make a difference in a large global issue.*

Participants appreciated the multiple disciplinary nature of the course offering through PBL. One participant mentioned that such learning experience would be also helpful to the students that he/she taught:

> *It [PBL] gets them out of their own little world they live in and allows them to see the global impact of the science we try to teach them. It [PBL] also causes the learning to be interdisciplinary, combining language, geography, social issues, math, science, and culture together.*

Such authentic tasks provide anchors which give opportunities for teacher/facilitator guided discovery which help make a difference.

The Role of the Course Facilitators

The course is usually co-facilitated by the researcher and a colleague who was from a different country. In this offering, one facilitator played the role of the tutor-facilitator since the researcher had assumed the role of researcher-facilitator.

An analysis of the discussion forum postings and email correspondences showed that the facilitator performed the following activities:

- Welcoming participants and explaining the expectations of the course.
- At the beginning of each week the facilitator would lay down the objectives of the discussion, providing the true frame and the norms of the discussion.
- Guide and facilitate the discussion by offering more clues, opinions and resources.
- Collect rich sources of materials on PBL and initiate specific discussion.
- Grade participants' activities and giving relevant feedback
- Respond to participants' questions
- If some participants were dormant, the facilitator would send emails to them urging them to contribute

At the beginning of each week the facilitator would send an email message to all participants, welcoming them to the new week and giving an overview of the week's lesson. Sending welcome messages at the beginning and encouraging participation throughout were some of the key roles played by facilitator-tutor. The facilitator-tutor was also responsible for creating a friendly social environment for learning which is also seen as an essential skill for the facilitator. For example in welcoming a participant, one of the co-facilitator wrote;

> *"Welcome to the course X (not actual name)! I have a 6 year old daughter, so we have something in common. I hope you find the course rewarding and fun."*

An analysis of the discussion forums indicated that the facilitator-tutor provided timely and relevant feedback on participants' input, using a friendly personal tone.

DISCUSSION

The findings of this study confirms earlier observations by for example Merrill, (1992) and Savery & Duffy, (2001) that supporting learners, designing authentic tasks, constructing an environment for learner reflection and incorporating collaboration are key features to encourage participation and enhance learning. The iEARN-STM online professional development was able to create a community of learners within which participants could collaborate and learn from one another and reflect on their learning and on the contributions of their colleagues. The most obvious themes that appeared over and over again were the learning that took place among peers as a result of collaboration, reflection and authentic tasks. The course propositioned only one rule: support your fellow community members. For instance, the collaborative tasks were predominantly centered on evaluating and responding to each others' contributions. In other words, collaborative/peer-learning and reflective thinking assumed significant importance in iEARN course design and delivery. The design of the iEARN online course and its implementation encouraged and sustained collaborative learning and reflective learning. The participants negotiated their own regime of participation with occasional support of the facilitator. The participants who were teachers drown from schools, around the world shared best practices and learned from each other on a daily basis. However, the results of this study have shown that as Riel (1996) argues building a collaborative learning environment online is not the same as building it in a face to face a learning environment. Technology tools such as discussion forums, emails and web pages do not define collaboration. Collaborative learning is a process that involves interaction among individuals in a learning situation. Collaborative learning engages all participants (both participants and instructors) in working together in the learning process. It is rather the participation and interaction between and among the people who gather together that define collaboration. The issue here is not just the inclusion of the tools, but the manner in which they are used to create and sustain relationships. Strategies need to be in place to launch dialogue and exchanges and familiarise people with the environment that foster a learning community. The engagement of co-

facilitators (facilitator-tutor and facilitator-researcher in this case) in the course helped in stirring dialogue among the participants.

The course brought together participants in a learning community for them to see each other's experiences and share knowledge. The value of collaboration to participant learning permeated all data sources. When participants referred to, elaborated on and reflected on their colleagues' contributions, they did so because they considered these contributions as worthwhile resources. The participants negotiated their own regime of participation with occasional support of the facilitator. For instance, when participants were absent from the course for a period of time the initial process of rejoining the community was often aided by the timely intervention of the facilitator; usually in the form of a direct e-mail summarising the most recent activity in the course and how they could join in. Also the facilitators were seen as a force for motivation and encouragement. Participants considered these experiences and knowledge to be learning resources as was evident in their interactions and extensive contributions to the discussion forums. In this study collaboration resulted in the sharing of new ideas, considerations of varying perspectives, affirmation and/or constructive feedback for the learner. Peer learning/collaborative learning correlates with the constructivist components of learner-centered environment as well as community-centered environment. Collaborative learning in the iEARN online professional development course occurs when learners share their experiential knowledge and support each other through their interaction.

The analysis of course discussion topics confirms that the online professional development course effectively promoted reflection for the participants. In the course, evidence of reflective thinking included participants questioning their teaching practice and comparing their practice with others. Such reflection allowed participants to make meaning of experiences and information. Evidence of reflection included engagement in dialogues to search for the meaning of course experiences, and participants writing about their learning process.

Online courses are sometimes criticized for focusing on knowledge acquisition rather than solving complex real-world problems (Dole and Bloom 2009). In this study, course design helped participants engage in authentic and real life situation. Attention was given to relevant contexts that support authentic learning. The use of real world problems captured through videos, case studies and projects were instructional approaches that were used to foster authentic learning. These approaches helped to cultivate an environment in which participants worked together in a learner centred environment, sharing

expertise, contributing to knowledge where participants owned their own learning outcomes.

Although online discussion is critical to the success of online courses, the facilitators should also be aware of their influence on the discussions in class. Payne (2008:158) states, "the danger that student-to-student interaction will be stifled or overwhelmed by instructor/facilitator postings is real." The facilitator instructor needs to find a balance between being available for communication and to answer questions, and to also be aware of how much they are contributing or leading the discussion. Learners should build their own knowledge by using class resources more than having to rely wholly on the instructor. The facilitation could be improved by allowing for more socially mediated learning, providing more prompt and concrete feedback, relating current learning to prior learning more effectively, and offering more hands-on practice of technological skills. Efforts should also be made to provide an electronic space for non-course related interaction to foster participant social interaction.

IMPLICATION FOR COURSE DESIGN

The findings of this research point to the need for online professional development courses to create an environment where participants support each other through reciprocal participation. This should be supported by timely response to discussion forum posts. When participants feel accountable to each other then they are more likely to continue participating without external facilitation. In order to achieve this supportive culture the participants need to feel that their participation is important. This necessarily requires the facilitator to play a less active role, intervening only when the rhythm of participation is at risk. However, it was also evident that while the facilitator should remain at the periphery of the community to allow participants every opportunity to negotiate their own centripetal practices, the facilitator must also be prepared to more actively broker a community regime of participation.

Another implication for online course design is that teacher professional development should take place in authentic and real-world environments; course content and skills should be made relevant to the profession and be understood within the framework of the educator's prior knowledge. It should be noted that active participation in online discussions does not occur by itself, but must be intentionally designed into a course (Salmon, 2002; Laurillard, 2002). In designing an online professional course, designers and implementers need to create standards for participation and encourage participant feedback.

CONCLUSION

The online course design based on constructivist approach is the success factor behind the success of the iEARN course. This study provides evidence to support earlier research finding that constructivist approach to course design and delivery can promote high levels of learning through collaboration and reflection. The iEARN course design which is based on constructivist approach demonstrated that collaborative work, opportunities for reflection, authentic tasks and experiences with real life situations within the courses are the inevitable elements for deep, active learning and skills development. Furthermore, the findings of the study demonstrated that the constructivist framework which research has established as conducive to online learning can be effortlessly applied to online professional development courses for in-service teachers. Therefore, this research recommends an intensified need to consider the constructivist approach to online course design in order to improve on teachers' professional competence in technology integration.

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