Best of EDEN 2011

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The best research papers published in EURODL
and presented at the 2011 EDEN Annual Conference

Edited by
András Szűcs, Ulrich Bernath

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Introduction

One of the important missions of EDEN is to support the exchange of academic and professional experience, to promote navigation and information reach on the rapidly evolving scene.

EDEN is organising since 1992 annual European conferences for open, distance and e-learning and also bi-annual thematic research workshops and Open Classroom conferences on learning innovation for school level e-learning.

The EDEN conferences have become major events in Europe, with increasing attendance from other continents. They are based on collecting best practice: the papers presented and published in the Proceedings have been serving as relevant resources for the professional community.

The integrating approach of the conferences helps to consolidate the knowledge and to build the international community of professionals. EDEN conferences have been useful in capitalising on the knowledge of proficient actors and also in assisting in the introduction of newcomers.

Research in open, distance and e-learning is indispensable to provide information for development, decision-making and quality of products and services. Even more this is the case as many changes occur and the pace as well as the extent of innovation often seem to be dramatically fast and wide.

The EDEN Best Research Paper Award was launched in 2008. And it is granted at EDEN's Annual Conferences as well as at EDEN's bi-annual Research Workshops. A high quality standard selection process guarantees the branding of the award for scholarly conference papers in the field of open, distance and e-learning.

The selection process takes place in collaboration with the Ulrich Bernath Foundation for Research in Open and Distance Learning and is supported by a Jury, nominated by the Foundation and approved by the EDEN Executive Committee.

The finalists of the Best Research Paper Award Competition at the EDEN 2011 Annual Conference in Dublin in June have been invited to further elaborate and re-submit their contributions. The present selection contains the enhanced versions of these papers and few more selected excellent articles published in EURODL in 2011.

In co-operation with the Ulrich Bernath Foundation, our aim is to launch this tradition in order to provide visibility to quality research on the field.

Dr András Szűcs
Secretary General, EDEN

Budapest, November 2012

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Local Support for Online Learners with Possible Learning Disabilities

Torstein Rekkedal, NKI Distance Education and Norwegian School of Information Technology, Norway

Best Research Paper Award Winner

Abstract

This article reports from a research study concerning online distance study for competence development of vocational rehabilitation clients. The students included in the study are adults with health problems participating in a rehabilitation process to re-enter into working life. As a group the students are characterized by difficulties, problems and diagnoses that for many represent learning disadvantages. The study examines the results of combining individual online distance learning with support organized by a local vocational rehabilitation enterprise. In this article student support refers to all kinds of non-academic services and help to students, and does not include any face-to-face teaching or tutoring. The amount and type of local support given and how it has been experienced by the individual student may vary between the different enterprises, dependent on their budgets, number of students in the learning room, types of programmes studied and individual needs of the local students.

The study indicates that online line study with adequate local support may constitute a good solution for this target group. Both case handlers in the Labour and Welfare Administration, local counsellors and the students themselves report positive experiences with the learning solution examined. Statistics on completions and withdrawals demonstrate that the group of potentially disadvantaged learners achieve well in online study when they receive sufficient social, technical and practical support.

Keywords: disadvantaged learners, students support, online learning, completion rates, interview study

Introduction

This article reports from an evaluation study among a specific group of learners taking online courses for competence development for vocational rehabilitation and re-entrance to working life (Rekkedal, 2009). The vocational rehabilitation system of Norway gives practical and financial support through the Norwegian Labour and Welfare Administration (NAV) to help adults, who because of health difficulties have to change the type of job they can handle. Retraining and competence development is one most important element of rehabilitation, often combined with work practice at a relevant workplace. As the largest online institution in Scandinavia, NKI has a long tradition of supplying distance online courses to this group of students. Over time there has been some success with blended learning, i.e. online courses combined with local classes for this group of learners, while individual distance learning has had less success, mainly because of an assumed higher drop-out rate among these learners. Thus, many case handlers at NAV have been quite reserved concerning financing individual online learning programmes for this user group. (The official term for rehabilitation clients is the Norwegian term for 'user of vocational rehabilitation services'.)

Some few years ago NKI together with a local vocational rehabilitation enterprise took the initiative to explore solutions for satisfying the learning and support needs of this group in better and more efficient ways than had been done before. The main reason was that although a blended learning approach had had a certain success; blended learning could not solve the general problem, as blended learning does have some disadvantages for this group:

1. The individual competence development needs vary, and very seldom there are a sufficient number of students having the same need at the same time to start a local class.
2. It is imperative that these students can start their learning just at the time when they feel the need and are ready, and motivated, for learning.
3. Because of a number of health, and often also social, difficulties, they need maximum flexibility to adjust study work to what they have the energy to manage on a daily or weekly basis.

The solution that came up was the concept of 'individual distance learning in the learning room'.

Student or learner support is defined in different ways in the distance and online learning literature (see e.g. Brindley et al., 2004) It might cover learning materials, teaching and tutoring and non-academic elements administrative aspects, guidance and counselling. In this article student support refers to all kinds of non-academic services and help to students, and does not include any face-to-face teaching or tutoring.

The idea was to combine individual flexible online learning with local support in the 'learning room'. The local vocational rehabilitation enterprise establishes a physical room furnished for learning with all necessary facilities including computers, Internet access, individual study areas and areas for social activities and co-operation – the 'learning room'. In addition, there is an educational counsellor available, who supports the students in deciding which online programme that is best suited for each individual, and who is able to give advice and support to the students in their learning endeavour. Technical and practical support is supposed to be continuously and easily available. The students in the learning room can study any online programme, start at any time, proceed at their own pace and interact socially, and sometimes academically, with other students studying the same, similar or different courses. Incidentally, they may have fellow students studying the same programme being ahead, behind or at the same stage studying the programme. Specifically, it was considered for these students that bringing structure into their lives by requiring an agreement of meeting physically for learning activities at specified times and days would be very important for their success. Since the start about 5 years ago the idea has spread, and this co-operative solution to support individual learners has been established by a number of local rehabilitation enterprises, which also have made agreements with other online distance learning providers. It should be emphasized that the support in the learning room concerns, practical, technological and social support of individual online study, but generally no face-to-face teaching. However, the amount and type of support given may vary a lot between the different enterprises, dependent on their budgets, number of students in the learning room, types of programmes studied and individual needs of the local students. The solution is strongly supported by the national Association of Vocational Rehabilitation Enterprises. This study concerned NKI rehabilitation students and was carried out in co-operation with the Association.

Aim and method of the research

The main aim of the present evaluation study has been to find answers to whether the pedagogic and administrative arrangement of combining online study with local

support in the learning room for this group of learners did function according to expectation, and not least demonstrate for the Labour and Welfare Administration (NAV) as funding source for rehabilitation processes that, if results were satisfactory concerning completions, attitudes and achievements, individual online learning with local support could constitute an effective and cost-efficient solution for competence development, and eventually bring the users back into working life. This study is mainly concerned about the competence development aspect of the rehabilitation process. Whether and how soon the user may return back into working life is dependent on many other factors, both related to the person and to the local labour market.

The research chose a sort of triangulation method (see e.g. Bryman, 2001), including telephone interviews with students in the learning room (30), with local organisers (25) and local representatives of NAV (12), which is funding both the courses and the support supplied by the local organisers. In addition, statistical data on completion and attrition rates among online students in the learning room and other individual online and blended learning students was collected. The interviews were carried out by the author of this paper and answers were registered in writing during the interviews.

Students with special needs and/or learning disabilities

Special needs among online students in the vocational rehabilitation programme

There is probably no doubt that students in the vocational rehabilitation programme as a group have greater personal, social, health and other difficulties, such as reading and writing problems, than the general online learning population, that may interfere with learning efficiency. This is exemplified by some of the local counsellors with statements such as:

> *"One of the problems is that they have all kinds of individual needs. It ranges from help to get up in the morning, meeting at agreed times, plan their studies, reading and writing. Many do have large reading and writing difficulties."*
>
> *"... Many lack social experiences and really need to be socialized."*
>
> *"... The user is often in a situation having lost social identity and role and economic security and has to define a new existence, this often*

combined with health problems that gives new frames of reference in life."

Some statements from the NAV representatives:

"We often see that users have the intellectual capacity for formal learning, but cannot take advantage of the ordinary school system because of experiences of having lost self confidence in the ordinary school system, and often also have a personal situation with physical and psychological problems, including mental processing abilities, e.g. ADHD etc., that reduce their capabilities and make it impossible to spend whole days and whole weeks for study."

There are large differences in needs, some struggle with anxiety problems, ... some have a history of being bullied in school etc.; ... the support in the rehabilitation enterprise gives social support and security for progress in the studies."

Also student statements give a picture of special needs:

"The flexibility of online learning is important as I have an ADHD diagnosis and concentration difficulties."

"The flexibility is important because there are all sorts of different reasons for being in a rehabilitation programme. I have to take the days as they come."

According to the Association of Rehabilitation enterprises information about diagnoses of users are not well systematized. The following represents information from 2009 of users' diagnoses as indicated from NAV to the rehabilitation enterprises (information is available for only about 25 percent):

Psychological diseases/difficulties	*26 %*
Drug/alcohol abuse	*5 %*
Muscle/skeleton diseases	*32 %*
Mentally retarded	*2 %*
Sense losses	*1 %*
Socially maladjusted	*7 %*
Other (ADHD, mixed problems, uncertain diagnoses)	*27 %*

(Association of Rehabilitation Enterprises 2010 unpublished)

Online learning and learners with learning disabilities

The above statements and information do by no means imply that all rehabilitation students have disabilities or learning disadvantages. However, there are good reasons to assume that measures to satisfy 'universal accessibility standards' and solutions to support learners with reading and writing difficulties represent improvements in user functionality also for the average students.

We agree with Nielsen (2000), who states that:

> *"Designing online Internet-based courses that are accessible to students with disabilities results in courses that are easier to use and understand for everyone." (Here quoted from Edmonds, 2004, p. 51)*

This assumption has been the basis for some previous NKI projects on disadvantaged learners, *'Distance education for adults with reading and writing disabilities'* (Lundberg, 1996; Letrud et al., 1997) and the *'Universal accessibility project'* (Mortensen, 2003). As a result of these projects the NKI online learning web pages have been adapted and assessed according to universal accessibility standards, and a synthetic speech solution is implemented for all online text materials.

There is no doubt that online distance education may represent an opportunity for learning for people with some kinds of disabilities better than traditional forms of education that require physical presence at defined times and places. This author's incidental meetings with disabled distance learners during over 40 years in the field are numerous. Some of these are described in an article on 'who is the distance student?' (Rekkedal, 2004) and illustrate how online learning gives new and better learning possibilities for many disabled students.

The proportion of disabled students in distance education programmes may differ a lot, estimates vary from 1.5 % to 4 % (Paist, 1995; Moisey, 2004). Letrud et al. (1997) estimated on the basis of an analysis of written assignments that over 10 % of the participants in a vocational training programme for caretakers had serious reading/writing difficulties. Supporting disadvantaged distance learners is a matter of both making online materials and communication universally accessible (W3C, 2010) and support learners according to each individual's needs. Internationally there is a certain attention towards challenges concerning distance education and accessibility, partly as a result of distance education institutions being specifically attentive to service disadvantaged learners, and partly because electronic distribution and

communication may involve great advantages, or disadvantages, for some learners with certain disabilities according to how accessibility issues are attended to, see e.g. California Community Colleges (1999), Banerjee (2003), TRACE Center (2007), Roberts & Crittenden (2009), Burgstahler (2010). Burgstahler et al. (2002) describes the situation well:

> *Technology "...has also been viewed as a great equalizer when used by individuals with disabilities. However, the full potential of using technology in education to benefit individuals with disabilities is not being realized. Ironically, one reason this is happening is that not all students can access the technology that has the potential to provide a more accessible educational opportunity." (Burgstahler et al., 2002, p. 1)*

Moisey (2004) has studied characteristics of students with disabilities in a cohort of distance students at Athabasca University including study success and possible effects of specific support services. These students had a wide range of disabilities including learning disabilities and psychological disabilities:

> *"Students who received more types of support services tended to have somewhat more success in terms of course completions, and certain types of disabilities appeared to be more amendable to certain types of assistance." (Moisey, 2005, p. 73)*

Paist (1995) has discussed a philosophy for distance education and disabled students based on ethical, legal and practical considerations and the practical applications of this philosophy for University of Wisconsin-Extension. She also refers to the enrolment of vocational rehabilitation clients with probably similar characteristics of the students in our study. Practical actions involve eight components:

> *"– Informing students with disabilities or their advocates about our program and our ability to meet their needs*
> *– Case-by-case planning for accommodation and access*
> *– Making instruction accessible*
> *– Making course materials accessible*
> *– Making testing accessible*
> *– Training and supporting faculty and staff*
> *– Getting funding to support efforts to serve students with disabilities*

> *Staying abreast of developments, especially technological developments, that will improve future services and access" (Paist, 1995, p. 65)*

There is not much research published on the relative success of disadvantaged learners in distance and online learning. Moisey (2004) reported from Athabasca University that students with disabilities did not show markedly different completion patterns from the average student population. However, there were some differences, e.g. that students with psychological disabilities showed somewhat lower completion rates, while students with hearing and vision loss completed at a somewhat higher rate. Disabled students who received more support services had more success concerning course completions. That disadvantaged students possible might succeed in online distance learning if adequate support services are available, is of specific relevance for our study.

Shonfeld & Rohnen (2009) explored how an online distance course with face-to-face meetings could answer the needs of different student groups, including students with learning disabilities. Based on the assumption that students with learning disabilities might be affected by disorders that influence the use of listening, reading, writing, reasoning and other skills that influence learning efficiency, they found it of interest to examine how these students were learning and integrated in an online course. The study did not report study success directly, but reported on how students with learning disabilities experienced their learning abilities and activities in an online study situation. The researchers report that results were surprising, e.g.:

> *"… that an online course can improve students' learning, emphasizing self-directed learning, participation in forums, satisfaction from online labs and the final grade evaluation. A slight but explicitly marginal advantage of the LD (learning disability) students was presented when compared to 'Regular' and 'Excellent' students." (Shonfeld & Rohnen, 2009)*

The research further indicated that the advantage of online learning for 'excellent' students and LD students is different. LD students find online students as a flexible solution that enables continuing learning with necessary personal time management; the honour students see it as a flexible place that can save them time. The LD students were courage by intensive communication with instructors and peers, while the honour students enjoy being independent from class interaction.

Results

Interviews with local representatives of NAV

The interviewees were selected on the basis of information that they worked as manager or consultant/case handler at a local office, and that they had some experience with funding competence development through online learning and local support in the learning room for one or more users. In total we had a list of 21 possible interviewees. Reaching these persons on the telephone turned out to be difficult. 12 case handlers and/or managers from 11 different offices were interviewed.

Some conclusions

It was a general impression that the consultants and managers who had some experience with the learning room solution expressed very positive attitudes. The main aspects that were pointed out were:

- Individual online learning combined with follow-up, support, guidance and social presence in a group of learners is much more effective than individual online distance learning for vocational rehabilitation users.
- The learning room solution is not suitable for all users. Some consultants point out that some users have too many difficulties to be able to take advantage of online learning and need the direct teaching in a classroom.
- The learning room solution functions much better than face-to-face for many users because the solution in practice gives much better individual follow-up, and also because many users have a history of bad experiences from previous school attendance resulting in negative attitudes and anxiety for participating in settings that remind of a traditional school situation.
- The learning room solution is more flexible and better adapted to users who have to relate efforts to unpredictable physical and/or psychological conditions that vary from day to day.
- Online learning combined with support and other activities such as work practice in the vocational rehabilitation enterprise is a good basis for success in returning to working life.

One manager put his viewpoint very clear:

> *"We are so certain about the efficiency of the learning room solution that we have told the rehabilitation enterprises that they have no choice. They have to establish the learning room solution if they wish*

to continue to be part of the co-operation with the Labour and Welfare Administration in the future."

Interviews with local representatives of vocational rehabilitation enterprises

We managed to get in contact with all 25 rehabilitation enterprises that were supposed to have some experience with supporting online learners in the learning room. The respondents were mainly the person who locally had functioned as the local supervisor/advisor/counsellor in the learning room. The individual experiences varied a lot from only having had a few students in the system to having worked with hundreds of online students studying in the learning room solution over some years.

The general impression of the interviews was that:

- The local counsellors express a firm belief that the learning room solution represents an arrangement and organisation of online learning and local support that have proved its worth for the user group in question.
- They are, however, worried that many case handlers in the Labour and Welfare Administration have an outdated attitude towards training and competence development based on a belief that traditional classroom teaching universally represent the best solution for learning.
- They report that the users are satisfied both with online learning and local support, and that there is very little drop out among learners in the learning room. It seems that the only drop outs are students having so many health problems that study becomes impossible or that they succeed in returning to ordinary working life before they complete the course.
- They point out that quality of online teaching is critical for success. The online teachers have to give quick and sufficiently constructive feedback.
- Individual assessment of each individual user's motivation and health situation, as well as guidance in choosing courses and study planning, is a necessary condition for success.

Interviews with students

The students were selected from a list of students who were registered as completed or cancelled their online learning contract the last month. We started from the bottom of the list, the most recent completed/cancelled students. The completed/cancelled group included 16 students who had finished their studies, four students who had completed at least one complete study programme and continued to study another and two

cancelled students. This group were supplemented with eight students randomly selected among rehabilitation students who had studied 6 months or more. We consider the interviewed students to be close to randomly selected. The student group consisted of 18 women and 12 men coming from seven different rehabilitation enterprises. The relative number of men and women is close to the NKI average with about 70 percent women. They varied in age from below 20 to well over 50. A majority had quite low previous education.

Table 1: Age

Below 20	20-29 years	30-39 years	40-49 years	50-59 years	Total
1	4	7	12	6	30

Table 2: Previous education

Little	Some secondary	Secondary/ craft certificate	Higher education	Total
9	13	7	1	30

Table 3: Study status

Completed	Completed/ Active*	Active	Cancelled	Total
16	4	8	2	30

*Completed one or more programmes – having proceeded studying an additional programme

The two discontinued students gave very different explanations for not completing, as the first said to have dropped out of the competence development programme because of successful effort of quick return to working life, while the second informed that she had never started her studies because her health being too bad to continue in the rehabilitation programme.

Eight of the 30 interviewed students informed that they were back in full time work and four respondents were in part-time work or temporary engagements. Of those in full time work, one meant that the online study had not had any significant effect for success in returning into working life; six said that the studies had been the major reason for success in getting a new job, while one referred not to the course content as such, but meant that the personal development process of studying had been important. Some statements:

- *I am back to work – competed the Accountancy Programme in March 2008 – the study was incredibly important, and I got a job before I finished, a job I could manage with my health problems.*
- *I am back to work – the study was important to get started – I believe it works for the majority of people in the system.*
- *I am in a job where I do not apply what I learned, but I believe the study was important because it demonstrates that I am willing and able to learn...*
- *I am working as apprentice and did get the job because of my online course.*

28 of the respondents were generally positive concerning their experiences with individual online learning with support in the learning room, nine of these had some minor comments on aspects that could be improved, while one was generally critical (the same person that had quit and got work independent of the rehabilitation programme; critical viewpoints were mainly related to NAV's handling of the rehabilitation programme and not to the learning programme itself). Typical statements:

- *I am very satisfied – very good.*
- *I have nothing to complain about.*
- *Superb, I cannot praise it enough.*
- *Superb, I found it interesting; I liked both the course and the pedagogical solution.*
- *I am very happy that I did not have to work alone; good to have somebody to ask; good to have fellow students to ask and discuss with, not least those who were ahead of me in the same course. …*

Nearly all express positive experiences with support and guidance in the learning room (21 without and 6 with some minor reservations or comments):

- *It is important that you don't have to sit at home alone; I am a social being, and it is very important with other participants present, even when they study other courses.*
- *I am satisfied – the people in the rehabilitation enterprise are so helpful. No one else studies the same course as me now. In my previous course we were two students. It is very good when we are more than one in a programme; we discuss and solve exercises together. Everyone help each other. We constitute a tight-knit group. Some have already finished. I have got many new friends; it is an excellent situation of co-operation in the group.*

- *I met regularly in the learning room. It is excellent, but much up to yourself; important to take initiative. I experienced that for many it was important with other participants present. For me that was not important – had no need for sharing with others.*

Although there are some few minor reservations, nearly all express positive viewpoints concerning their online learning experiences:

- *Very good learning materials – I have nothing to complain about. I did not get much acquainted with the tutor, but I received very good feedback. It functioned well, received answers to all my questions. I would not change anything. If you are motivated, it works well – you have to be motivated. And you must have time, online study is demanding. I worked most from home, only two days a week in the learning room, but worked mostly alone there as well. I did not have much communication with NKI, but no problems; it went just smoothly.*
- *The learning materials have been easy to read; it has functioned very well with the tutors; I have not experienced slow return of assignments – I know some have.*
- *Generally positive impressions. Very friendly and pleasant tutors who have supplied helpful and thorough feedback. The feedback comments have been good both when the content has been positive or negative.*
- *Absolutely satisfied – very good comments and feedback. The tutor is pleasant and responds nearly immediately and you always get help when you ask. I find the study guides very helpful; they explain the textbooks – you cannot learn with the book only.*
- *The course 'Learning to learn' (optional introductory course to NKI online learning programmes) was motivating and instructive. I have nothing to complain about concerning the tutors. The tutor supply quick feedback – also at late evenings. He is excellent to answer questions; very satisfied with tutors. It could have been some more information and guidance concerning online study in the beginning.*

We asked about positive or negative viewpoints concerning the flexibility of time, which is an important aspect of the NKI, and not least the learning room, solution. The majority point out flexibility as important:

- *Very important; I had work practice beside the studies and have also some physical limitations – important with individual pace.*

- *That is just what is important; that you don't have to follow ordinary secondary school; I really liked this solution.*
- *It is really essential; because I needed time to complete. Very important that you don't have to feel the pressure of time.*
- *Very important – else it had probably not gone well for my home and family situation or in any other way.*
- *Important as we are in a rehabilitation situation for different reasons. Many have to meet and take the days as they come.*
- *Excellent, I had two years to complete, and I did it in one and a half!*

Conclusions from the interview study

It was a general impression from the learner interviews that the participants have been very satisfied with their experiences of the total learning room solution. They experience good support from the local rehabilitation enterprise, specifically from the supervisor responsible for the learning room. The majority expresses that other participants represent great support, especially if they study the same course, and also when they are at different phases in the course, ahead or behind. Many point out that the social support of other learners, also when studying different programmes, represents positive and motivating support. There is no doubt that the participants experience the structure, guidance, social support and motivation in the learning room as a major factor for success in their online studies. In general, the participants express satisfaction with the online learning solution, emphasizing excellent learning materials and tutor quality with quick turn-around times (regrettably with some exemptions), that they receive response on e-mail requests, and that feedback comments on assignments are thorough and understandable. The interviews indicate that some few of the online tutors are seen not to give sufficient support. The time flexibility of online learning combined with local support is seen as specifically important for their perceived success.

The interviews with the local supervisors demonstrated that they perceived it as a great challenge to follow up and support participants, many characterized by great needs for individual help because of physical and psychological difficulties and learning disadvantages related to reading and writing problems or unfavourable previous school experiences. The supervisors express great belief in the learning room as a sustainable solution for the rehabilitation users in the future. They perceive it as a great challenge to inform and convince local NAV case handlers that, when individual online distance learning is supplemented with local guidance and support in a

structured environment as in the learning room, it represents a very good study alternative for these users.

The local NAV consultants, who were interviewed, were selected on the basis that they had some experience in allocating users to the learning room solution. Their unanimous opinion was that individual online learning combined with follow-up, support and social interaction with other online students in the learning room functions much better than traditional individual online distance learning for the target group in question. At the same time they express that this solution is not suitable for all users, as some are considered to have too many personal difficulties to be able to succeed in individual online study, as it still requires a high degree of motivation, initiative and autonomous study activity, also when supported as in the learning room. They see the learning room solution as better than face-to-face and classroom education for many users, because the solution, in fact, supplies better individual support than face-to-face solutions, and not least because many come to the rehabilitation process with a history of unfavourable school experiences resulting in reluctance and anxiety towards any activity that reminds of previous failures. (Full transcripts of all interviews are presented in the original report (Rekkedal 2009).)

Statistics on study success in the learning Room

The interviews were carried out from august 2008 until February 2009. The answers both from participants and local supervisors indicated relatively high completion rates. Statistical data to examine study success of learning room students were collected October 2010.

Online students in the learning room study a wide variety of different programmes, secondary school courses, state accredited tertiary level vocational programmes and higher education programmes. The statistics below relate to NKI state accredited tertiary level vocational programmes, except "Office worker" that is a small NKI non-accredited online vocational programme (Norwegian legislation on accreditation does not include programmes smaller than equivalent to ½ year full time study.) The table and figure presenting statistics of 2008 recruitment to the 35 programmes studied by learning room students include all types and levels of programmes.

The following section presents statistical data on study progression of vocational rehabilitation students and ordinary individual students for the most frequent programmes studied by the rehabilitation students in the learning room. As both groups of students can follow their individual progressions schedule, at the time of

data collection, students may either having completed their programme, still being active studying, or having withdrawn. To get a sufficient number of cases, we chose to select students recruited to the four most popular vocational study programmes among rehabilitation students (Accounting, Salary and Personnel work, Caretaker and Office worker) during the four year period from 1 January 2006 until 31 December 2009. In addition, we compared study status between the rehabilitation students and ordinary students on all the study programmes that recruited rehabilitation students during the year 2008. (The last comparison may involve some sources of error as the relative number of rehabilitation students and ordinary students within each programme may differ. Still, there is reason to assume that the comparison is valid for demonstrating possible differences between the groups concerning study success.)

Table 4: Study status October 2010 of enrolees to the Accounting programme (Regnskapsskolen) during 2006-2009.

Study status	**Vocational rehabilitation group**		**Ordinary individual DE students**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**
Completed	51	63	211	31	262	34
Active	25	31	302	44	327	43
Cancelled	5	6	172	25	177	23
Sum	**81**	**100**	**685**	**100**	**766**	**100**

χ^2 =34.398, df = 2, p<.001

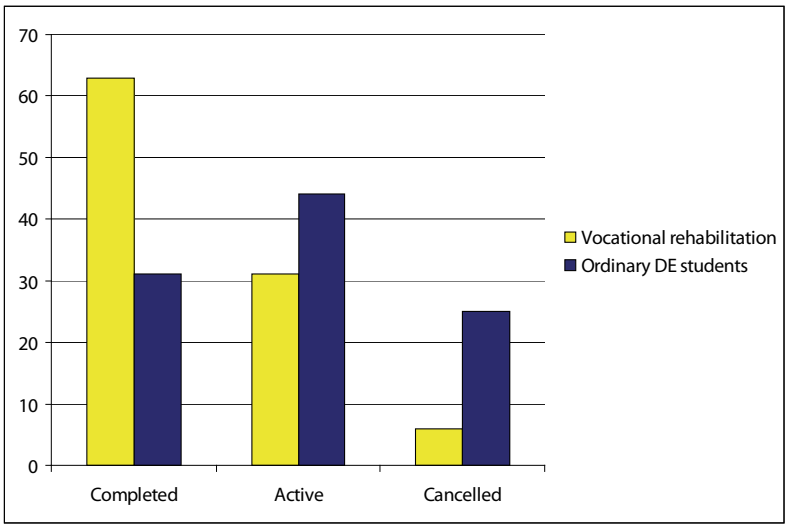

Figure 1. Graphical representation of completion/non completion rates among students at the Accounting programme 2006-2009.

Table 5: Study status October 2010 of enrolees to the Salary and Personnel programme (Lønns- og personalskolen) during 2006-2009.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	13	68	41	32	54	36
Active	4	22	58	45	62	42
Cancelled	2	11	30	24	32	22
Sum	**19**	**101**	**129**	**101**	**148**	**100**

$\chi^2 = 8.112$, df = 2, p<.025

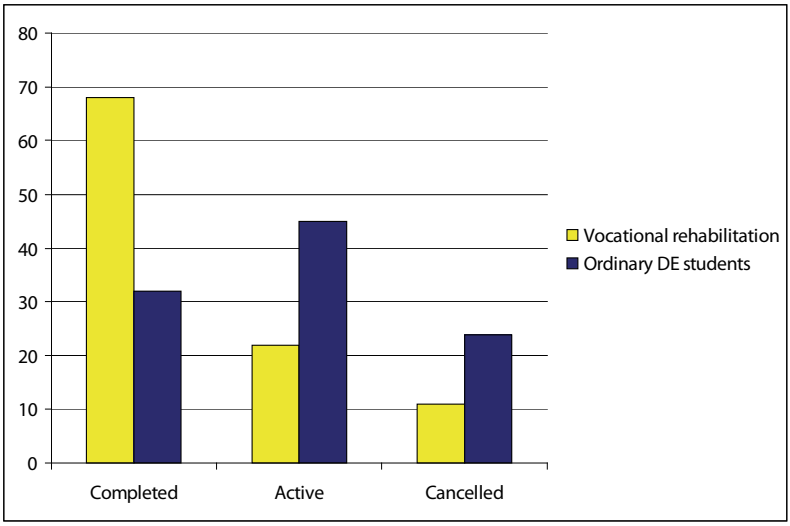

Figure 2. Graphical representation of completion/non completion rates among students at the Salary and Personnel programme 2006-2009.

Table 6: Study status October 2010 of enrolees to the Caretaker programme (Vaktmesterskolen) during 2006-2009.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	18	51	20	19	38	27
Active	17	49	66	63	83	60
Cancelled	0	0	18	17	18	13
Sum	**35**	**100**	**104**	**99**	**139**	**100**

$\chi^2 = 16.664$, df =2, p<.001

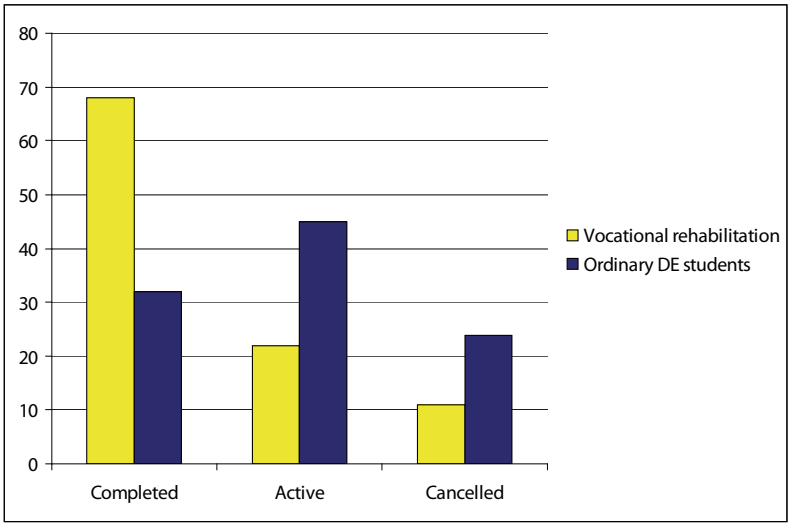

Figure 3. Graphical representation of completion/non completion rates among students at the Caretaker programme 2006-2009.

Table 7: Study status October 2010 of enrolees to the Office Worker programme (Kontormedarbeiderstudiet) during 2006-2009.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	52	74	97	34	149	42
Active	8	11	124	44	132	38
Cancelled	10	15	61	22	71	20
Sum	**70**	**100**	**282**	**100**	**352**	**100**

$\chi^2 = 38.417$, df = 2, p<.001

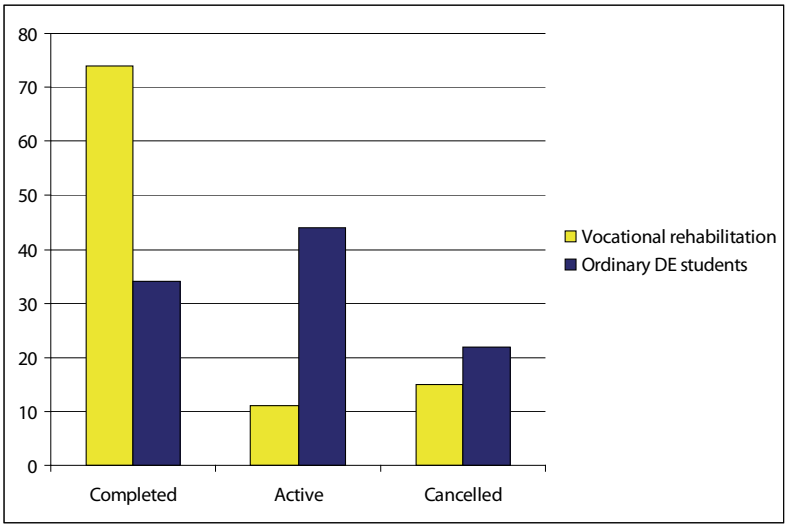

Figure 4. Graphical representation of completion/non completion rates among students at the Office worker programme 2006-2009.

Table 8: Study status October 2010 of enrolees to 35 selected study programmes 2008.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	101	57	486	30	587	33
Active	34	19	428	27	462	26
Cancelled	43	24	686	43	729	41
Sum	**178**	**100**	**1600**	**100**	**1778**	**100**

$\chi^2 = 51.118$, df = 2, p<.001

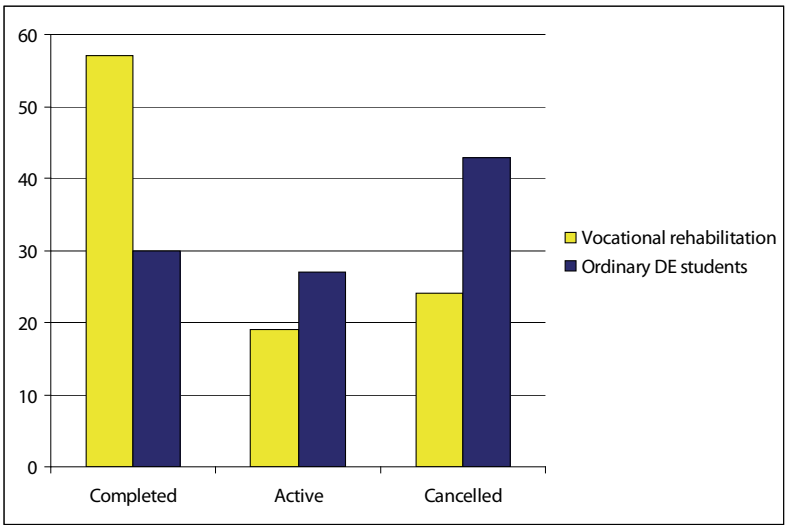

Figure 5. Graphical representation of completion/non completion rates among students enrolled 2008 in the learning room and ordinary DE students in 35 selected study programmes.

The statistical data show higher completion rates and lower cancellation/withdrawal rates among the vocational rehabilitation students than among the ordinary online distance students at NKI. For the recruitment period 2006-2009 the difference is statistically significant for all four programmes examined. The same tendency is demonstrated when we examine the study status for students in all the 35 programmes for the recruitment year 2008.

Conclusion: The learning room solution, where vocational rehabilitation students in addition to individual online distance study participate in an organized local support system including physical attendance in a structured social learning environment with other learners, including ICT infrastructure, and technical, social and practical support, results in significant higher completion rates than among ordinary online distance students. Looking at the number of students in the two groups, who still are active studying, the data also indicate, that the rehabilitation students proceed at a quicker pace through their studies than do the ordinary online distance students.

Some of NKI's most popular vocational study programmes can be studied in a blended learning solution where online learning is combined with local support and teaching in instructor led face-to-face classes. The local classes may be administered by a local study organisation or by a company organizing the local class for own employees. Statistics at NKI have clearly shown over time that blended learning, i.e. online learning with regular continuous attendance in face-to-face classes results in higher completion rates than pure individual online learning. The following tables and graphs show comparisons between the individual online rehabilitation students in the learning room with ordinary students participating in blended learning solutions. Except for the Accounting programme, which shows statistically significant better results among the ordinary blended learning students, the differences between the groups are small and not statistically significant. The statistics indicate that the rehabilitation students in the learning room achieve more like blended learning students than ordinary online distance students.

Table 9: Study status October 2010 of enrolees to the Accounting programme 2006-2009.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	51	63	76	78	127	71
Active	25	31	15	15	40	22
Cancelled	5	6	7	7	12	7
Sum	**81**	**199**	**98**	**100**	**179**	**100**

$\chi^2 = 6.267$, df = 2, $p<.05$

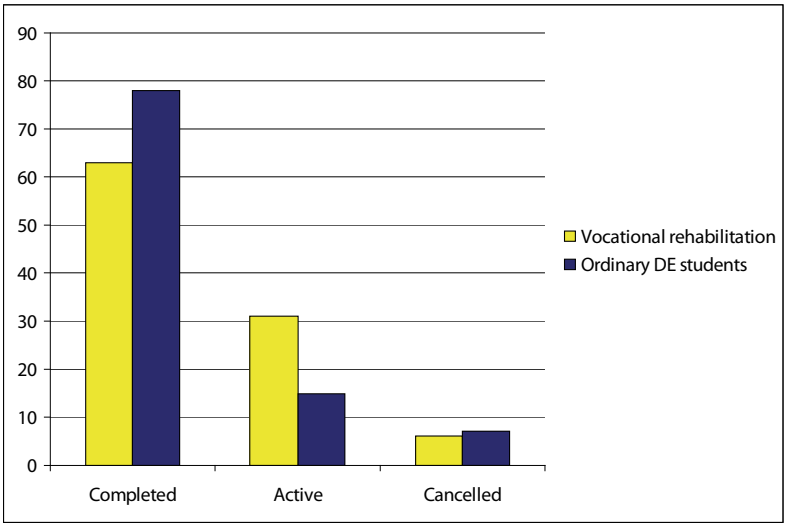

Figure 6. Graphical representation of completion/non completion rates among students in the learning room and blended learning students in the Accounting programme 2006-2009.

Table 10: Study status October 2010 of enrolees to the Salary and Personnel programme 2006-2009.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	13	68	9	60	22	65
Active	4	22	6	40	10	29
Cancelled	2	11	0	0	2	6
Sum	**19**	**101**	**15**	**100**	**34**	**100**

χ^2 = .261, df = 1 (Active/Cancelled combined because of small cell frequencies.) No significant difference.

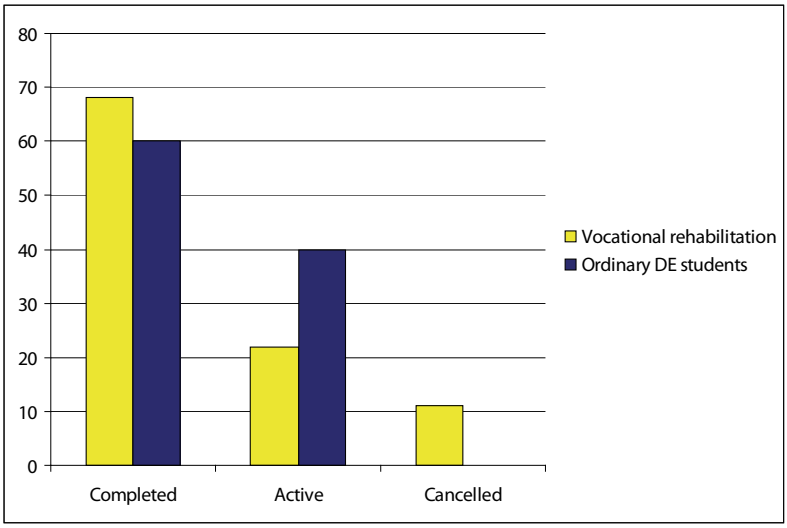

Figure 7. Graphical representation of completion/non completion rates among students in the learning room and blended learning students in the Salary and Personnel programme 2006-2009.

Table 11: Study status October 2010 of enrolees to the Caretaker programme 2006-2009.

Study status	Vocational rehabilitation group		Ordinary individual DE students		Total	
	N	%	N	%	N	%
Completed	18	51	98	58	116	57
Active	17	49	59	35	76	37
Cancelled	0	0	11	7	11	5
Sum	**35**	**100**	**168**	**100**	**203**	**99**

$\chi^2 = 3{,}031$, df = 2, p>.20

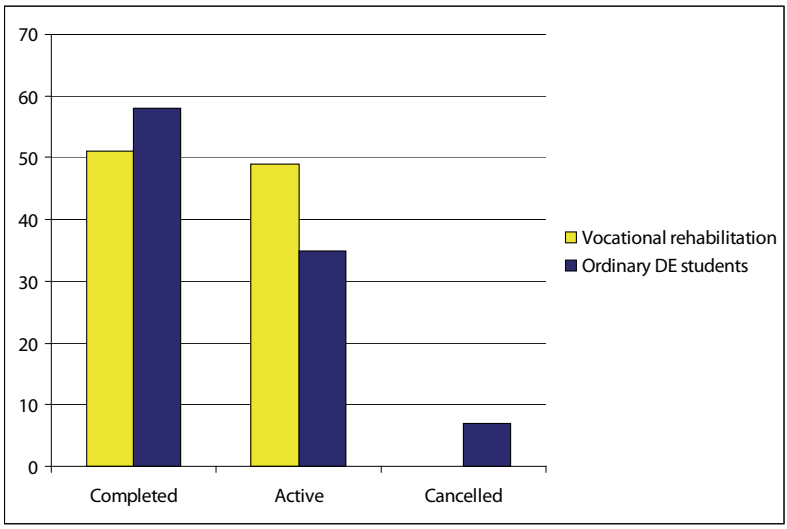

Figure 8. Graphical representation of completion/non completion rates among students in the learning room and blended learning students in the Caretaker programme 2006-2009.

Summary, conclusions and discussion

This study was initiated to evaluate to quality and success of online distance learning combined with support supplied by local vocational rehabilitation enterprises for students who take online courses for competence development in their endeavour to return to working life. The learning room solution was developed to support online vocational rehabilitation students.

As this group of students include many individuals with learning disadvantages, because of health problems and/or previous experiences of failure in the school system, it has been a great challenge to find adequate learning opportunities. Great differences

in individual needs restrict enrolment possibilities in ordinary face-to-face classes or in blended learning solutions. Thus, online individual learning with free enrolment time and individual progression schedules has been considered to be a good solution. However, case handlers within the social security system have been reluctant to accept and finance online learning for this group, because experience has shown that many of these students have had great difficulties in succeeding in learning situations that require personal involvement, autonomy, and ability to plan and give priority to study without external pressure, control and structure.

As the learning room solution had been in operation for some years, and the solution was adopted by more and more vocational rehabilitation enterprises, it has been time to assess the solution for possibly further development. NKI has also been involved in developing the solution further for another target group with at least some similarities concerning learning needs and learning disadvantages, inmates in prisons.

The study included interviews with students, case handlers/consultants/managers in local Welfare and Labour Administration (NAV) offices, and with local counsellors/supervisors in the vocational rehabilitation enterprises. The interviews with all groups demonstrated that in general all parties find that individual online distance education functions well for this group of learners on the condition that they also participate in a structured environment of social, technological and practical support.

The study shows that with the adequate local support these students, in spite of the fact that they as a group has many characteristics of learning disadvantages, perform better than ordinary individual online distance learners.

As the actual support supplied may vary, according to local conditions, number of students, types of study programmes and individual student needs, it is not completely clear which aspects of the learning room characteristics that are most effective for student success.

The study gives a good platform for developing the learning room solution further, to expand the solution to other target groups, such as prison inmates, and to disseminate information to the public and organisations responsible for vocational rehabilitation activities. This year (2011) the Norwegian Association for Distance and Flexible Education (NADE) has together with the Association of Rehabilitation Enterprises and NKI taken the initiative to a research and development project to explore the learning

room concept further by collecting, analysing and distributing information on how the learning room solution is practised in different contexts and how the solution can be further developed to satisfy competence development needs of vocational rehabilitation users in possibly even better ways.

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New Challenges Facing Universities in the Internet-Driven Global Environment

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Abstract

This paper explores some new challenges facing universities in a global multimediated Internet-based environment, as they seek alternative paradigms and options to remain true to their core business. At a time of rapid technological change, and contested, complex concepts associated with globalisation, knowledge is becoming a primary factor of production in a global economy. Universities face macro challenges of responding to the exponential demand for higher education, decreasing government funding, and the changing nature of knowledge, student expectations and global competition. While advances in the Internet can support constructivist, self-directed interactive learning, its implications for higher education remains complex and problematic. The paper examines potential challenges of new educational approaches within the framework of more traditional open learning and e-learning environments. The main challenge is to develop a university that shifts the paradigm from the conventional national university to a sustainable global learning system that maintains quality in teaching, learning, processing and applying knowledge to real-life problems in diverse cultural contexts.

Keywords: global curricula and local learning; teaching/learning/knowledge; the Internet; artificial intelligence (AI) systems.

Introduction

The core functions of universities are the storage, processing, dissemination and application of knowledge to address the great issues of our time. Correspondingly, challenges are to define the great issues of our time which are increasingly global, and

to manage universities so they can successfully respond to changing demands in rapidly changing technological environments.

Developments in the Internet, virtual reality (VR), artificial intelligence (AI), digitalisation, and mobile telephony are revolutionising how we communicate in all enterprises. Higher education is no exception. Concurrently with new technological developments, society's needs and paradigms of knowledge are changing, and government education budgets are shrinking just when the demand for lifelong education is expanding (Tiffin and Rajasingham, 1995). University education is seen as the key to escape from poverty, dependency and exclusion, and as the gateway to survival in an increasingly competitive, globalised economy. According to John Daniel, merely to maintain the present proportion of the world population that benefits from a university education a sizeable new university would now be needed every week (Daniel, 1996). That is unlikely to happen.

Technological innovation is changing the way in which universities teach and students learn, and the way information is processed into knowledge that is applied to real-life problems. Since the 1990s, a number of seminal texts on the future of universities has been published; texts which argue the need for new university paradigms in an era of rapid technological change (Grocock, 2002; Bates, 2004; Hanna, 2000; Tiffin and Rajasingham, 1995, 2003). A Google search shows 4,790,000 academic texts on the future of universities (16 November 2010).

In introducing the concept of virtual classes and virtual universities on the Internet, Tiffin and Rajasingham (1995, 2003) sketch a philosophical foundation for the future of the university and have contributed to the debate and critical commentary on the challenges that universities face in the fast-changing, unpredictable future. The twin themes in these texts are that the contemporary university of the nation state will in the future become global, and that it will become largely virtual. It is salutary to review the ideas presented in the books to see the extent to which reality has matched predictions and expectations expressed just a few years ago, and to evaluate the validity of the heuristics and the ways of thinking about the issues involved within more recent research that relate to challenges in e-learning and its implementation (Bernath, Szűcs, Tait, & Vidal, 2009). However, there is still a problem of rubrics as applied to virtual or e-learning universities as they face new challenges with evolving innovative information and communications technologies (ICTs), learning processes, supporting pedagogies, and applications in the digital environment.

The validity of ongoing research on the future of higher education now faces new challenges. The empirical approach in science is dominating literature. While this approach has some merit, it also has some deficiency, in that empirical research is restricted in envisioning futures scenarios, because it draws from the past and describes what is the present. Increasingly, research that examines the impact of the Internet on society, and particularly education, and globalisation call for futures methodologies and scenarios designing given the dynamic concepts associated with globalisation and education. E-Learning and virtual education have changed the definition of global education, where previously this concept meant students travelling to study in different countries, today, it means using the Internet for anywhere, anytime, for anyone in any mode education. Ideas expressed in the literature reviews since the 1990s effected change. Today, it is suggested that change is effecting ideas, yet to be tested and become mainstream. Therefore, seeking current empirical evidence of new learning approaches is problematic. According to Tony Bates (2007) it seems that a new journal on e-learning opens every week and this is not necessarily good news. It is not difficult to create even a refereed online journal – find a few colleagues from different institutions who think similarly and peer-review each other's articles. The result is often narrowly focused articles of a poor quality. He suggests that there are some excellent journals on e-learning in other languages, particularly Spanish. This paper seeks to contribute to the debates on these critical issues facing universities.

Information and communication technologies (ICTs) still have some way to go to achieve the robustness required for fully immersive virtual environments. But the technical limitations of today's Internet are being resolved by increased computer-processing power, growth of bandwidth, and the increasing availability of wireless technology. Telecommunications are becoming more and more ubiquitous, especially in developing countries like India and China which, together with many African countries, have leapfrogged a lack of landline telephony by a reliance on mobile phones. The use of mobile phones as tools for learning is an emerging area of research.

In this paper, such neologisms as e-learning, online learning, open learning and m-learning (mobile learning) are used interchangeably, while the discrete characteristics of each approach are acknowledged. New paradigms such as just-in-time learning, constructivism, student-centred learning, self-directed learning, interactive learning and collaborative approaches to learning have emerged, supported by technological advancements such as simulations, virtual reality multi-agent systems, and wireless platforms, creating both opportunities and challenges. This paper considers such

challenges to be an extension of, and within the framework of, the more traditional open learning and e-learning approaches.

Alan Tait (2008) proposes a useful framework within which to examine the purpose of open universities. He charts the histories of open universities that include The University of London External Study system, the first British Open University (Bell & Tight, 1993), The University of South Africa, Distance Education in the former USSR, Distance Education in Spain (UNED) and the Open University, UK (OU UK). Tait successfully examines the mandate of Open University systems premised on their being agile, flexible, competitive, cooperative, national and language specific, and serving their societies well (Tait, 2008). The OU UK and the Indira Gandhi National Open University (IGNOU) have been and are very successful, and are internationally recognised. It is suggested the reason for their success is that these open universities were first and foremost created for national needs, had the support of their governments and the campus-based national universities, and were recognised, accredited institutions within their own location country, providing education *pro bono* rather than for profit before they went offshore.

A significant success story is the world's first continuous, and sustainable, virtual university, the Universitat Oberta de Catalunya (Open University of Catalonia). Based on some of the ideas expressed in Tiffin and Rajasingham (1995) it celebrated 15 years of successful existence and growth in 2009. A 100 % Internet-based university, the Universitat Oberta de Catalunya (UOC) was created in response to Catalan society's desire for lifelong learning in Catalan to engender a community of practice. It was accredited from its inception in 1995, and is one of the eight public universities in Catalonia. It began with 200 enrolments, and today has more than 54,000 (6,000 international) enrolments (www.uoc.edu). Research into the UOC's critical factors contributes to an improved understanding of the complex local outcomes of the UOC's successful, robust and sustainable e-learning model, and especially, with implications for fostering national, regional and global learning communities. Such research also provides some useful insights into challenges facing universities in an Internet-driven global environment (Rajasingham, 2010).

In order to highlight the new challenges facing universities, it is useful to understand how universities transformed themselves from the place-based industrial age model to the current emerging knowledge age where their activities are conducted mostly online.

Higher education: past discourse

Universities have undergone a series of paradigm shifts from the classic Aristotelian model of the Greeks to the Ptolemaic Library at Alexandria and then from the medieval European university to the modern university we are familiar with. In responding to the needs of the society in which it operates, the modern university is place-based and uses transport technologies such as roads, seaways, railways and airways to bring teachers and learners together to effect education. Education is in the national language, operates under national law, and is assessed and accredited within national quality-control mechanisms.

The industrial age education system that most of us grew up in is only a little over 100 years old. People travelled in order to do business, shop, work, bank, learn, and entertain themselves. Teachers and learners came together by walking, or by using buses, cars, boats or sampans, and in the case of international education, by aircraft. Essentially, teacher-controlled information sources were contained within two covers of a book, and/or in the teacher's head, and education took place within the four walls of a classroom, and during six periods a day, a 2x4x6 model, to borrow a metaphor of the building trade. In this system, teachers set the problem to be addressed, based on national curricula. Education was government subsidised, and prepared people for their place in society by emulating factories and offices based on time-motion constructs.

Following the end of World War 2, increasing demand for educational opportunity from several groups of people, such as demobilised soldiers, women and the decolonised newly independent nations, led to one of the most significant breakthroughs in the delivery of higher learning in the last 50 years (Rajasingham, 1988). This was distance education.

Distance education has a long pedigree going back to the 18th century. In an attempt to define distance, Börje Holmberg (1983) describes distance education as a 'guided didactic conversation' and Michael Moore (1993) as one involving 'transactional distance'. These succinct metaphors, which emphasise the importance of communications in the education process, resonate with open learning, e-learning, online learning, virtual education and m-learning approaches where education is a kind of communication between teacher, learner and the problem to be solved and is enabled by ICTs. No precise definition for these new approaches can be given that is universally accepted (Mason and Rennie, 2006). However, as subsets of distance education, they share essential characteristics of education in which the learner is

separated by distance, time or space, convenience or personal choice from their study source, which is usually within an institution. The bridge between learner and teacher is provided by media, or combinations of technology. Falling into the rubric of 'technology-mediated learning', according to John Daniel (2007) e-learning provides a unifying theme in many current educational developments.
See www.col.org/speeches.

Higher education: current discourse

The main new challenges facing society since the 1990s relate to concepts associated with globalisation which continue to be contested. What is a global curriculum? Who will teach it, to whom and in what context? The Internet provides instant connectivity and defines how we bank, shop, communicate, think and learn. Universities face competition in, and the commercialisation of, education because information and communications infrastructures have been changed radically. As a consequence, the university's role and relevance are questioned by researchers, educationists and scholars (Coombs, 1968; Hanna, 2000; Readings, 1996; Tehranian, 1996; Tiffin and Rajasingham, 1995; 2003) who maintain that universities need to change if they are to survive in the twenty-first century. They are, it is claimed, too slow to incorporate new knowledge, and have Byzantine bureaucratic structures that belong to the industrial society, preparing people for past ideas, attitudes and values.

More recently, The National Science Foundation's Report on Cyber Learning (June 24, 2008) notes that few of the innovations tried over the 25 years since the US Department of Education report *A Nation at Risk* (1983) have resulted in large-scale systemic change in education. The National Science Foundation's Report argues that it is now time for a radical re-thinking of what constitutes successful learning, using the rich new environments enabled by the Internet (NSF Taskforce Report, 2008).

In their book *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns,* Christenson and colleagues argue that education's structure has made the market difficult to penetrate and lasting reform hard to come by (Lagace, 2008). They suggest that to improve education as an industry, there needs to be investment by that industry in technological platforms that will allow for robust educational user networks to emerge.

What is needed is effective, efficient learning that responds to rapid technological change, and new kinds of knowledge, delivered interactively at the convenience of the learner, in any mode, at any time, anywhere for anyone, in culturally appropriate ways.

As the university, which has been successful for nearly a thousand years, becomes disconnected from the needs of the society in which it operates, it is challenged to examine what is taught, to whom, how and with what *effect,* and how all this is to be done cost-effectively in the future.

The reality today is, however, that with the consumer model of education and user pays, education is moving from a teacher-centred to a lifelong learner-controlled model and learners, now as paying customers, challenge universities to effectively align their resources with learner expectations in order to stay in business (Rajasingham, 2010).

Students rely increasingly on the Internet to get the information they need. This is not a seamless transition as faculty grapple with students' cut-and-paste plagiarism and copyright infringements. In a New York Times article titled *Brain drained by Google?* Edward Tenner (2006) suggests that today's students are less teachable than students used to be and the convenience of search engines could be the reason. He cites a British survey that finds that students are generally poorly prepared and the ability of undergraduates to read critically and write cogently has fallen significantly since 1992.

Nicholas Carr (2008) argues that the Internet is fundamentally changing our brains and the way in which we think. Complex and powerful, the Internet computing system is subsuming most of our other intellectual technologies and it is becoming our map, our clock, our printing press, our typewriter, our calculator, our telephone, and our radio and television. Carr quotes Maryanne Wolf, who suggests that we are not only what we read, but also how we read; and that the reading promoted by the Internet, a style that puts "efficiency" and "immediacy" above all else, may be weakening our capacity for deep reading, with the result that we tend to become "mere decoders of information." The Internet may threaten our ability to interpret text, to make the rich mental connections that form when we read deeply and without distraction or when by any other act of contemplation we make our own associations, draw our own inferences and analogies and foster our own ideas. Deep reading is indistinguishable from deep thinking (Wolf, quoted in Carr, 2008). In his recent compelling text, Carr (2010) builds on the insights of Marshal McLuhan and warns that the media alters

patterns of perception for its fiscal survival steadily and without resistance, because our focus on the medium's content can blind us to these deep effects.

Another challenge for universities is to become businesses while maintaining their core functions of creating, processing and disseminating knowledge that can be applied to the issues of our time. These issues are increasingly global issues, such as environmental degradation, global warming, natural disasters such as volcanic eruptions, tsunamis, pandemics, terrorism and ideological clashes, and credit crunches. These global problems need global solutions.

Higher education: future discourse

The world is changing dramatically both in technological infrastructures and societies' socioeconomic demands. However, the rapid changes brought about by advances in, the Internet particularly in relation to globalisation, competition, and the commercialisation of education mean we now need a new kind of higher education system. The new university, while maintaining those core functions that do not change whatever the paradigm and episteme, must address the impact of rapid changes on the learning needs of a global knowledge society that is becoming increasingly mobile and multicultural. The challenge will be the design and development of global curricula for localised learning, and the re-thinking of what we teach, and how we teach it, in the new global networked environment within the Vygotskian framework of the Zone of Proximal Development. The Zone of Proximal Development outlines three critical factors of education: *teachers*, who help *learners* to solve *problems* (Vygotsky, 1978). By inference, these factors effect education through communicative interaction.

In his helical model of communication, Frank Dance (2001) argues that teaching is a form of communication and that there is no teaching without communication. He concludes that the better the communication, the greater the chance of teaching success (Duff, 2003). Tiffin and Rajasingham use a neo-Vygotskian framework and consider knowledge to be the fourth critical factor in education. They submit that education is a kind of communication as both education and communication are information intensive and depend on communications technology for the teacher to help the learner to *apply knowledge* to a problem (Tiffin and Rajasingham, 1995, 2003). In the modern industrial age university, the four factors – teacher, learner, knowledge and problem – come together to effect education, using building and transport systems based on fossil fuels, which are rising costs and damaging the environment. In the knowledge age, the four factors of education will communicate and interact using the

Internet that enables globalisation. However, the full power of the Internet is still emerging, changing the educational environment swiftly. New social networks, platforms allow speech recognition, wearable computers, wireless Internet, and social networks encourage the development of phenomena such as blogs, wikis, Facebook, Twitter, YouTube, Bebo, and new mobile technologies encourage the proliferation of devices such as PDAs, iPads, Blackberry, iPads, iPhones and smart phones. Examination of a plethora of new applications in relation to their potential as learning tools, connecting learners with teachers/sources of information and with one another from anywhere, at any time and in a variety of modes are beyond the scope of this paper.

Sean Park (2007) introduces a useful concept of complexity thinking in education, which draws upon themes of emergence, self-organisation and non-linearity that are relevant in learner-centred learning environments and new teaching approaches. The scientific research paradigm, which characterises accepted knowledge in conventional universities, is concerned with what can be proven through physical existence or extrapolated from statistical evidence. However, it is suggested that a quiet, grassroots citizen (student)-created content-controlled revolution on the web is challenging, in unprecedented ways, the traditional way knowledge has been viewed by established organisational systems and professional practice. Blogs, wikis and the unlimited potential of social networks are reshaping thinking about knowledge and its legitimacy.

Any innovation will, by definition, bring challenges as it struggles to become mainstream. It is time now to consider some characteristics of learning in the new multimediated global environment to identify challenges, to overcome barriers and to learn from examples of success in e-learning.

Twin strands of virtual reality and artificial intelligence

The conventional classroom provides a fully immersive, multimediated space for learning through our five senses. Today we look to technology to provide an alternative learning space where the communications functions of the conventional classroom can be replicated. As visual and verbal processors, we use pictures and images, which become increasingly available to e-learning and which are becoming far superior to the pictures available in the early days of educational television.

The technology that does this will also make it possible for e-learning to be conducted in a HyperReality that allows teachers and students to come together as telepresences no matter where they actually live. HyperReality is an advanced technology conceptualised by Nobuyoshi Terashima that seeks to make the interaction between the physically real world and virtual worlds, and between human intelligence and artificial intelligence (AI), seamless (Terashima, 2001; Tiffin and Rajasingham, 2001). It is suggested that ten years have passed since the vision of HyperReality providing an e-learning platform, and its metaphor today is the Internet.

Distributed virtual realities that make such interaction possible have been available on the Internet for over a decade. ActiveWorlds and SecondLife educational universes are now home to hundreds of experiments in education in virtual reality. Similarly, in December 2007, the Croquet Consortium released its Open-Source Software Toolkit to promote collaborative 3-D virtual environments to support learning and commerce. Croquet SDK 1.0 promotes collaboration amongst non-collocated research teams, educators and industry. These networked 3-D teams are able to work together across a variety of computer platforms and devices, from laptops to cell phones. According to a principal researcher in the Croquet project, Julian Lombardi, the free kit provides developers with a flexible tool to create virtual spaces with built-in networked telephony and a "late-binding object-oriented" programming language that allows multiple users to jointly create, animate or modify 3-D objects and dynamic simulations, in realtime.
See: http://www.opencroquet.org/index.php/Current_Projects (retrieved 24 April 2011).

Theoretically and technologically, whatever can be done when teachers and students come together in a conventional bricks and mortar classroom can be done in a virtual class. However, where conventional classrooms are available only to teachers and students who live in the area around the classrooms that is made available by local transport systems, e-learning and virtual classes are available to anyone, anywhere, any time, and make the globalisation of education possible.

Given that there are challenges for new educational approaches as they move from experimental and pilot stages to mainstream practices, this article now examines some of these challenges specific to stakeholders of universities in the future.

Challenge 1: Knowledge in universities and the need for global curricula

Knowledge is a universal of the university paradigm. As the university changes with the new episteme, so too does the knowledge it teaches and researches. A key question to be addressed is what shape knowledge will take to address the issues and problems of the future.

In theosophical, mediaeval universities there was only one knowledge paradigm but in the modern university knowledge takes paradigmatic forms in each of the different subject disciplines that are taught. University degrees certify that holders are proficient in the application of a knowledge paradigm. What counts as knowledge, in what contexts, who is empowered to teach it, what counts as learning achievements, and how these matters are measured are subjects of continuing debate. The issues of who is allowed to question, critique, assess and accredit will be among the critical issues in the future.

The main changes taking place in knowledge come from the Internet, which is making professional knowledge available outside universities and taking over many of the functions of university libraries. Two technologies that enable this are multilingual knowledge systems and three-dimensional time-variable modelling of phenomena are available on the Internet, for example, in the gaming world.

Today, not only has knowledge been broken into a multiplicity of subjects, but the way subjects themselves are seen varies from university to university, from country to country and from language to language. Where the mediaeval universities of Europe had a common language in Latin, and modern universities use the written language of the nation that supports them, the future requires a new online cyber literacy.

Today's postmodern mood sees virtue in multiple knowledge on the same theme, and constructivism suggests that knowledge is individual to each of us. The growing fragmentation and lack of consensus as to what constitutes knowledge creates a context for chaos, and for ideological and cultural clashes. If a language means all things to all people it is just 'noise' – the element that prevents the message getting from the sender to its destination in a coherent way. If knowledge is whatever an individual thinks it is, then there is no paradigm and no way people can communicate and cooperate in its application. If paradigms of knowledge vary according to country or culture, then global issues can be addressed only from the perspective of each country or culture. It is suggested that we are witnessing a clash of knowledge

paradigms that may account for the global and regional upheavals we are witnessing today.

Challenge 2: Globalised curricula for localised learning

In his 1902 collection of essays, *The Idea of a University*, John Newman said: 'A university, I should lay down, by its very name professes to teach universal knowledge' (Newman, 1996, p. 25*)*. Curricula for the global environment need to incorporate as an integrated whole what is universal in university curricula, whatever the episteme. Technological ideals pitched against pedagogical imperatives, and the managerialism of the conventional modern university, result in re-evaluation of internet-based curricula that focus on design issues rather than on pedagogical rationale and application, and is technology pushed rather than demand pulled (Nemet, 2009).

Curricula that deal with global issues and are designed according to rigorous instructional criteria are critical: but learning always takes place in consonance with local contexts, paradigms and epistemes, and learning styles. There is no one size fits all in this game as learners apply knowledge to problems in culturally appropriate ways. Global education is where we find such subjects as mathematics, science and medicine, and national education where we find subjects such as history, literature and law as learners apply global knowledge and concepts in their own local contexts. When more knowledge is gained through culturally diverse interaction, more world views are being asserted, giving rise to increasing cultural, political and ideological conflict as value, power and cultural claims are asserted. These concepts have been further explored by the Development Education Association (2006).

Teaching/learning in the global virtual university

Antonio Gramsci profoundly noted that, 'Every teacher is always a pupil and every pupil a teacher' (Gramsci, 1971, p. 350). It can be said that teachers teach the way they were taught, and the way teachers think does not change readily. The paradigm of teaching tends to be teacher-controlled rather than learner-centred. Teachers are a universal of the university paradigm and as universities change to adapt to the new episteme, so too must teachers. Teacher development for the new technology-mediated environment becomes a high priority for universities, as is the need for learners to learn in multiple and mobile environments in culturally appropriate ways.

Is there anything in the way academics teach that can be said to transcend nation, culture and time and therefore needs to be incorporated in a university of the future? The neo-Vygotskian communication model defines the role of a teacher as helping students to apply knowledge to problems. What differentiates the university teacher is that they also help the student critique the relationship between knowledge and problem because they are involved in research. Along with these capabilities go the communications skills of knowing when, for how long, in what tenor, in what sequence, with which students, and in what setting to explain, demonstrate, question and give feedback. The job also calls for sensitive management of the many contingencies that occur in the teacher-student communication axis. The challenge is that this process is now conducted on the Internet.

Changing teacher roles

In foreshadowing a new model of teaching and learning, in 1982 Christopher Dede predicted challenges in teaching and learning that remarkably reflect today's environment. He observed:

> *"...perhaps fifteen or twenty years from now, with centralised production and decentralised distribution systems, with privatisation of education, with new teaching and diagnostic and evaluation and administration strategies, we will have such new teacher roles, such new teacher skills, such new pay scales, and such new distributions of where teachers work, that the model we see for education will be fundamentally different from what we have seen in the last hundred years. It will be a completely new Profession" (Dede, 1982).*

Because there are so many different aspects to teaching, good teaching is hard to define and no single system of evaluation can ever measure it accurately. There is no 'right' way to be a good teacher. A good teacher to one student may be a nightmare to another.

Studies of teachers and teaching are usually based on the supposition that teaching is the independent variable and learning the dependent variable and that teaching is responsible for learning, while the measurement of learning outcomes remains complex. Yet the teacher-learner communication axis is one of interaction that can function only with what, in cybernetics, is known as circular causality, or feedback. In traditional Western pedagogy, university teachers were regarded more as content

providers than teachers and learning was thought of as a function of student intelligence and application rather than the outcome of teaching.

Scientific management, the brainchild of Frederick Taylor in the nineteenth century, held that the manufacture of a product could be divided into a sequence of tasks that would allow people to do the tasks they were best at, as distinct from trying to complete the whole product (Kanigel 2000).

According to Carr (2008), Taylor's ethic is beginning to govern the realm of the mind as well. The Internet is a machine designed for the efficient and automated collection, transmission, and manipulation of information, and its legions of programmers are intent on finding the "one best method"– the perfect algorithm – to carry out every mental movement of what we've come to describe as "knowledge work".

What Taylor did for the work of the hand, Google is doing for the work of the mind: 'to organize the world's information and make it universally accessible and useful'. It seeks to develop "the perfect search engine", which it defines as something that "understands exactly what you mean and gives you back exactly what you want". In Google's view, information is a kind of commodity, a utilitarian resource that can be mined and processed with industrial efficiency. The more pieces of information we can "access" and the faster we can extract their gist, the more productive we become as thinkers (Carr 2008). This assertion is today being debated.

We can see something like this happening in universities. Carried to its logical conclusion teaching itself could be subdivided into its component processes so that different people could be assigned to do different parts. In Taylorist terms, people who are good at lecturing would lecture, people who are good tutors would tutor, people who enjoyed assessment and marking would do so, and so on.

However, it is as naive to think that universities in the next decades will still be totally taught by humans as it is to think of them as being totally taught by computers.

Figure 1 suggests a possible pedestal for a future teaching hierarchy that will be computerised, where the bottom level of teaching activities, consisting of often repetitive tasks such as marking exams, tests and assignments that have predetermined answers, collating marks, providing data on student activities and so on, can be done by computers to relieve teachers of these burdens.

The second level is tutoring. In his description of the international role of UK higher education in 1858, Tait (2008) acknowledges the importance of this tutorial level, which took place in 'colonial centres' around the UK and, in the 1930s, around the world. This is where teachers interact with students to guide their learning. It involves listening to students, comprehending the difficulties they have in mastering a subject and its application, eliciting performance, being able to explain and demonstrate, monitoring student practice, marking assignments, tests and exams in which answers are open ended, providing detailed feedback and answering questions. It requires considerable one-on-one or small group communication and is the reason that low teacher-to-student ratios make for good instruction in a university. This level is labour intensive and, as they become commercial, universities will look for ways to reduce costs by automating tutoring. Increasingly this will involve just-in-time artificially intelligent tutors (JITAITs). These are expert systems that, with human input such as frequently asked questions (FAQs), become more intuitive and useful (Tiffin and Rajasingham, 2003).

The third level of the hierarchy is that of the master professors. Here we would find teachers in the old-fashioned sense of content providers. They would be people who had achieved academic stature through research and publication and, therefore, really did have content to provide. They would have responsibility for the knowledge paradigm. Their primary purpose would be to communicate a synthesis of the subject matter in a way that brought it up to date, placed it in context and encouraged students to question it. Professors would do this by lecturing and giving seminars. Using technological platforms like HyperReality, Croquet, streaming video and other multimedia applications coming online, a global virtual university would be a means whereby no matter where professors lived they could be available to students worldwide and focus on the media events of their virtual lectures, leaving all the interaction to a network of tutors in different countries. These lectures might well be open to the public, attracting new students and giving them a feel for the level and nature of study. Because of its size, the cost of such a course could be lower than is typically the case in conventional universities. The more students the professor had the higher might be their remuneration, similar to the way authors relate to their publishers through royalty payments.

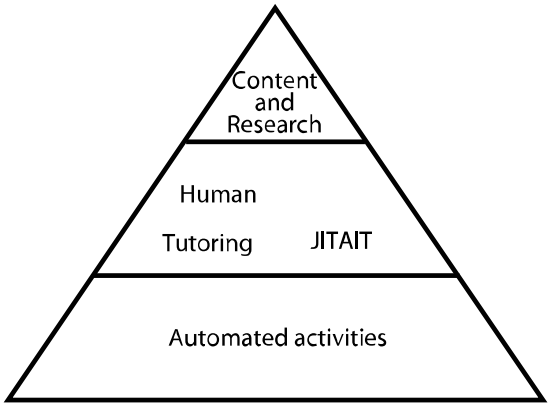

Figure 1. Future hierarchy of academic functions in Higher Education (Tiffin & Rajasingham, 2003)

Changing student expectations

The extraordinary growth in demand for lifelong tertiary education provides the driving force behind the emergence of a global trade in university education. An important response is The General Agreement on Trade in Services (GATS), a treaty of the World Trade Organization (WTO) that came into force in January 1995. The world continues to face an explosion of higher education. It would not be unreasonable to suppose that at some time in the next decade over 200 million tertiary students will be enrolled worldwide. Yet growth in tertiary enrolments in the populations of China, India, Brazil, Indonesia, the Philippines, Pakistan and Bangladesh will have hardly begun.
See http://www.nationmaster.com/graph/edu_ter_enr-education-tertiary-enrollment (retrieved 25 April 2011).

However, the increased demand seen as a problem for the old generation of national universities becomes an opportunity for a new generation of commercial global virtual universities, which views the expanding demand for university education as a business opportunity in a sellers' market.

Mobile technologies that increase access to quality education for increasingly mobile learners seeking just-in-time, and just-for-me education solutions, challenge universities to align their capacities to respond to the new expectations of learners.

Challenge 3: Interoperability of intelligent learning content in learning management systems

Currently, considerable effort is being put into standardising e-learning initiatives to ensure the development of quality content (learning objects) that can be adapted, reused and contextualised many times in different cultural environments. Each learning object needs to be stored in a secure repository and tagged with metadata that can be easily accessed by teachers and learners for interoperability solutions. However, current Learning Management Systems (LMSs), for example, WebCT, Blackboard and SCORM, are yet to provide appropriate personalised support for using rich (for example, simulations), intelligent content and learning activity. Challenges to LMSs arise because typically learning activity is spread over time, while the learner changes the simulation parameters, for example, to problem solve in real time, synchronously. What is needed is a run-time environment that allows LMS to launch, track and communicate with learning objects. Marta Rey-Lopez and colleagues (2008) address the restrictions on run-time by comparing several standardised run-time environments with non-standard solutions that aim to overcome these constraints. See http://www.editlib.org/p/26219 (retrieved 25 April 2011).

In his paper, Mathias Hatakka (2009) examines the inhibiting factors for reuse of open content in developing countries where open, free-to-use content has the potential to offer individuals the right to education. Despite the benefits of open content, usage is very low in developing countries such as Bangladesh and Sri Lanka. Findings show that many of the factors inhibiting reuse of open content do not necessarily relate to the actual content, but to bureaucratic educational rules and regulations, lack of infrastructure, teaching practices and traditions that are major obstacles yet to be addressed. See www.ejisdc.org/ojs2/index.php/ejisdc/article/view/545/279 (retrieved 25 April 2011).

Challenge 4: Bridging past and future education: overcoming barriers to e-learning

Blackmore et al. (2008) identify several barriers to employees' e-learning and cite Mungania's (2003) seven multidimensional barriers: (1) personal or dispositional, (2) learning style (3) instructional, (4) situational, (5) organizational, (6) content suitability, and (7) technological barriers. Situational barriers are the most prevalent while personal barriers were the least common (Mungania, 2003).

To explore this challenge, the Sloan-C's Five Pillars of Quality Online Education (1997) framework is useful for defining how to overcome the barriers to successful e-learning (Rajasingham, 2010). The Pillars are: *Learning Effectiveness, Scale, Access, Faculty Satisfaction, and Student Satisfaction.* The Pillars are inter-related, and conventional universities have a long and successful history of established procedures and structures for the interaction between the Pillars. However rapid advances in the Internet, multimedia and m-learning will have their affect on the interrelation between Sloan-C's Pillars, changing how teaching, learning, knowledge creation and dissemination, the universals of universities, will be conducted in the future as education moves from being teacher-controlled to being learner-centred and concentrates on achieving quality learning outcomes. See http://www.sloan-c.org/publications/books/pillarreport1.pdf (retrieved 25 April 2011).

Conclusion and outlook

This paper explores some new challenges facing universities in a global multimediated Internet-based environment as they seek alternative paradigms and options to remain true to their core business. At a time of rapid technological change, and contested, complex concepts associated with globalisation, knowledge is becoming a primary factor of production in a global economy. The findings are not prescriptive, but rather highlight some inhibiting and some success factors facing universities at a time of rapid technological change. As knowledge is becoming a primary factor of production and competitive advantage in a global economy, universities face macro challenges in responding to the exponential growth in demand for higher education, and to the changing concepts of globalisation, commercialisation and competition. While Internet advances can theoretically support constructivist, learner-centred and interactive learning, challenges of Internet-enabled learning such as e-learning considered within the changing nature of knowledge, changing needs of society, changing teacher roles, and learner expectations need further investigation. These challenges go beyond innovative ICT implementations to the design and development of a holistic university system, that responds national and global needs, and to the community of demand, as for example, in the case of UOC. Answering the challenge entails a paradigm shift from the modern national university to a sustainable global higher learning system that provides rigorous quality in teaching and learning, and processing and application of knowledge to real-life problems in diverse cultural contexts. How we assess learning effectiveness, and whether we assess according to

global and/or local standards will become increasingly important, and contestable as universities seek to respond to the global issues of our time.

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Activity-Based Costing Models for Alternative Modes of Delivering On-Line Courses.

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Abstract

In recent years there has been growth in online distance learning courses. This has been prompted by; new technology such as the Internet, mobile learning, video and audio conferencing: the explosion in student numbers in Higher Education, and the need for outreach to a world wide market. Web-based distance learning is seen as a solution to problems of outreach and course delivery.

This paper considers module costing models to compare the costs of delivery of:

- A traditionally delivered face-to-face module,
- A web-based distance learning module delivered by in-house academic staff
- A web-based distance learning module delivered by external contracted staff.

The model uses Activity Based Costing (ABC) utilising data from HEFCE and other sources; and with assumptions made from practice at Leeds Metropolitan University from over ten years experience of delivering web-based distance learning courses.

Using the models; different scenarios can be run. The paper concludes that there are savings to be achieved by utilising Web-based distance learning. This saving could, in turn, be passed on to students. Furthermore, the student experience, in terms of contact does not have to suffer and may in fact be enhanced by utilising Web-based distance learning.

Keywords: Financial Cost, Activity Based Costing, Delivery, Finance, Cost Modelling.

Introduction

Dame Lynne Brindley, Chair of the UK's Online Learning Task Force, in an interview in the Times Higher Education (Attwood, 2010) recently stated that "the best examples of on-line learning were not cheap alternatives". The same issue also carried a report that budget cuts are driving The University of California, Berkeley to offer fully online undergraduate degree programmes. However, whilst web-based distance learning has been in operation for several years and there is a wealth of research into pedagogic models for developing and delivering web-based distance learning material; research in to the actual costs of such development and delivery has been limited.

Rumble was a pioneer, considering the economics behind distance learning since the early 1990s. Cohen and Nachmias (2006) looked at the broad picture of providing a cost benefit analysis for implementing Web supported academic instruction. Vilaseca and Castillo (2008) also look at the economic efficiency of e-learning. Ling-yun et al (2007) Considered Return on Investment in E-Learning. Garbett (2004) developed a 5 year DCF chart showing the costs in developing and delivering a distance learning course.

The National Board of Employment, Education and Training (1994) "Costs and Quality in Resource-Based Learning On and Off Campus" produced by the Australian Government carried a detailed analysis of costs of distance learning from a range of Universities. However, at that time, the report was mainly concerned with print media and the use of Virtual Learning Environments was in its infancy.

There has been little research into the actual costs of delivering a module by web-based distance learning, using an Activity-Based Costing methodology and actual data from TRAC and from practice.

This paper seeks to fill this gap. The following pages present a series of cost models for distance learning.

The models compare the costs of delivering a typical Level 7 (Masters Level) module by three alternative delivery methods:

- A traditionally delivered face-to-face module,
- A web-based distance learning module delivered by in-house academic staff
- A web-based distance learning module delivered by external contracted staff.

Masters Level modules are used in the model as:

1. This reflects current expertise at Leeds Metropolitan University. The Leeds Metropolitan University MSc in Facilities Management has been delivered via the web since the late 1990's and is believed to be the first fully web-based Masters Level course world-wide.
2. Masters Level students are likely to be more independent than students at lower levels and, therefore, more suitable for distance learning.

Although the examples used in the following models are at Masters Level, the model itself could be utilised for other levels.

An MP4 video of the main features of the model is available by following the link: http://www.eurodl.org/materials/contrib/2011/Chris_Garbett_files/Costing Model Commentary Aug 2010. camrec.html

Costs

Total Cost is the sum of Fixed Costs plus Variable Costs plus Semi Variable Costs. (TC = FC + VC*N)

In the following cost calculations:

Fixed Costs include, for example, costs associated with Exam Boards. The Exam Board incurs expenditure irrespective of how many students are involved. Similarly, for traditional Face to Face delivery, there will be a fixed cost for delivering a lecture, irrespective of the number of students in the lecture. In practice, a large number of students would require a large lecture hall which would incur more costs than a small lecture delivered in a classroom, however, for the purposes of these models, the marginal difference in room costs is minimal and can be ignored.

Variable Costs include items such as assessment, individual tuition time. Clearly, the total time spent on assessing students' work varies with the number of students.

Semi Variable Costs arise, for example, with accommodating and staffing tutorials. As the number of students increases, there is an incremental point at which an additional tutorial session is required. In the accompanying spreadsheets maximum tutorial sizes can be adjusted. If student numbers exceed the maximum for a tutorial group, additional tutorial sessions are entered into the cost equation.

Assumptions

For each model the same assumptions are made. These assumptions are grounded in practice and based on a Masters (Level 7) module as delivered on the Leeds Metropolitan University MSc Facilities Management, MSc Building Surveying and MSc Quantity Surveying Commercial Management courses.

1. Modules comprise standard band B, 20 credit points, nominal 200 hour, modules.
2. The material already exists in an appropriate web-based distance learning format, therefore the costs of developing that material have been amortised and there is no further cost involved in developing new material. The cost of updating and maintaining the material is built into the models.
3. The module is delivered during a standard 15 week semester; 13 teaching weeks.
4. Academic time is costed at £429 per day or £57 per hour. This cost is based on an academic member of staff mid range on scale eight (Senior Lecturer) as used in Transparent Approach to Costing (TRAC) guidelines.
5. Administrative time is costed at £370 per day or £49 per hour. This cost is based on a scale six administrative person and, again, comes from the Transparent Approach to Costing (TRAC) guidelines.
6. Module material is updated after every delivery. This maintenance requires 10 hours of academic time
7. Each item of assessment, at Masters Level, takes one hour of academic time to mark, provide feedback and returned to the student. This may be generous, but is based on a compromise between: the results of a survey undertaken by the University and College Union, Open University Branch, which found that the average assessment takes one hour 48 minutes to mark; and the allowance made by the Open University of 45 minutes to mark an assessment.
8. An allowance for academic time for contact with individual students, outside of formal teaching sessions or assessment, is built into the model.
9. A proportion of academic and administrative time taken up with the Exam Board is included in the model.
10. Admin support in terms of admissions or other queries is built into the model.

11. There is no percentage deduction from gross income made to cover any contribution to central overheads. A relevant proportion of the overall University overhead from TRAC of £3,695 per Full Time Equivalent (FTE) student, per course is incorporated in the model.

Income

In England, income comprises; Higher Education Funding Council for England (HEFCE) income per student per module; plus fee income per student, per module. For the models a total income of £905 per student per module has been used. This can be readily varied in the model.

Model one: Traditional face to face delivery

This model looks at a module delivered by traditional face-to-face delivery.

Face to face delivery - cost assumptions

1. For parity with the distance learning modules, it is assumed that these are part-time students.
2. Admin support, per student, for the module comprises two hours for one administrator costed at £49 per hour.
3. Delivery comprises 12 one-hour lectures +1 one-hour tutorial per tutorial group per week; costed at £57 per hour. The lecturer delivers 1 lecture and 2 tutorials per week over a 12 week teaching period. The number of tutorial sessions varies according to: the maximum number of students per tutorial group and the total number of students taking the module. For example, if a total of 30 students are the taking the module, a tutorial group maximum size of 10 requires 3 tutorial sessions per week.
4. There are two items of assessment, each of which takes one hour for marking and feedback costed at £57 per hour.
5. There is further student-tutor contact on an individual basis via; visits to the office, e-mails, phone calls, etc, comprising a total of two hours per student during the semester, costed at £57 per hour.
6. There are printed handouts distributed to students.
7. As there are eight modules to the course the University overhead (item 11 above) of £3,695 per FTE per course equates to £462 per FTE per module. For part-time students, the FTE is reduced by 50 %.

8. Contribution to the cost of the Exam Board is 4 full days for admin staff per course (half a day per module) plus one full day for academic staff (.125 days per course).

Using the above assumptions a baseline cost of £2,743 for one student is calculated. Breakeven point is achieved at 6 students.

Model two: In-house delivered, web based distance learning

This model considers the same module delivered by web-based distance learning tutored by in-house academic staff.

As the students are at a distance it is likely that there will be increased requirement for admin support. Therefore costs for admin support have been increased to 3 hours per student for one administrative person costed at £49 per hour.

Maintenance costs remain the same at 10 hours to update materials at £57 per hour.

There are no costs for lectures or face to face tutorials. An allowance for four online tutorials, using Elluminate or similar, each comprising one half-hour tutorial has been built in. This is based on existing practice on the MSc Facilities Management and MSc Building Surveying at Leeds Metropolitan University.

Assessment remains at 2 points of assessment.

Contact with individual students by e-mail or phone calls etc is increased to two hours per student.

Although there are no hard copy handouts an allowance has been made for assignments which may be submitted online and staff may elect to print hard copies of their assignments.

The allowance for university overheads, based on £3,695 per FTE per course has been reduced by 50 % to remove accommodation costs (tutorial rooms and classrooms) from the equation. As before, the allowance per course has been divided by 8 and by 2 to arrive at a cost per module per part-time student.

This results in an overall cost of £1,422 per student. Break even point is achieved with three students.

DISTANCE LEARNING COURSES
FINANCIAL APPRAISAL

Chris Garb

MODULE COSTING MODEL

COSTING MODEL	**Module Title**	**Traditional F2F Delivery**	**Course(s)**	**MSc (Level 7) Module**			
INCOME			**COSTS**				
HEFCE Income	£280	p student p module	**Admin**	£370	p day	£49	p.hr
Fee Income	£625	p student p module	**Academic**	£429	p day	£57	p hr
					per FTE		Per P-T student
			Contribution to Central overheads	£3,695	per COURSE	£231	per MODULE
			Printing	£0.03	p page		
			Tutorial size max	12	Students		

MODULE COSTING				Student	Module	Totals
INCOME						
HEFCE Income						
say	£280	p student				
FEE Income						
say	£625	p student				
Gross Income						
Assume	1	students				
Total **GROSS** income				£905	£905	£905
OUTGOINGS						
Contribution to Central overheads						
say	£231			£231	£231	£231
Admin Support						
Admissions, queries, support						
1	hrs	1	admin, p student			
£49	p.hr					
Assume		1 students		£49	£49	£49
Module Costs						
a)	**Development Costs**					
0					0	
b)	**Maintenance Costs**					
Assume have to maintain modules, update materials						
Say		10	hrs updating materials			
10	hrs @	£57	p.hr		£570	
c)	**Delivery Costs**					
ci)	***Fixed Costs***					
13	***1 hr lectures***	13				
Tutorials						
13	***1 hr Tutorials***	13				
Other Delivery						
		0				
Total		26	hrs @			
		£57	p hr		£1,482	
cii)	***Variable Costs***					
Assessment						
2	assessments					
Marking and feedback, say		2.00	hrs p student @			
		£57	p hr			
		1	students	£114	£114	
Individual Tuition						
Contact with individual students		1	hrs @			
Emails, phone calls etc. Say		£57	p.hr	£57	£57	
		1	students			
Printing & Repro		40	pages p student			
		£0.03	p page			
		1	students	£1.20	£1.20	
Other		0				
Overheads p student		£0				
		1	students	£0	£0	
TOTAL COST P MODULE					£2,224	£2,224
d)	**ADMINISTRATION**					
Exam Board						
0.125	day	1	academic			
£429.00	p day p academic		£53.63			
0.5	day	1	admin			
£370.00	p.day p admin		£185.00			
Exam Board Total					£239	£239
TOTAL COSTS				£452	£2,743	£2,743

PROFIT/LOSS

Gross Income p student	
£905.00	
1 student per MODULE	
Total Gross Income per MODULE	
	£905
Total Cost per MODULE	**£2,743**
Net Income p module	**-£1,838**
Profit/loss	-£1,838

Per Module

Figure 1. Face to Face Delivery

COSTING MODEL	Module Title	In-House DL Delivery		Course(s)	MSc (Level 7) Module			
INCOME				COSTS				
HEFCE Income	£280	p student p module		Admin	£370	p day	£49	
Fee Income	£625	p student p module		Academic	£429	p day	£57	
				Contribution to		per FTE		accomm
				Central overheads	£3,695	per COURSE	£115	50.00% costs
				Printing	£0.03	p page		
		-£460						

MODULE COSTING				Student	Module	Totals	
INCOME							
HEFCE Income							
say	£280	p student					
FEE Income							
say	£625	p student					
Gross Income							
Assume	1	students					
Total GROSS Income				£905	£905	£905	
OUTGOINGS							
Contribution to Central overheads							
say	£115			£115	£115	£115	
Admin Support							
Admissions, queries, support							
2	hrs	1	admin, p student				
£49	p.hr						
Assume		1	students	£98	£98	£98	
Module Costs							
a)	Development Costs						
0					0		All modules are fully developed
b)	Maintenance Costs						
Assume have to maintain modules, update materials							
Say		10	hrs updating				Time spent updating materials, preparatio
10 hrs @		£57	p.hr		£570		
c)	Delivery Costs						
ci)	*Fixed Costs*						
Lectures							
0	*1 hr lectures*	0					
Tutorials							
0	*1 hr Tutorials*	0					
Other Delivery							
4	*1/2 hour OLT*	4					on-line tutorials, Elluminate or similar
Total		2	hrs @				
		£57	p hr		£114.00		
cii)	*Variable Costs*						
Assessment							
2	assessments						Increased amount of assessment to ensu
Marking and feedback, say		2.00	hrs p student @				
		£57	p hr				
		1	students	£114	£114		
Individual Tuition							
Contact with individual students		2	hrs @				Assume increased (double compared to F
Emails, phone calls etc. Say		£57	p.hr	£114	£114		
		1	students				
Printing & Repro		40	pages p student				
Printing off student submissions		£0.03	p page	£1.20			Assume assignments submitted on-line a
		1	students		£1.20		
Other		0					
Overheads p student		£0		£0			
		1	students		£0.00		
TOTAL COST P MODULE					£913	£913	
d)	ADMINISTRATION						
Exam Board							
0.125	day	1	academic				
£429.00	p day p academic		£53.63				
0.5	day	1	admin				
£370.00	p.day p admin		£185.00				
Exam Board Total					£239	£239	
TOTAL COSTS				£443	£1,365	£1,365	

PROFIT/LOSS		
Gross Income p student		
£905.00		
1	student per MODULE	
Total Gross Income per MODULE		
		£905
Total Cost per MODULE		£1,365
Net Income p module		-£460
Profit/loss	-£460	Per Module

Figure 2. In-House Web-Based Distance Learning Delivery

Model three: Externally house delivered (outsourced), web based distance learning

This mode is essentially the same as Model Two. However, instead of tuition being delivered by in-house academic staff; tuition is provided by external staff, similar to the Associate Lecturer employed by the Open University. In effect, tuition is outsourced to external providers. These tutors could be retired academics or professionals, "portfolio" employees, etc.

Unlike the Open University Associate Lecturer, who is employed on a nominal hourly basis, external tutors under the outsourcing model are recruited on a price per student basis.

Clearly, there would be costs involved in training p-t staff and updating their skills. For staff recruited ab initio into teaching, it is reasonable to assume an initial 3 day course at a cost of say, £900 (£300 per day). If utilising retired academic staff, this initial training would not be required.

In addition, there would be a requirement for ongoing staff development, estimated at, say 10 hours training per annum at £35 p hour, i.e. £350 pa.

These costs have not been included in the presented model. Staff training and development has not been included in the other two models and in each case is assumed to be a central overhead covered by the University overhead.

On the outsourcing model, admin support is further increased to 4 hours per student, to allow for any increased contact between the University and the tutor or for students having difficulty contacting the tutor.

An additional item is included for in-house staff monitoring and managing the module. It is assumed that a defined sample of assessments will be monitored by the in-house tutor. This may be particularly relevant if there are large numbers of students and several outsourced tutors. Management and monitoring has been assumed at ½ hour in-house staff time, per student.

Module updating and maintenance is undertaken by the in-house staff and, as previously, costed at 10 hours at £57 per hour. All delivery is included in the cost per outsourced tutor, per student. In the presented example, this is £150 per student to include; costs of administering on line tutorials, assessment and feedback, and any individual tuition.

MODULE COSTING MODEL

COSTING MODEL	Module Title	Out-sourced DL Delivery		Course(s)	MSc (Level 7) Module			
INCOME				COSTS				
HEFCE Income	£280	p student p module		Admin	£370	p day	£49	
Fee Income	£625	p student p module		Academic Staff	£429	p day	£57	
				Academic Part-time	£150	p. STUDENT		
				Contribution to		per FTE		acco
				Central overheads	£3,695	per COURSE	£115	50.00% costs
				Printing	£0.03	p page		

MODULE COSTING				Student	Module	Totals	Notes
INCOME							
HEFCE Income							
say	£280	p student					
FEE income							
say	£625	p student					
Gross Income				£905			
Assume	1	students					
Total GROSS income					£905	£905	
OUTGOINGS							
Contribution to Central overheads							
say	£115			£115	£115	£115	
Admin Support							
Admissions, queries, support							
4	hrs	1	admin, p student				
£57	p.hr						
Assume		1 students		£228	£0	£0.00	
Monitoring and Management							
1	Students	0.5	hrs p student @				
		£57	p student	£28.50		£28.50	
Module Costs							
a)	Development Costs						
0					0		
b)	Maintenance Costs						
Assume have to maintain modules, update materials							
Say		10	hrs updating				
	10 hrs @	£57	p.hr		£570		
c)	Delivery Costs						
ci)	*Fixed Costs*						
Lectures							
0	*1 hr lectures*	0					
Tutorials							
0	*1 hr Tutorials*	0					
Other Delivery							
1	£150				£150.00		in contract
Students	p.student						
Total					£0.00		
cii)	*Variable Costs*						
Assessment							
2	assessments						
Marking and feedback, say		0.00	hrs p student @				
			p hr				
		1	students	£0.00	£0.00		
Individual Tuition							
Contact with individual students		0	hrs @				
Emails, phone calls etc. Say		£0	p.hr	£0.00	£0.00		
		1	students				
Printing & Repro		0	pages p student				
Printing off student submissions		£0.03	p page	£0.00			
		1	students		£0.00		
Other		0					
Overheads p student		£0		£0			
		1	students		£0.00		
TOTAL COST P MODULE					£720	£720	
d)	ADMINISTRATION						
Exam Board							
0.125	day	1	academic				
£429.00	p day p academic		£53.63				
0.5	day	1	admin				
£0.00	p.day p admin		£370.00				
Exam Board Total					£424	£424	
TOTAL COSTS				£257	£1,144	£1,172	

PROFIT/LOSS		
Gross Income p student	£905.00	
	1 student per MODULE	
Total Gross Income per MODULE		£905
Total Cost per MODULE		£1,172
Net Income p module		-£267
Profit/loss	-£267	Per Module

Figure 3. Outsourced Web-Based Distance Learning Delivery

Assessment remains at 2 points of assessment. Contribution to Exam Board expenses remains as previous. On these assumptions, the cost per individual student is £1,172. Break even is achieved at two students, (if the annual CPD for tutors is included in the module cost, break even is achieved at 4 students).

Student individual contact

Face to face student contact

The traditional Face to Face delivery postulated above allows for varying contact in tutorial time. Assuming, say 13 students per tutorial group over the semester this equates to 1 hours personal contact in tutorials, (though this proportion varies with the numbers of students and tutorials). There is also the equivalent to 2 hours individual attention in assessment and feedback, plus 1 hour additional contact outside of scheduled hours. Total individual academic time is 4 hours.

In-house distance learning student contact

In-house delivery of distance learning allows for 2 hours individual contact, plus the equivalent of 2 hours individual attention in assessment and feedback.

There is also the opportunity for individual contact during the on-line or audio tutorials. The suggested four half-hour tutorials are based on practice on some Leeds Met modules. At four students, this gives ½ hour individual attention; though clearly this diminishes as the student numbers rise. Total individual academic time is 4+ hours.

Outsourced distance learning

The outsourced distance learning model has the same assumptions as the in-house distance learning model. In addition, there is the equivalent to ½ hour individual attention in the monitoring process.

Total academic time for the individual student is 4½+ hours.

Conclusion

Marginal costs and revenue

Marginal costs and revenue can be calculated for a range of students.

This can be graphed to show marginal Profit/Loss

Marginal Profit/Loss Profiles

F2F Profit/Loss	In House DL Profit/Loss	Outsourced DL Profit/Loss	Students
-£1,838	-£460	-£267	1
-£1,385	£2	£459	2
-£932	£464	£1,186	3
-£479	£927	£1,912	4
-£26	£1,389	£2,639	5
£427	£1,851	£3,365	6
£879	£2,314	£4,092	7
£1,332	£2,776	£4,818	8
£1,785	£3,238	£5,545	9
£2,238	£3,701	£6,271	10
£2,691	£4,163	£6,998	11
£2,403	£4,625	£7,724	12
£2,856	£5,088	£8,451	13
£3,308	£5,550	£9,177	14
£3,761	£6,012	£9,904	15
£4,214	£6,475	£10,630	16
£4,667	£6,937	£11,357	17
£5,120	£7,399	£12,083	18
£5,573	£7,862	£12,810	19
£6,026	£8,324	£13,536	20
£6,478	£8,786	£14,263	21
£6,931	£9,249	£14,989	22
£7,384	£9,711	£15,716	23
£7,096	£10,173	£16,442	24
£7,549	£10,636	£17,169	25
£8,002	£11,098	£17,895	26
£8,455	£11,560	£18,622	27
£8,908	£12,023	£19,348	28
£9,360	£12,485	£20,075	29
£9,813	£12,947	£20,801	30
£10,266	£13,410	£21,528	31
£10,719	£13,872	£22,254	32
£11,172	£14,334	£22,981	33
£11,625	£14,797	£23,707	34
£12,078	£15,259	£24,434	35
£11,789	£15,721	£25,160	36
£12,242	£16,184	£25,887	37
£12,695	£16,646	£26,613	38
£13,148	£17,108	£27,340	39
£13,601	£17,571	£28,066	40
£14,054	£18,033	£28,793	41
£14,507	£18,495	£29,519	42
£14,959	£18,958	£30,246	43
£15,412	£19,420	£30,972	44
£15,865	£19,882	£31,699	45
£16,318	£20,345	£32,425	46
£16,771	£20,807	£33,152	47
£17,224	£21,269	£33,878	48
£17,677	£21,732	£34,605	49
£18,130	£22,194	£35,331	50

Figure 4. Table of comparable Costs/Income

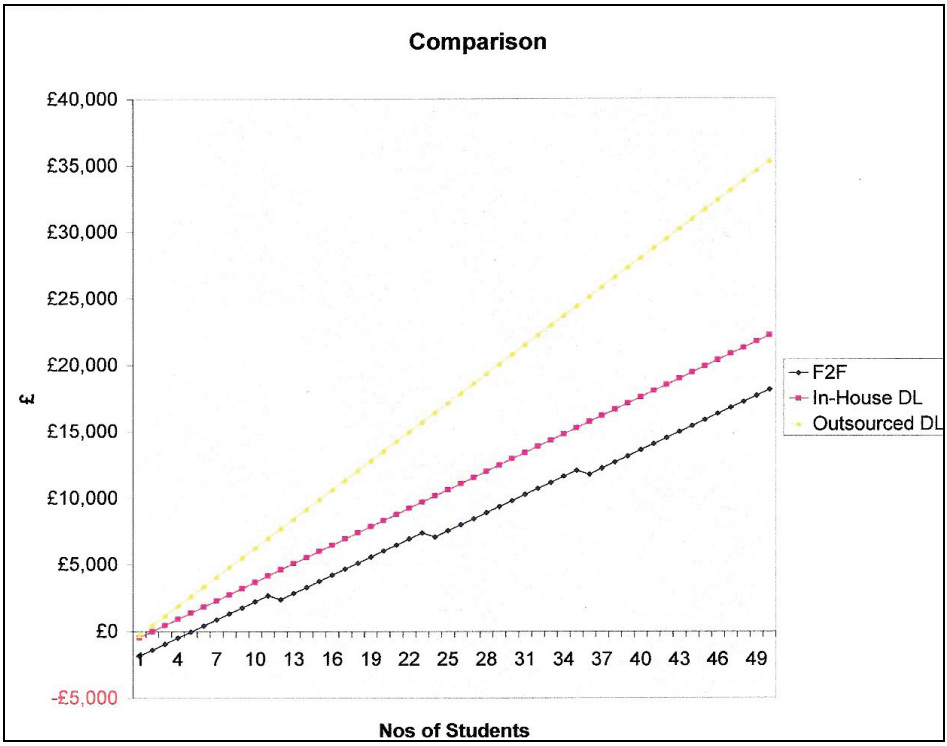

Figure 5. Graph of Costs/Revenue Alternative Forms of Delivery

The least cost effective method of delivery is the traditional face to face lecture. The most cost effective is the outsourced method of distance learning, more than twice as profitable as face to face learning.

The model can be varied to show the effects of differential changes. For example, if Distance Learning courses are given a further assessment to promote staff-student contact, the cost profiles move; but distance learning still shows a distinct advantage over face to face delivery, at least in smaller class numbers; there is some divergence as numbers rise.

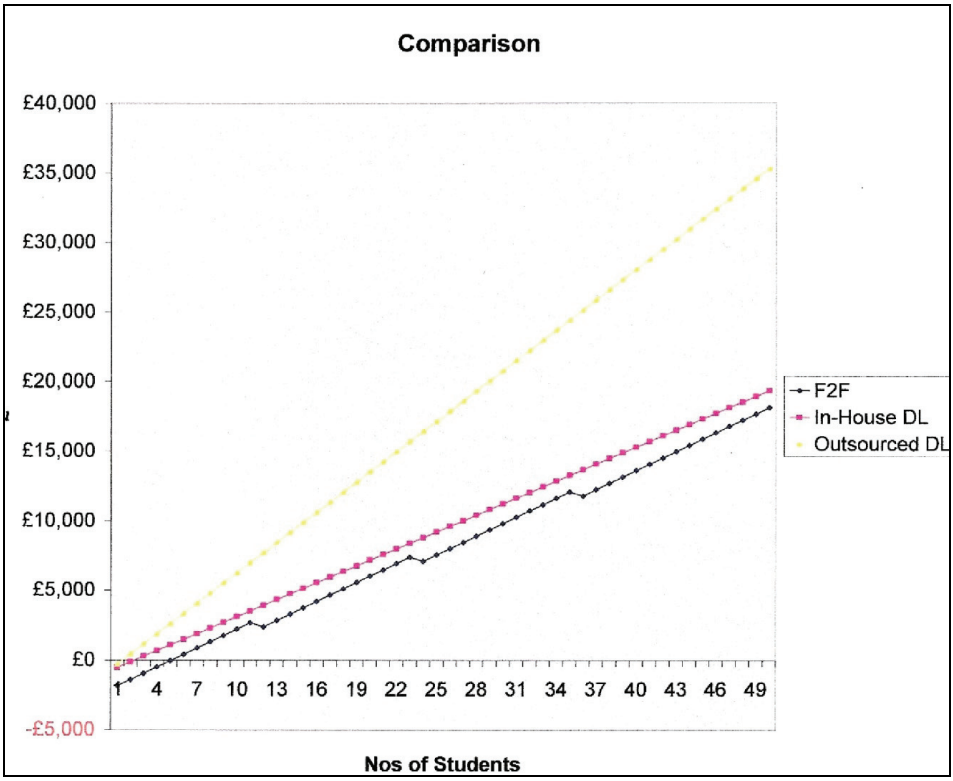

Figure 6. Graph of Costs/Revenue Alternative Forms of Delivery, 2 Assessments C/F 3 Assessments for Distance Learning

Recommendations and further considerations

The above models, of course, assume that all material is already available in distance learning format. The cost of producing, or converting material into Distance Learning format has to be incorporated into any models where distance learning is being developed ab initio. However, costs of producing material are falling as more material becomes available in the form of Open Access Learning Objects.

With, say 15 students, the net surplus for in-house web based delivery is £5,157 compared to a surplus for traditional face to face delivery of £3,761. Assuming that the module is delivered once per year, this gives a net annual surplus of £1,396 pa. Capitalising this at, say, 4 % yield gives a Capital Equivalent of £34,900.

Similarly, the Capital Equivalent of the surplus from in-house web-based delivery is £153,575.

These figures; £34,900 and £153,575 represent the capital available to produce the web-based material.

The costs of producing a distance learning module are currently being researched as a separate exercise.

A further consideration is the relative costs to the student of studying full-time, attended part-time, or by distance learning. Again, this is being separately researched.

Environmental costs of different forms of delivery also have to be considered. Clearly there environmental benefits in distance learning in terms of: journey to work (study) costs, land and buildings usage, and production of hard copy materials. Again, this is subject to separate research.

Appendix A

DISTANCE LEARNING COURSES
FINANCIAL APPRAISAL

Chris Garbett

MODULE COSTING MODEL

COSTING MODEL	Module Title	Traditional F2F Delivery	Course(s)	MSc (Level 7) Module			
INCOME			COSTS				
HEFCE Income	280	p student p module	Admin	370	p day	49	p hr
Fee Income	625	p student p module	Academic	429	p day	57	p hr
			Contribution to Central overheads	3695	per FTE per COURSE	=G6/2/8	Per P-T student per MODULE
			Printing	0.03	p page		
			Tutorial size max	12	Students		

MODULE COSTING			Student	Module	Totals
INCOME					
HEFCE Income					
say	=B4	p student			
FEE Income					
say	=B5	p student			
Gross Income					
Assume	1	students			
Total GROSS income			=SUM(B12:B14)	=F17*B16	=G17
OUTGOINGS					
Contribution to Centra					
say	=I6*B16		=I6	=B21	=G21
Admin Support					
Admissions, queries, st					
1	hrs	1 admin, p s			
=I4	p.hr				
Assume	=B16	students	=A26*A25*C25	=H28	=$F$28*$B$28
Module Costs					
a)	Development C				
0				=A32	
b)	Maintenance C				
Assume have to maintain modules, update materials					
Say		10 hrs updating materials			
=C36	hrs @	=I5 p.hr		=A37*C37	
c)	Delivery Costs				
ci)	*Fixed Costs*				
13	*1 hr lectures*	=A43			
Tutorials					
=IF(B16>=#REF!,A43*4	*1 hr Tutorials*	=ROUNDUP(A45,0)			
Other Delivery					
		=A47			
Total		=C47+C45+C43 hrs @			
		=I5 p.hr		=C49*C48	
cii)	*Variable Costs*				
Assessment					
2	assessments				
Marking and feedback,		=A53 hrs p stud			
		=I5 p.hr			
		=B16 students	=C55*C54	=F56*C56	
Individual Tuition					
Contact with individual students		1 hrs @			
Emails, phone calls etc. Say		=I5 p.hr	=C58*C59	=F59*C60	
		=B16 students			
Printing & Repro		40 pages p st			
		=G7 p page			
		=C60 students	=C62*C63	=F64*C64	
Other		0			
Overheads p student		=#REF!/8			
		=C64 students	=C67	=F68*C68	
TOTAL COST P MODU				=SUM(G30	=G69
d)	ADMINISTRATI				
Exam Board					
0.125	day	1 academic			
=G5	p day p academ	=A74*C73*A73			
0.5	day	1 admin			
=G4	p.day p admin	=A75*C75*A76			
Exam Board Total				=SUM($E$5	=SUM($E$74:$E
TOTAL COSTS			=SUM(F20:F77)	=G78+G65	=H78+H65+H26

PROFIT/LOSS		
Gross Income p stude		
=F17		
=B16	student per MOI	
Total Gross Income per		=A83*A84
Total Cost per MODULI		=H79
Net Income p module		=D86-D87
Profit/loss	=D86-D87	Per Module

Figure 7. Spreadsheet for F2F Delivery, showing formulae

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Dedication, Humbleness, and Audacity: Advice from Pathfinder Faculty to Colleagues New to Online Distance Education

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Abstract

Despite its long history, Distance Education (DE) has only won the support of renowned universities and space in public policy after the advent of the Internet and other information and communication technologies (ICTs). Teachers, who previously saw it with suspicion, perceived in online DE the possibility of extending university education to underserved population groups, e.g., fulltime workers and residents of remote regions. Given their recent foray in this educational modality, many teachers explore DE as an uncharted territory and advise those who come after them. Cooperation, commitment, organization, and above all courage and humility to learn and openness to new experiences, are, according to this research, attitudes essential to teacher-explorers of the Media Age.

Keywords: Distance education, teacher education, higher education, teacher knowledge base.

Introduction

A discussion on Distance Education (DE) should begin by examining it in the context to which it is mostly applied: higher education. The past and present situation of DE and its future development are closely related to the characteristics of higher education Institutions (HEIs), their activities and their demands throughout history. It is well known that HEIs are enduring institutions; few human organizations have survived for so long. Sixty-two of the 66 institutions with continuous existence since the sixteenth century are universities (Brunner, 1997). However, this longevity has its counterpart:

conservatism. In fact, many current procedures of HEIs – e.g., sequential curriculums and measurements of student performance through tests – were established when the first universities were founded in the Middle Ages.

Still, despite an overall tendency to inertia, there are indications that HEIs have been regularly forced to change their procedures in response to social needs and persuaded to incorporate new theories derived from educational research and communication technologies available at different historical moments. This is no different today: many HEIs have been encouraged to change their practices to accommodate a more diverse student body, composed also by individuals previously underserved or excluded, and adults who come to universities and colleges for deferred professional training to supplement or upgrade previous education, or even for personal enrichment. To this there can be added pressures for further democratization of higher education with the purpose of reaching spatially-marginalized populations, a key issue in a country with continental dimensions like Brazil, whose centres of culture and knowledge dissemination are concentrated in some regions and in state capitals.

Moreover, HEIs have been required to change their processes to meet their students' different educational learning styles, long pointed by Kolb (1981), which tend to grow in the course of life (Knowles, 1984). However, the compartmentalized, linear, and cumulative curricula and the teaching methodologies based on the transmission and reception of concepts and theories validated by science, common in HEIs, seem to favour a sole learning style: intuitive, verbal, deductive, reflective, and sequential (Felder, 1993). Above all, these curricula and teaching methods do not seem to take into account the learning characteristics of students who enter their doors today, accustomed to the intensive use of the Internet and other information and communication technologies (ICTs). It seems that even the simplest technological advances may affect students' expectations and their learning styles. Grauerholz et al. (1999) call attention to the fact that today's children – our future students – interact with the television and by analogy with other sources of information differently from individuals who have experienced this technology before the remote control was invented and popularized. The authors believe that traditional teaching methods – in which students are expected to pay attention to teachers lecturing for an hour or more – will become a major challenge for both parties.

Higher education and ICTs

Despite not exhausting the current problems faced by HEIs, the abovementioned factors have forced HEIs to consider alternatives to traditional educational models, conceived in the Middle Ages, at a time when books were rare and expensive and teachers were reliable (and cheap) sources of knowledge. Nowadays, this teaching role is less important because of the Internet (e.g., visits to online databases, journals and books). Lectures have been gradually replaced by less directive methods – i.e., rooted in the premise that knowledge is not transmitted, but constructed by the individual – and technologies are increasingly being incorporated to support and improve teaching. In this direction, although it is hard to predict how higher education will evolve in Brazil, or elsewhere, as it depends on public policies and investments, it seems that the classroom will become more and more supplementary, learner-cantered, and ICT-based. That is, the classroom will have a function different from what it currently has; it will be used less for transmission of theory and more for processing of information sought by students and for implementation of the same in problem-solving and projects.

In fact, nowadays information transmission can already happen through more comprehensive and more efficient media: ICTs such as synchronous video-lectures, pre-recorded classes, and databases, even in face-to-face education. Discussions among students and teachers about concepts and their applications (essential to knowledge construction) are already carried out through ICTs, e.g., mailing lists (Internet) and web-conferences, in some traditional HEIs. However, it is important to emphasize that, despite the increasing incorporation of ICTs into teaching and learning processes, this has not occurred uniformly among nations and regions of the same nation. It is also believed that, however promising, ICTs will always be used less at some educational levels (e.g., elementary school), due to its characteristics. Moreover, even in higher education, there will always be varying degrees of ICT incorporation among programs and courses of the same program; ICTs may be more compatible to some contents than others.

Teaching face-to-face and at a distance in higher education

Moreover, the integration of ICTs into the teaching-learning process of HEIs has been uneven when comparing face-to-face to distance education. There are certainly numerous reasons for this disparity, including the conservatism of HEIs and its actors,

accustomed to the didactic possibilities allowed by the traditional classroom. However, it seems that the fast appropriation of ICTs by DE administrators and teachers is due to their perception that these technologies allow them to make use of educational theories (e.g., constructivism) and make available information (e.g., through texts, videos, databases, and tutorials) in their teaching-learning processes, once limited to mailing instructional materials and teacher-student correspondence. In fact, the Internet has made it possible to design virtual learning environments (VLE), which enable interactions among students and between teacher and student (both ways). These interaction modes are important in that they promote knowledge construction by increasing information-processing time for students, exposing them to different viewpoints on a same topic, and promoting elicitation and rectification of misconceptions and consensus building, among other things.

Online teacher knowledge base

The application of ICTs to processes of teaching and learning at a distance has promoted the development and popularization of DE and adhesion of many HEIs and teachers that were previously wary of its effectiveness or believed it to be a form of industrialization and massification of higher education. Because this popularity is recent, there is still much to be investigated concerning the processes of teaching at a distance. Then, this paper intends to contribute to the education of teachers to work in this emerging educational modality. There is much to learn about that which a teacher needs to know in order to perform well in a VLE. The literature on the education of face-to-face teachers indicates the need of developing a body of knowledge that includes: knowledge of the fundamentals, history, and goals of education; knowledge of students, knowledge of curriculum; knowledge of content; pedagogical knowledge; and pedagogical content knowledge. Roughly speaking, the pedagogical content knowledge, according to Shulman (1987), combines all the other kinds of knowledge so as to promote students' understanding of a given concept/content.

It is reasonable to think that this knowledge base is required to teach both face-to-face and virtual students at the higher education level, in spite of the fact that many of these teachers come from baccalaureates and therefore have little or no pedagogical training. However, despite the large interface between face-to-face teaching and teaching at a distance, the latter has peculiarities that are not usually addressed in teacher education programs. In fact, there are few initial or continuing teacher education curricula that include knowledge about DE and ICTs. Borrowing from the taxonomy of Zabala (1998), this knowledge may be divided into conceptual knowledge (e.g., history and

development of DE), procedural knowledge (e.g., use of ICTs) and attitudinal knowledge. It is possible to assume that DE theories and most of the skills necessary to work in a VLE can be satisfactorily addressed in initial/continuing teacher education programs, although attitudes in favour of DE may be more difficult to promote. Still, we believe that some recommendations contained herein may be valuable to teachers – whether experienced or inexperienced in face-to-face education – new to DE and managers and to coordinators/administrators of online programs in order to understand their teachers' needs and difficulties and promote teacher adherence.

Contextualization and methodology

This investigation was conducted among teachers, instructors of undergraduate programs offered online through a partnership between Universidade Aberta do Brasil (Open University of Brazil) or UAB and Universidade Federal de São Carlos, São Paulo State, Brazil, hereinafter referred to as UFSCar. This partnership also involves a third party, towns or cities, which provide their online students (residents of their region) with infrastructure (e.g., computers, textbooks, and laboratories) where they come to perform face-to-face activities, do experiments, and sit mid-term and end-of-term exams. These infrastructures, known as Poles, are run by partner town/city administrations, which are responsible for their staff, with the exception of local face-to-face tutors, who are selected/hired by UAB-UFSCar. UFSCar offers five online programs through UAB: pedagogy, environmental engineering, sugar-ethanol technology, music education, and information technology.

Because this is a new project at UFSCar, the teachers – mostly from face-to-face programs of this institution – were experiencing online teaching for the first time. In accordance with the qualitative nature of this study (Denzin & Lincoln, 1994), in order to give them voice and document their experiences for future appreciation of novice ED teachers, the participant teachers were given a questionnaire with open and closed questions (59 respondents). In this questionnaire there was room to write recommendations to newcomer colleagues. These data were categorized, analyzed and triangulated with observations and unstructured interviews carried out by the researchers. In the DL model adopted by UAB-UFSCar teachers are responsible for preparing and administering their courses. That is to say that they develop their own written material and other learning objects and design VLE activities and other online course-related aspects with other professionals. In addition, teachers have the support of online tutors (one for every 25 students) while the course is online.

Results and discussion

The suggestions given by the participating teachers to their fellow beginners in DE point to a wide range of conceptual, procedural, and attitudinal knowledge and indicate some correlation to the participants' individual characteristics. Although the difficulty of categorization is inherent to qualitative research, we have attempted to demarcate some subcategories within these major categories; needless to say that these subcategories should not be taken rigidly. The teachers' suggestions point to the development of conceptual knowledge (e.g., about DE and ICT), procedural knowledge (e.g., organization of time and management of the work done by tutors), and attitudinal knowledge (e.g., cultural change as regards DE, commitment to the DE model adopted by UAB-UFSCar, collaboration with other actors, and acknowledgement of DE specificities) (Figure 1).

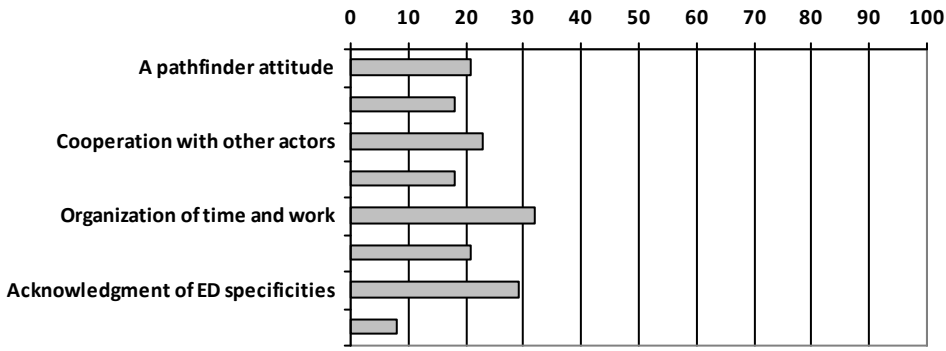

Figure 1. Suggestions versus percentages of teachers mentioning them.

Acquaintance with DE

Under conceptual knowledge, respondents pointed to the need for acquaintance with DE. This need implies (self-)instruction and willingness to learn about ICTs and the DE model adopted by UFSCar, *sine qua non* for the proper performance of online teaching function:

> *"Read about DE";*
>
> *"When you start working at UAB [online UFSCar], try without delay to understand how each tool and/or methodology can be used in the courses";*

> *"[…] the awareness that computational tools are just tools, i.e., they just expand the capacity to promote learning when appropriately used by the teacher and learners, thus breaking once and for all the myth that machines can replace people."*

It should be remarked that the increasing complexity of the computational tools and the speed of these advancements imply that this teacher preparation to work online should occur both in initial and in-service teacher education programs.

As it was expected, the use of ICT stood out among the skills cited by respondents. To UFSCar teachers of DE courses ICT know-how leads to greater teacher autonomy, which is reduced in this mode of education due to teachers' dependence on other actors (e.g., instructional designer):

> *"Seek to build autonomy in Moodle [the online course/program management system at UFSCar]";*
>
> *"Learn how to use Moodle, not to depend on or demand the whole thing from the technical team."*

This is an interesting aspect in that teachers regaining part of their lost autonomy can result in greater professional satisfaction and, therefore, greater retention of faculty in DE programs.

Organization of time and work

There are some other skills that, however useful in any kind of education, seem to be indispensable in teaching at a distance because of its characteristics, e.g., higher technological complexity and greater difficulty in changing processes. DE seems to demand more careful planning from teachers, which might overwhelm them, especially if they have to perform other academic activities (e.g., research), as is the case of UAB-UFSCar teachers. For this reason, most of the recommendations cited by respondents refer to the organization of time and work, which is associated with two aspects:

Advance preparation of online course:

> *"[It is important] to have the printed material ready with all their educational interfaces properly adapted to DE";*
>
> *"Time organization for course preparation. DE courses use more preparation time, because you have to transfer all information to the environment and that takes time";*
>
> *"Schedule more time. DE demands that beginning teachers have a lot of time."*

This careful course preparation also appeared in the speech of teachers associated with students' time and workload, i.e., with the need to compute the time needed to perform the activities proposed to students, as shown by the following extracts:

> *"Balancing quantities of content and tasks with workload from the perspective of the student";*
>
> *"Be economical in the beginning, in the preparation of materials. I overdid it when selecting and writing the texts and the amount of activities. This demanded a lot of my time and work, besides overloading my students (who need to allocate their time among various courses of the module [semester]).*"

This exercise of predicting the time needed to carry out the activities seems to be a challenge for teachers, accustomed to face-to-face education, in which it is easier to make changes in courses in progress. Although it is risky – perhaps impossible – to predict the progress of courses in both educational modalities, due to varying characteristics of different groups of students, it seems to be more difficult for teachers to subtract or add activities in ED courses while in progress because of the collective nature of the teaching work in this modality, which requires the assistance of other professionals (e.g., instructional designer).

Setting up a work schedule while the course is online:

> *"Establish and follow a strict weekly schedule of activities, such as opening and closing activities, answering questions from students. If necessary, provide guidance for tutors, give instructions, etc.";*
>
> *"Set aside 10-15 hours per week for the first offer [of the course]. If your course is considered difficult in face-to-face education and you have 200 or more students, reserve much more time than that."*

Ability to manage group of tutors

The need to organize their teaching work and time while offering the course is closely related to a skill little required in face-to-face teaching: team management. In the face-to-face modality teachers not only prepare their courses without the aid of colleagues or other professionals, but they also teach them in the same way. DE teachers have to work with tutors, who are mediators between students and the content in question and between these and the teacher. Therefore, the progress of the course depends on the teacher's ability to manage his/her team of tutors. According to respondents, establishing *an effective communication channel* and *a relationship of cooperation and equality with tutors* is crucial to the success of the course and satisfactory student performance:

> *"Follow closely the work of your tutors, directing and synchronizing the work of the team";*
>
> *"Learn how to lead your group of tutors in a non-authoritarian way, after all it is they who are actually teaching your students";*
>
> *"Choose carefully your tutors and create a clear channel of communication with them so as to monitor the course well";*
>
> *"Listen to your tutors; they often know more about the students than we do."*
>
> *"Create a sense of team among you (teacher) and tutors. Never put yourself above them, because their performance is the soul of any [online] course. This requires the building of a team identity among the people involved, a sense of complicity and optimism, so that*

commitment and responsibility will come as a result (with consistency in educational practice and dialogue—no need for empty rhetoric)."

Collaboration with other actors

The last excerpts also refer to a characteristic of teaching at a distance: collaboration with other actors, which can be seen as both a skill and an attitude. Regardless of the teacher's ICT know-how, preparation and maintenance of courses while online always require working together with other professionals such as tutors, instructional / web designers, computer technicians, other teachers and program coordination / administration, at least in the DE model adopted by UFSCar. This aspect was perceived by respondents, who suggested that colleagues beginning in this educational modality:

"Stay in sync with the program coordination and administration";

"Share information with other teachers and experienced tutors; share information with other institutions; seek to work collaboratively with tutors, teaching team and other teachers";

"Embrace the opportunity to work with different teams, each bringing its contribution. Collaborative work [in DE] presents possibilities unheard of in face-to-face teaching environments."

Involvement and commitment

Apart from the willingness to collaborate with other DE professionals, faculty commitment emerges in the data as an important attitude for success in this educational modality. Essential to the implementation of any innovative proposals in education (Huberman, 1973), involvement and commitment appear in the participants' suggestions associated with:

DE in general:

"Apply yourself to your work with great intensity";

"Lots of discipline and organizational skills are essential to work in DE, and a lot of involvement";

Courses and students:

> *"Make yourself present in the environment [VLE]; guiding tutors and intervening whenever necessary";*
>
> *"Know about what is happening during the course, students' expectations and tutors' comments";*
>
> *"Identify your students' profile, which usually differs from that of face-to-face students";*
>
> *"Visit the Poles to see that students are real people";*
>
> *"Do not be afraid of interacting with students. It is important that students have some contact with the teacher, to feel the 'presence' of the teacher, to feel they are being supported."*

Besides alluding to the importance of teachers' social and teaching presence (Garrison & Archer, 2007) in the ED model adopted by UAB-UFSCar, these passages hint at a type of knowledge that seems to be hampered in online teaching: knowledge of students and their characteristics (Shulman, 1987). Despite this, the participants' statements suggest the existence of strategies that can be used to mitigate this effect of online DE.

Acknowledgement of DE specificities

According to respondents, another attitude necessary for promoting students' achievement in the context studied is the acknowledgement of DE specificities:

> *"Work closer to your tutors and devise shorter and more direct activities [than those of face-to-face education]";*
>
> *"Adapt content to the language by which students will come into contact with the course";*
>
> *"Reflect well about the difficulties that your DE students will face in your course over time in order to propose activities that will effectively help them overcome the barrier of physical distance";*

> *"Don't simply insert materials/resources in the Moodle platform [VLE]. There should be a thorough preparation of materials and proper planning to meet DE specificities";*

> *"Balance quantity of content and tasks with workload from the perspective of the student".*

All excerpts above point to a type of knowledge that Shulman (1987) considers vital to teaching: the pedagogical content knowledge. It appears that in DE this type of knowledge is a combination of content knowledge, pedagogical knowledge, knowledge of students as well as knowledge of ICT and DE specificities in order to promote student learning online. These recommendations are also relevant in that they constitute words of caution about the dangers of employing pedagogical models and teaching strategies conceived for face-to-face education in DE contexts.

A pathfinder attitude

In addition to these more pragmatic attitudes, essential to the proper progress of the course, the teachers' statements indicate the need for teachers new to DE to nurture a *pathfinder attitude*, or the cultivation of attitudes necessary for all who are entering uncharted territories, regardless of their personal characteristics. For the research participants is necessary to have flexibility, patience, and perseverance in the face of difficulties and a willingness to learn. Most of the respondents recommended that teachers beginning in DE:

> *"Be humble. Open your mind";*

> *"Be flexible. Be open-minded to accept new challenges and also changes in direction whenever necessary";*

> *"[Have] patience when problems occur";*

> *"Be open to learn and incorporate new teaching practices";*

> *"I'd suggest not to be afraid of technological challenges and to move forward, because the world certainly will not revert from these acquisitions and new forms of human relationship. We need to modernize and keep pace with new and inescapable trends."*

We believe that this and many examples of conceptual procedural and attitudinal knowledge enlisted above are not commonly or appropriately developed in initial or continuing teacher education programs. Besides, as previously stated, we are aware of the difficulty in promoting some of these abilities and attitudes. However, we agree with the excerpt below that it is necessary to take into account this knowledge associated with teaching at a distance in initial and in-service education of teachers so as to prepare them for a wider scope of professional settings and to advance student learning both in face-to-face and distance learning environments:

> *"I think courses on pedagogical issues [in DE] are essential to arouse true interest and motivate teachers to change their practices, to become, regardless of the media used, conductors of student learning".*

Final remarks

ICT developments and the consequent possibility of applying educational theories to DE helped to promote adhesion to this educational modality of many HEIs and teachers, who previously saw it with suspicion. Today the world's best universities now offer DE programs/courses and there is a mounting body of research attesting to its effectiveness in promoting learning in several fields of knowledge. DE in Brazil has gained momentum over the last decade, with the support of government agencies (e.g., Open University of Brazil) and public universities and teachers committed to democratization of higher education and quality teaching and learning. Due to this recent adhesion, current teachers can be compared to explorers of new territories in the Middle Ages, at the time of the founding of the first universities. Their advice to teachers to come is valuable in that it encourages them to take advantage of the range of possibilities offered by ICTs and warn them against the dangers of applying models used in a familiar territory (face-to-face education) to one that is still being charted (DE). Especially in view of the conservatism inherent to HEIs, these pathfinder teachers advise humbleness to learn new things and audacity to try new ways of teaching and learning, two attitudes essential to all explorers of new educational spaces of the Media Age.

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From Distance to Online Education: Educational Management in the 21st Century

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Best Research Paper Award Finalist

Introduction

Distance education gathered speed in Sweden after 1898 when Hermods correspondence courses were established. 70 years later, like in many other countries (Tait, 2008), public investment in distance education was directed towards higher education in general (Willén, 1981). The impetus for the development of distance education since the 1960s was educational concerning education for all, and enriching people's lives, economic in terms of economy of scale and political concerning spreading higher education to all classes (Powell & Keen, 2006). The state in Sweden has historically had an interest in distance education to ensure education to citizens. This interest has been manifested in different organizations with commission to stimulate the development of flexible distance education and to make education more accessible and adjusted to the student's situation. The increasing interest in distance education for Umea University is related to a couple of factors in society (e.g. Morey, 2004). For instance, the location of Umea University in the northern part of Sweden contributes to a responsibility to develop the sparsely populated region and to educate people with limited possibilities to read campus courses. Higher education in Sweden is also increasingly dependent on the market of students whereas competition for students has become a core activity in Swedish higher education. Universities have been forced to redefine their activities and innovate to attract students (e.g. Miller & King, 2003; see also Ball, 1997). The Swedish educational system for higher studies is partly dependent on number of students to succeed, since the economic support to the University is based on how much the students have completed i.e. output based. Among their innovations in the competition for students, universities have turned to distance education using information and communication technologies to attract students who not have the possibility to attend campus courses or for other reasons choose distance education alternatives.

During the period between 1970's and 2000's educational conditions has changed in dramatic ways, especially for universities in smaller cities in Sweden. A recent report from Swedish national agency for higher education (2010) show that during 2000s have distance education constantly increased and that distance education increased its proportion of the total education volume. The technological development has developed distance education and created new possibilities. Information and communication technology (ICT) makes it possible to connect humans to each other and create interplay between humans regardless of time located at different places, regions and countries (e.g., Guri-Rosenblit, 2009; Miller & King, 2003). In year 2010 there are approximately 18000 full year students at Umea University whereas 4,900 of them are distance students. Distance courses, is both courses with physical meetings once or twice during a course mixed with online activities or courses that are carried out totally online. The different modes of distance education at Umea University are carried out with different extent of online activities from distribution of information to courses with high extent participative communication. Garrison (2009) show that the development of technology change how teaching can be designed and carried out from the independence in the early self-instructional correspondence packages to two-way communication (e.g., the emergence of audio conferencing in late 1970s; see also Stock McIsaac Nirmalami Gunawardena, 1996 description of how radio during first world war impacted on the delivery systems in education). The change in educational conditions has redefined what a teacher is and the act of teaching (cf. Castells, 1998 view of how technology have impacted on work processes). From a teaching and learning perspective the totally online participation and teaching lead to new pedagogical rationales which change the teacher role. The online courses also attracts other students, which often are older and other life situation, which impact on the design of the education (Lundberg, 2005; Mårald & Westerberg, 2005).

Today 70 % of the new students at Umea University are distance or online students. The trend is that more and more courses are carried out in online environments without physical meetings (online education). Distance or online courses are foremost carried out with delayed study pace (50 % study pace) to enable people working to read courses but there are also courses totally online with 100 % study pace that attract students. The report from National agency for higher education 2010 in Higher education in Sweden show that the proportions of students have strongly increased during recent years and that the student participation in online courses on full time studies over a year had increased with 45 % the last five years at Swedish universities (Högskoleverket, 2010). This means that, teaching in higher education is in the middle

of a transformation process where online education is becoming important for most of all academic disciplines. One late example of this in Umea, is that the medical education at Umea university also can be followed at distance from 2011.

There has been a change from distance education with few physical meetings to online education without no physical meetings at all (cf. Hasan & Laaser, 2010, description of the situation in Portugal). In this paper we will focus on this shift from distance to online by investigating the courses at department of education from an educational management perspective. This paper describes and analyses the development of distance education in terms of driving forces behind the development and the consequences of it. It uses department of education at Umea University as a case in point.

Method

Our description and analysis in this paper derives from economical, staff and student data between 1994-2010, Policy and strategy documents regarding ICT and learning were also collected. The data has been categorised according to number of courses, total yearly income of distance and campus courses, registered students at distance courses, output of students.

Distance education in this paper refer to education where teachers and students are separated in time and place which is the definition of the reporting in the study document system used in Swedish higher education[1].

Distance education at Umea University

Umea University has a long history of distance education. In the 1970s and the 1980s it was foremost the teacher or the students three-four times each semester who travelled to the place where the teaching should take place. The emerging information and communication technology started to be used in distance education for communication in the late 1980s. Umea University initiated a distance project between 1987 and 1993 where this new information and communication technology were used in education for among other things message exchange (Hedestig, 1993). The connection speed was at that time 9.2 or 14.4 Kbit/second. In the beginning of 1990s video conference equipment were installed in different places in the northern area of

[1] This does not mean that synchronous software is not used.

Sweden and used for distance educational purposes. Even though information and communication technology were used in their immature phase it is not until the middle of 2000 distance or online education started to be used by others than the real enthusiasts at Umea University.

Distance education at the department of education

The department of education has had a long interest in distance courses. A strong interest of using technology in education contributed to that video conferences were used in the early 1990s in distance education (Dahlgren & Karp, 1998). In the middle of 1990s ICT, email and world wide web, started to replace the delivery of the course material (Söderström, 1997, 1998). The emergence of this technology had consequences on how teaching was designed and carried out. For instance from the beginning of 1995 to 1998 the teaching on the web changed character from delivery of information to possibilities to interact with teachers and peer students (Söderström, 1998). In the 1990s it was teachers with an interest for learning and ICT that worked with the development of learning management systems and implementations of ICT tools in education. In the late 1990s the system administrator at the department started to support the technological part of the distance education. In year 2001 an ICT educationist was employed which was followed late 2002 with a new employment of one more ICT educationist. Today there are three ICT educationists employed at the department.

However, despite this stronger emphasis on ICT as a tool for teaching it took many years before everyone at the department had to work with ICT in their teaching. In the ICT policy from 2002 the ambition was that ICT should be used and integrated in teaching but also to initiate ICT-pedagogic development. Other areas in the policy covered information strategies, the ICT competence among the staff and what responsibilities the ICT- group had. In the document information and communication strategy from 2008 the role of ICT in teaching and online education is much more explicit expressed. The strategy is more detailed about how ICT should be used to support the teacher and the students to enable for distance and flexible studies. The document also point out that knowledge from different ICT initiatives shall be followed up to enable long term knowledge making, but also about how knowledge and experiences shall be spread within the department. In year 2010 the decision was made to not have any particular ICT Policy since it is fully integrated in the daily activities.

Distance, online and campus course development 1994 to 2010

The results from our investigation of economical, staff and student data between year 1994 and 2010 shows that both the number of courses and the number of students increased for distance education. When it comes to the course offered by the department there has been a development from a few longer courses with defined course modules (30 ects) to shorter courses lasting over 5 weeks 7.5 ects (Table 1).

Table 1: Number of courses between year 1994-2010

Year	No. Courses Campus	No. Courses Distance
1994/1995	2	1
1995/1996	2	1
1997	2	2
1998	2	1
1999	2	3
2000	2	2
2001	2	2
2002	10	2
2003	18	14
2004	17	11
2005	18	13
2006	18	14
2007	15	17
2008	10	10
2009	9	11
2010	10	8

Table 1 show that the number of courses increased a lot from 2002 at campus and 2003 for the distance courses. First it was tried out as campus courses and the year after they were run in the distance mode. The number of students reading the courses has also varied over the years, which is illustrated in Figure 1 below.

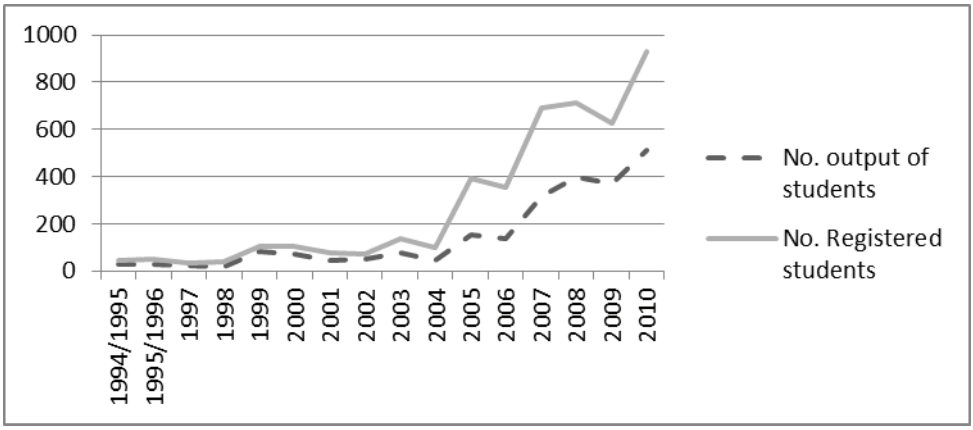

Figure 1. Number of registered students and output of students 1994-2010 in distance courses

Figure one illustrates that the number of registered distance students increased in high extent and especially from year 2005 and forward. The output of students was around 60 % 1994/1995 and it has been around 55 % the latest three years. However, the figure also illustrates that there was a decline in the output of students between 2005-2007. The number of students increased dramatically 2007 which also was the first time when all distance courses shifted to totally online courses. All of the distance courses in general education used the learning management system Moodle from 2005. Before that other systems as first class or web pages in combination with synchronous software (audio and video) was used. The campus courses have had a reversed development compared to online education. This is illustrated in figure two but also that 100 % study pace online that started up 2008 attracts much more students than the campus alternative.

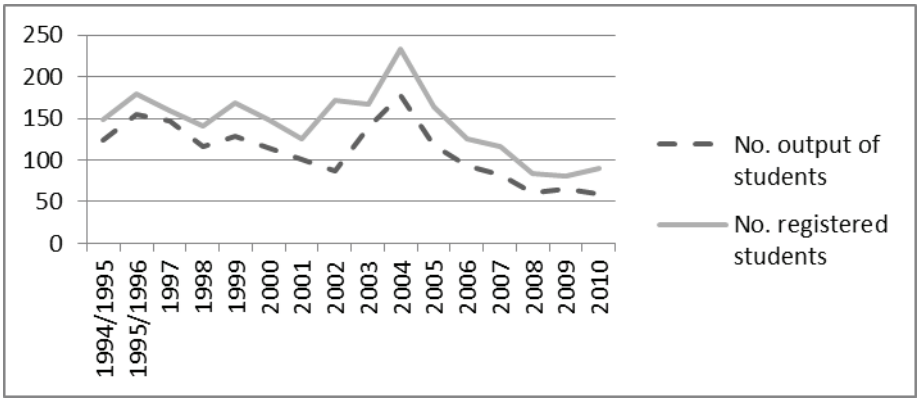

Figure 2. Number of registered students and output of students 1994-2010 in campus education

Figure two illustrates that the number of registered students has gradually declined since 1994. However, the throughput was around 85 % in average on the 1990s but declined in the middle of 2000 to be around 72 % with the lowest value 66 % year 2010. Figure 3 show that the online alternative (100 % study pace) that started up 2008 attracts four times more students than the campus option.

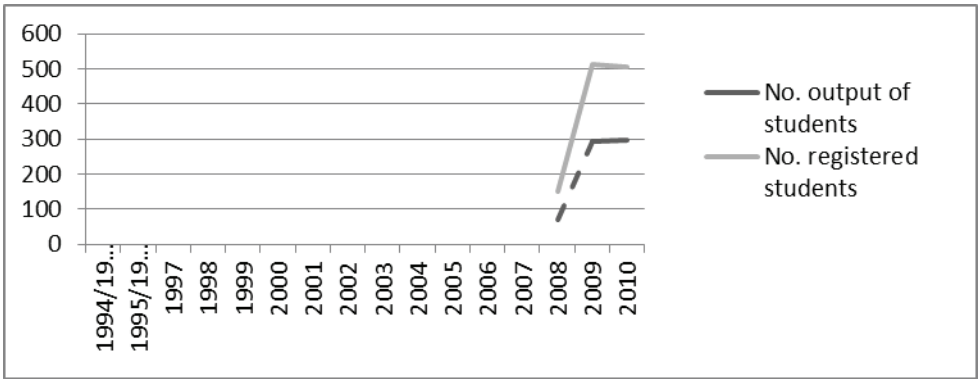

Figure 3. Number of registered students and output of students 1994-2010 in totally online education (100 % study pace)

However, it is the output of students that results in the state funding and Figure 4 clearly shows how the change in student numbers impacted on the economy at the department.

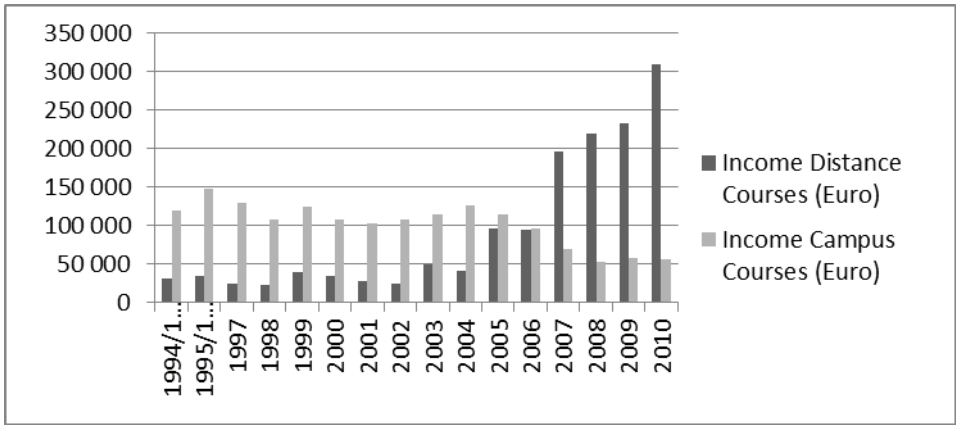

Figure 4. Income from distance and campus education 1994-2010

Figure 4 illustrates that the income from the distance courses and the online courses has gradually increased and in specific the latest years. If we also consider the 100 % study pace online the economical income from those courses have grown from 123,600

Euro 2008 to 468,900 Euro 2010. This means that the income from online courses totally 2010 was 778,700 Euro and 55,800 Euro from campus courses.

Discussion

The results from this study show that the during the last 20 years there has been a development that can be characterized from a early enthusiast projects to an educational management strategy, where ICT is a natural part of the everyday life of the department. The strategic documents have supported different actions concerning, for instance, whether or not to develop or discontinue courses, or to employ people with specific knowledge. It is clear that the rapid technological development have had a major impact on the growth of distance and online education at our department (cf. Stock McIsaac Nirmalani Gunawardena, 1996). It forced the department at different time to make decisions on strategic issues[2]. In 1996 the students attending a course did not have internet at home and they were not using internet or the web (Söderström, 1997). Today the situation is totally different. Nearly all students have their own computers and access to internet at home and they demand the departments to use ICT to facilitate for their studies.

The results from the data presented here have a relation to strategic decisions made at the department. One important decision was when we decided to employ people with specific ICT educationist competence 2001. It has enabled for decision later on since these are backed up by an internal competence, which had enabled for high level of flexibility. The data show that between 2002 and 2003 the number of courses increased which raised the number of students and the total income[3]. Another decision was the shift from distance with online activities to totally online courses in year 2007. It doubled the number of students and doubled the income from the courses. One major reason for this shift to totally online mode was that the output of students was low and students did not attend the physical course meetings. The shift to online increased the output of students a bit but was still low the first year which created a demanding working situation for the teachers. To overcome the situation with low throughput and demanding working conditions for the teachers' different projects aiming at increasing the online educational quality were initiated. For instance, projects were established in

[2] Of course have the deployed market oriented framework in Sweden been one important factor in the strategic decision making.

[3] We split large courses to smaller courses Four courses each semester means 8 courses each year.

order to let the students to feel "belonging" and a community with other students in the course but also activities directed to the teachers to be more comfortable to work in online settings. The results also show that the output of students increased from year 2008 which, in combination with much more registered students, dramatically increased the economical output from online courses. In year 2008 we also decided to try to promote our courses in 100 % study pace totally online. The results show that these courses attract much more students compared to the traditional campus courses which over the years attracted less and less students. Today then, income from the campus courses enable work for one teacher whereas the online courses in total enable work for approximately 15 teachers. The extreme increase of number of students might not only be dependent on the online mode. At the moment there are a lot of possible students in Sweden due to large birth-rate in the late 1980s and early 1990s which also is combined with a low conjuncture in society.

The consequences of the used educational management strategy are that we have been able to develop education as a subject at the university. In the beginning of 2000s the economical outputs from courses in general courses like "teaching" or "education" etc. were low. Teachers had few hours for teaching a course since there were few students attending and carried out the courses (the income from the course regulates how many teaching hours each course have). The changeover from distance to online courses had contributed to more students (economy of scale) which have made it possible to deposit resources for pedagogic development work. The online courses have also contributed to better working conditions for the teachers. They do not have to teach many different contents to fill their appointments. Without the conscious educational management strategy the alternative might have been to discontinue general educational courses, which had been a serious threat for the subject education. However, the influences of the market can, as Guzman & Trivelato (2010) point out, contribute to mechanistic standardized courses. We chose at the 1990s to control technology and manage the systems by ourselves, which has been necessary to be able to adjust our courses to different learning conditions. One other reflection we want to stress is that from the beginning with primitive webpages at one or two courses all courses at the department today, both campus, distance and online, are supported by ICT. An ICT pedagogical development needs both technical and pedagogical support in combination with support from a strategic leadership. Finally, the tricky thing is that the development does not have any fixed end. The rapid technological development will challenge all the time operating according to the strings of modernity. Bauman claim:

> *Modernity is what it is – an obsessive march forward – not because it always want more but because it never gets enough; not because it grows more ambitious and adventurous, but because its adventures are bitter and its ambition frustrated. The march must go on because any place of arrival is but a temporary station. No place is privileged, no place better than another, as from no place the horizon is nearer than from any other. (Bauman, 1991, pp. 10-11)*

Technology not only is a technology it also creates habits and lifestyle patterns. The next phase will be mobile learning with a lot of educational "apps".

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Evaluation of Serious Games, as a Tool for Education for Sustainable Development

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Abstract

Serious games could play a critical role as a pedagogical tool of Education for Sustainable Development, providing students with opportunities to experience the complex and abstract issues of sustainability. Digital game-based learning could support the development of important competences such as strategic and system thinking, planning and problem solving. The number of serious games on themes related to sustainability has grown exponentially over the last years. Although several criteria have been proposed for the evaluation of serious games most of them focus on aspects of usability and the general organization of the learning process. This study is aiming at: (a) developing a coherent set of criteria encompassing main pedagogical dimensions of Education for Sustainable Development, and (b) conducting a pilot evaluation on serious games related to this area.

Keywords: Education for Sustainable Development, serious games, evaluation

Introduction

Education for Sustainable Development (ESD), a contemporary field deriving from Environmental Education (EE), is a student-centered educational area which aims at motivating pupils to become actively involved in the learning process for environmental and societal issues. EE/ESD is constantly seeking for creative pedagogical approaches and methods that could attract and engage pupils into its subject.

Since the early stages of EE/ESD, 'games' have been proposed as an alternative instructional method (Taylor, 1983). Computer and video games attract increasing interest among teachers due to their potential to support learning. Such games are both engaging and interactive due to their built-in learning design. With a highly immersive nature that engages participants for a longer duration in a relaxed environment, these games also contribute to bridging the gap between teachers and students (Padature, 2011). Although there is some skepticism with regard to an extensive integration of such games into formal educational spaces (Annetta, 2008), Petkov & Rogers (2011) argue that educational systems need to incorporate the use of video games to accommodate the technology-dependent students of today. In fact, young people (even in many developing countries) grow up in a technology enhanced world. Internet, mobile phones and computer / video games being at the cutting edge of this reality, form a parallel world where many teenagers live in. Knol & de Vries (2010) argue that this particular age group is proficient at multitasking, prefers visual information over textual, is cross-media oriented, and is highly active on social network sites. The modern school should not underestimate this fact and ESD can take advantage of young people's new competences and their alternative point of view.

However, given that computer games are generally considered as a means of entertainment, in which way they could be incorporated into the learning process without missing the desired learning goals and outcomes? According to Hirumi et al. (2010) a proper balance between education and entertainment is necessary to optimize game-based learning. When one of these dimensions dominates over the second, either the dramatic flow of story and the excitement of gameplay might be undermined or some key pedagogical principles might be lost.

In the last years a new category of computer games has emerged, entitled 'Serious Games', which are promising to achieve such a fragile balance. Serious games are one of the fastest-growing areas in immersive educational media today (Bronack, 2011).

Zyda (2005) defined serious games as "a mental contest, played with a computer in accordance with specific rules, which uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives". However, Liukkonen (2009) argues that the term 'serious games' is not clearly defined and, in this regard, several taxonomies (e.g. Sawyer and Smith, 2008) have been created attempting to overcome this problem. Within this context, Breuer & Bente (2010) also offer a systematic clarification of several educational concepts which are associated or partially overlap with serious games, such as edutainment, entertainment education or e-learning, digital game-based learning etc. Furthermore, they identify a range of platforms, i.e. personal computers, gaming consoles or mobile phones for which serious games are designed.

In any case, serious games aim at providing an engaging, self-reinforcing context in which to motivate and educate the players (Kankaanranta & Neittaanmäki, 2009). Children's experimentation, exploration, imagination and role-play constitute basic aspects of the learning dimension of these games (Meyer & Sørensen, 2009; Kirriemuir & McFarlane, 2004). Annetta et al. (2010) acknowledge that the design of a computer game allows players a way to build their knowledge and to develop new skills throughout its progression. It should be mentioned that their purpose can be set either by the designer or by the player. Serious games focus on situations of everyday life. Usually, such a game analyses an issue (a problem) into several "missions" of increasing difficulty. While involved into these missions, users develop several skills, such as analytical and spatial skills, strategic skills and insight, learning and recollection capabilities, psychomotor skills, visual selective attention etc. (Mitchell & Savill-Smith, 2003). Protopsaltis et al. (2011) extend the range of serious games' learning benefits. They point out that such games make users feel responsible for success according to their actions, match high-quality content, turn mistakes into learning elements, allow problem based learning and situated learning. According to Quinn & Neal (2008) "when a serious game is done effectively, it engages the learner's emotions and brain in a coherent experience that leaves them with new attitudes, understandings, and/or skills". Within this context the modern school should consider seriously ways to integrate particular serious games into the existing curriculum or to utilize them as an effective additional learning tool. Petkov & Rogers (2011) support such an integration of serious games; that is why they propose developing serious games to align with the content of traditional instruction and, in the same time, traditional instruction methodology to focus on the learning aspects of these games

Within the realms of ESD, serious games could play a critical role, as a pedagogical tool that provides pupils with opportunities to experience situations which are impossible in the real world. Given also that the most environmental and sustainability issues are both complex and abstract, pupils need to develop critical thinking in order to understand the root causes as well as to evaluate the alternative solutions. Pupils need also to become emotionally involved into such situations so as to clarify the values at the roots of these issues. Serious games can potentially offer experience-based education that is directly associated with ESD goals, i.e. the conscious involvement of citizens into individual and collective actions towards sustainability (Liarakou & Flogaiti, 2007). Hummel et al. (2010) had promising results while examining whether collaborative scripts within serious games can foster complex learning and improve learning about certain problem situations in the workplace. Furthermore, several studies provide evidence that serious games (such as EnerCities and Darfur is Dying) can effectively contribute to awareness rising, concept construction and the development of positive attitudes towards sustainability issues (Liarakou et al., 2012; Knol & De Vries, 2011; Peng et al., 2010).

The number of ESD serious games has grown exponentially during the last years. Following that, a discussion has begun about the evaluation of such games. According to Liu & Ding (2009) these games need a suitable evaluation system, since they are strongly associated with educational goals. Several criteria have been proposed for the evaluation of serious games (Prensky, 2001; Kirriemuir & McFarlane, 2004; Mitchell & Savill-Smith, 2004; Pinelle, Wong & Stach, 2008; Liu & Ding, 2009). Most sets of criteria focus on aspects of usability and/or the general organization of the learning process. However, there are no criteria concerning specific pedagogical dimensions, especially with regard to innovative educational areas, such as ESD. This study is aiming at developing a coherent set of criteria as well as at conducting a pilot evaluation on serious games related to ESD.

Methodology

Three research questions were addressed:

1. To what extent serious games on sustainability are consistent with the main pedagogical aspects of ESD?
2. To what extent these Games promote an organized learning process?
3. What is the usability level of these Games?

A rigorous search of serious games, related to sustainability, was conducted at the start of this effort. Several keywords were used in order to retrieve games, such as 'serious games', 'sustainability', 'environment', 'environmental education', 'education for sustainable development'. The search was finished when a critical number that could give a complete picture, i.e. the first 34 games, had been collected. These games constituted the sample of this study. Thirty two games were in English and two in Greek (the only games that were in this language). Games in other languages were excluded. In fact, most of the games were retrieved by two sites, i.e. Serious Games Classification and Games for Change.

Further, a draft set of evaluation criteria was developed. Among the criteria already set in literature, 9 of the most frequently presented and associated with organization of learning and usability, were selected and adapted for the purposes of this study. In fact, these criteria specify the second and the third research questions. The set was completed by 7 new criteria that were formed to reflect some critical pedagogical aspects of ESD. The first criterion is related to the holistic approach of sustainable development, a concept encompassing multiple interpretations and ideological perspectives. There is some consensus however that this concept represents a balance among three interrelated pillars, i.e. environmental protection, social welfare with equity and economic development, which could embody a new global and local vision. The other six criteria of this group represent some of the most important learning goals of ESD, which are associated with the cognitive and affective domains as well as with some competences, i.e. problem solving, critical thinking and active participation. Such competences have a key role in investigating and understanding the multiple causes and dimensions of sustainability issues and, further, in undertaking active role for the prevention of these issues.

All 16 criteria were then classified into a three-point scale, forming categories of varied quality. 5 researchers analysed and marked the games while, assessing the validity and reliability of the criteria, through a qualitative approach. After the pilot application, the set of criteria as well as their categories, were re-examined and corrected. The final set is summarised on Table 1, while the score of the games is presented on Table 2.

Table 1: Criteria and evaluation scale for serious games related to Education for Sustainable Development

Criteria	2 points	1 point	0 points
C1. Holistic approach of sustainability	It incorporates all three dimensions (environmental, societal and economic).	It incorporates two dimensions (environmental and/or societal and/or economic).	It incorporates only one dimension (environmental or societal or economic).
C2. Knowledge	Knowledge is constructed by users while proceeding.	Knowledge is provided and is prerequisite to proceed.	Knowledge is provided and is auxiliary.
C3. Attitudes-Behaviours	It encourages users to develop their own attitudes/behaviours.	It promotes specific attitudes/behaviours.	It promotes no attitudes/behaviours.
C4. Values	It promotes negotiation of conflicting values.	It promotes specific values.	It promotes no values.
C5. Problem Solving	Users have to solve problems, inventing solutions by using the provided information.	Users have to solve problems, choosing among given solutions.	Users don't have to solve problems in order to proceed.
C6. Systems thinking	The game progress depends on various interrelated factors.	The game progress depends on various non interrelated factors.	The game progress depends only on one factor.
C7. Active participation	The game progress depends always on users' decisions.	The game progress depends sometimes on users' decisions.	The game progress doesn't depend on users' decision.
C8. Game's goals	Game's goals are always displayed and their achievement is marked.	Game's goals can be seen anytime by clicking a button.	Game's goals are given only at the beginning.
C9. Rules	The rules are discovered by users during the playing, depending on the progress.	The rules are provided from the beginning.	The rules are not provided.
C10. Class-Collaboration	It promotes users' collaboration and there are instructions for teachers supporting the use of the game into class.	It promotes users' collaboration but there are not instructions for teachers.	It doesn't promote users' collaboration.
C11. Evaluation of knowledge level	There is knowledge assessment for all the tasks.	There is knowledge assessment for some tasks.	There is not knowledge assessment.
C12. Score	Users can see their score constantly or at the end of each stage.	Users can see their score only at the end of the game.	There is no score.
C13. Levels	There are different levels of increasing difficulty.	There are different levels, but not of increasing difficulty.	There are not different levels.
C14. Setting the parameters	The progress depends on the parameters, set by users.	The progress depends on some given scenaria.	The progress depends on a particular scenario.
C15. Save	It can be saved to be continued later (from the same point).	It can be paused.	It cannot be paused or saved.
C16. Representations	All representations are realistic.	There are both realistic and fictional representations.	All representations are fictional.

Results

With regard to games' thematic subject it is evident that serious games for ESD are strongly influenced by the issue that dominates the international environmental agenda, i.e. climate change. In detail, climate change and the interrelated energy issue have been detected in 18 out of 34 games. The second most popular subject is urban environment (10 games). 6 games are referred to crucial issues of the developing world, while natural resources management and solid waste management are associated with 4 games each. 3 games deal with agriculture. Natural disasters, marine-costal ecosystems, forests and water-wetlands constitute the main interest of 2 games each. Finally only 1 deals with toxic substances and 1 with biodiversity.

Consistency with main dimensions of ESD

The first seven criteria are mainly associated with important dimensions of ESD. There are only 4 games ('Stop Disasters', 'Climate challenge', '3rd world Farmer' and 'Ayiti: the cost of life') that deal clearly with all three main dimensions of sustainability, i.e. environmental protection, social welfare and equity and economic development. Out of 14 games, 9 cover the environmental and economic dimensions. 5 of them focus on environmental and societal dimensions. 16 games focus merely on the environment.

In more than half of the games (19), users can construct knowledge while playing. For example, in 'Plan it green' and 'Stop Disasters!' knowledge is constructed through the effects of users' actions and decisions, while in other games is constructed through images, narrations and dialogues (e.g. 'Food Force'). In 2 games users must consider the provided knowledge to proceed. The remaining 13 games provide only optional information. There are also games offering all three ways of acquiring knowledge, such as the 'Water Alert'. With regard to attitudes/behaviours, 14 games allow users to choose among many alternative attitudes/behaviours, and 20 promote specific ones. For example the 'Trouble Shooter' emphasizes on energy saving by recommending users to turn off electric devices. 10 games provide users with the opportunity to perceive that there are issues involving conflicting values, such as the 'Climate Challenge' which confronts economic welfare with ecological justice. Moreover, 18 games promote specific values, i.e. solidarity, respect on human rights etc., while 6 games do not promote any values clearly.

With regard to competences intended by ESD, there are 9 games which directly promote problem solving. Among the most characteristic such games are the 'Age of Ecology' in which users have to invent ways to restore a dam which was damaged by an earthquake, and the 'Green Planet' which calls users to create a sustainable community. In 12 games, users have to solve problems by choosing among the proposed solutions. The 'Energy Ville' belongs to this category, as users have to combine among particular proposed energy sources to secure the energy needed for a town. There are also games (13) providing no problems for solution. Usually interactive games offer appropriate environment so that users can develop systems thinking. In this study, 21 games were reported to involve different interrelated and dynamic parameters referring to the environment, although there are 13 games whose progress depends only on one parameter. The 'Ayiti: The cost of life' belongs to the first case since it deals with health, education, well being and wealth simultaneously. On the other hand the progress of the 'Go goat go' depends only on farming of goats. With respect to the seventh criterion related to ESD, 16 games were found to require users' decisions in order to proceed from stage to stage. In the 'Stop Disasters!' users have to check the soil and its resources before deciding where to construct a building. There are 6 games whose progress depends on users' decisions, such as the 'Errand Run', although in other cases they have to answer questions only. Finally, 12 games require no decisions from users to proceed.

Promoting an organized learning process

Five criteria aim at investigating whether serious games are associated with an organized learning process, i.e. setting goals and rules, promoting a collaborative learning process, evaluation and score. When users know which goals have been achieved during play, they can better plan their choices / actions and can directly self-evaluate their progress. There are 12 games, the goals of which are constantly displayed onto monitor and the achievement of the players is marked. The 'Operation Climate Control' is such a game. Moreover, 10 games (e.g. the 'Errand Run') allow users to see the goals, by clicking a button. The remaining 12 games give the goals only at the beginning.

Rules also constitute a crucial factor for every game, since they set the limits and provide a clear framework. Furthermore, it is preferable if rules are discovered by users through a process of observation and hypothesis testing, rather than to be provided from the beginning. According to the results, 9 games belong to the first category, as they allow users to discover the rules during playing (e.g. the 'Transform it!'), while 20 provide the rules from the beginning. In 5 games the rules are not provided.

Serious games can improve learning process in the class in various ways. Among the most important ones is to enhance collaborative learning and encourage creativity. To be used effectively by teachers, appropriate instructions must be provided. However, only 6 of the games examined provide suitable instructions that could help teachers to use them into class. A game that includes instructions regarding how pupils can collaborate and exchange ideas is the 'Power Up'. Moreover, 13 games promote users' collaboration even if they don't provide specific instructions for teachers (e.g. the '3rd World farmer'). Finally, 15 games are not offered for collaboration into class.

Since evaluation is a constitutive element of every learning process, games with educational purpose, such as serious games, should assess acquisition of knowledge, through tests etc. However, in this study only 3 games (such as the "Operation Resilient Planet") were found to assess knowledge level in every task and 5 games in some of their tasks. The strong majority of games (26) do not assess acquisition of knowledge. On the contrary, most of the games display the score that measures the successful completion of tasks. It has been assumed that it is pedagogically useful that the score is constantly presented on users' monitor, since it constitutes an extrinsic motivation for users. In this regard, 21 games do so, while 11 present the score at the end of the game. Only 2 games have no score, although a relevant comment is provided at the end.

Usability

Although usability of a computer game is linked to many factors, four characteristic ones have been chosen for this study: levels, setting of parameters, saving options and representations.

Regarding games' levels, broad differences have been reported. Although some games have many levels ('Plan it Green' has 45 levels) there are games with only one level. In detail, 15 games offer levels of increasing difficulty, 6 have different levels without increasing difficulty while 13 have no different levels. The importance of setting the parameters of a game consists in its potential to offer a different experience each time

it is used. For instance, in the 'Energy City' users can choose among different city scenarios while they can set specific variables of each scenario (i.e. duration, type of problem, policies etc). 11 games offer this possibility. Some games (8), such as the 'Transform it!', offer a number of alternative scenarios although users have no possibilities to set specific parameters. 15 games depend merely on a particular scenario. With respect to interrupting the progress of a game, only 6 games can be saved to be continued later (from the same point) and 5 can be only stopped temporarily. The remaining 23 don't allow the temporal or permanent saving of the current state. Finally, the representations contribute to games' usability since they allow users to better perceive and understand the sustainability issues they deal with. In this sample, 23 games offer realistic representations (such as the 'Energy Footprint'), while 8 offer partly some fictional (imaginary) representations (e.g. the 'Honoloko' and its health machine). There are 3 games in which the imagination is dominant throughout their representations. In the 'Barrel Blaster' there are, for example, flying barrels.

Table 2: Games' evaluation

Title of game	Number of criterion															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1. Food Force	1	2	1	1	1	2	1	1	1	0	1	2	1	0	1	2
2. Plan it green	1	2	2	2	1	2	2	2	2	1	0	2	1	1	2	2
3. Stop Disasters!	2	2	2	1	1	2	2	2	2	2	0	2	2	2	0	2
4. Trouble Shooter	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	2
5. Water Alert	1	1	1	1	1	2	2	0	1	0	1	2	0	1	2	2
6. Darfur is Dying	1	0	2	1	0	2	0	2	1	0	0	1	0	0	0	2
7. Climate Challenge	2	2	2	2	1	2	2	2	1	1	0	1	1	2	0	2
8. Eco Saviors	0	0	1	1	0	0	0	0	1	0	0	2	2	0	1	1
9. Electrocity	1	2	1	2	2	2	2	1	2	2	0	2	2	2	2	2
10. Clim Way	1	2	2	2	2	2	2	1	1	1	0	1	0	2	2	2
11. Energuy	0	0	1	0	0	0	0	2	0	1	0	1	0	0	0	2
12. EnergyVille	1	2	2	2	1	2	2	2	2	1	0	2	2	2	0	2
13. Barrel Blaster	0	0	1	0	0	0	0	0	0	0	0	2	2	0	1	0
14. Honoloko	0	0	2	1	0	2	1	1	1	1	2	2	0	1	0	1
15. Hutnet Island	0	0	1	0	0	2	0	0	0	0	0	2	2	0	0	1
16. Mission Lighting	0	0	1	1	0	0	0	0	1	0	0	2	0	0	0	0
17. Operation Climate Control	1	2	2	1	1	2	2	2	1	2	0	1	2	1	0	2
18. Operation Resilient Planet	0	2	1	1	2	0	1	2	2	0	2	2	2	0	2	2
19. Errand Run	0	2	2	1	1	2	1	1	1	1	1	1	2	1	0	2
20. Transform it!	0	1	1	0	2	0	2	2	2	1	1	2	0	1	1	2
21. Energy city	1	2	2	2	2	2	2	2	1	1	0	1	2	2	0	2
22. Garbage King	0	0	1	1	0	0	0	1	0	0	0	2	2	0	0	2
23. Power Up	0	2	2	1	1	2	2	2	2	2	0	1	1	0	1	1
24. 3rd World farmer	2	2	2	2	2	2	2	0	2	1	0	1	0	2	0	2
25. Toxic Blaster	0	0	1	0	0	0	0	0	1	0	0	2	2	0	0	0
26. Earth hour	0	0	1	0	0	0	0	1	0	0	0	2	0	0	0	1
27. Age of Ecology	1	2	1	2	2	2	2	1	1	2	0	2	2	2	0	2
28. Energy Footprint	0	0	1	1	0	0	0	0	1	1	0	1	0	0	0	2
29. Ayiti: The cost of life	2	2	1	1	2	2	2	0	1	1	0	2	0	2	0	2
30. Go goat go	1	2	1	1	0	0	0	1	1	0	0	0	1	0	0	1
31. Disaster Watch	1	2	1	1	1	2	1	0	1	0	1	2	1	1	0	2
32. Copenhagen Challenge	0	2	1	1	1	0	1	2	1	0	2	2	2	1	0	1
33. Green Planet	1	0	2	2	2	2	2	0	2	1	0	0	0	2	0	1
34. Catchment Detox	1	2	2	2	1	2	2	1	1	2	0	2	2	2	2	2

Discussion

Serious games have the potential to become a significant tool for achieving the educational purposes of ESD. They could be used either by individuals and/or in the class to support effective learning processes. There are plenty of games related to sustainability and ESD, even though their use has not been investigated within the school context. However many criteria have been set to assess pedagogical aspects and the usability of serious games in general. In this study a new set of criteria has been proposed, focusing on ESD. These criteria were used to evaluate 34 serious games related to sustainability. Three subsets of criteria were formed, i.e. consistency with main dimensions of ESD, promotion of an organised learning process and usability.

It could be argued, that serious games tend to be consistent with ESD's main dimensions since the mean value of the first set of criteria was 1.17. There is, however, much room for improving the quality of such games with respect to the holistic approach of ESD (i.e. covering the environmental, societal and economic dimensions of the topics), construction of knowledge, negotiation of conflicting values and promotion of problem solving. However, they sufficiently cover other pedagogical aspects of ESD, such as the encouragement of users to develop their own attitudes and behaviours, the encouragement of systems thinking and active participation regarding the issues they are dealing with. Furthermore, the mean value of the second set of criteria was 1.21, identifying that serious games could promote an organized learning process, even though they should emphasize more on the setting of goals and the evaluation of knowledge. It would be also important for these games to provide the appropriate conditions, such as giving sufficient instructions for teachers, regarding the use of the games in class. On the other hand, there are issues such as ways of providing the rules and the score, which are sufficiently covered. Finally, serious games demonstrate a quite high level of usability, i.e. mean value 1.39. Apart from the possibility to save the current status on the progress of the player, which is insufficiently provided, they usually have different levels of increasing difficulty. Also they provide users with the possibility of setting the parameters and of experiencing sustainability issues through realistic representations.

Although this study contributes to the development of a new set of criteria that would be used to evaluate serious games related to ESD, further research should be conducted to improve criteria to fully comply with all the qualitative features of ESD. Moreover, there is a great scope for improving the formulation of criteria so as to become clearer and more objective. Within the context of this study the games have

been evaluated by the researchers. It would be crucial to conduct such an evaluation within a class. The views and opinions of teachers and pupils could provide an integrated understanding of how such games actually affect the learning process.

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Cloud Computing and Creativity: Learning on a Massive Open Online Course

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Abstract

This paper explores cloud computing and how it might advance learning and teaching, particularly in terms of social creativity and collaborative learning. We present a study of a Massive Open Online Course (MOOC) – a semi-autonomous learning environment mainly distributed on the cloud – in which Open Educational Resources were produced, researched and shared by participants worldwide. The objective of this research was to explore the level of importance of creativity for learning and then to closely investigate how this creativity might be fostered in such a 'vast' educational setting and what factors might be of importance to enhance creativity in open networked learning. Through the participants' experiences, we discuss the various dynamics and profiles of the participants as they move from being consumers on the environment to becoming 'producers' and take creative steps in their learning. More importantly, we identify the elements of the course that need to be in place to encourage and support this move towards more effective creativity and learning. Finally further discussions and conclusions are presented.

Key words: Cloud computing, creativity, MOOC, networked learning, connectivism.

Introduction

Cloud computing is one of the latest phenomena to be discussed in the online education world. It has been suggested that Cloud computing has numerous advantages for our everyday lives, education included (Miller, 2008). But, what exactly is Cloud computing? How will it shape the future of learning and teaching?

In simple terms, cloud computing is a state-of-the-art internet-based technology that provides access to services, storage space, and resources on demand without the worry of downloading or installing anything on your computer. In effect, millions of people from all around the world can gain access to data and services, including their own data and documents, without the need for large local data centres, from any device that connects to the internet. Without a doubt, there are economic benefits to this, but what would be the educational benefits to millions of people around the world gaining access (if permitted) to one another through distributed services? The first idea coming to mind when assessing such a cloud space for learning, would be the creative potentials that could be nurtured i.e. the endless ideas, thoughts and knowledge that could be shared, created and inspired. Indeed, this extensive facility for multiple tenancy opens up our existing experience and understanding of the term 'collaboration'. In doing so it provides us with a variety of avenues for creative growth. It is this creative growth potential which we believe could hold the key to new and exciting ways of learning and teaching. This paper explores a cloud-based learning environment and how it advances learning and teaching, particularly in terms of social creativity and collaborative learning.

What is cloud computing?

Geelan (2009) suggests the cloud has as many definitions as there are squares on a chess-board ranging from "Everything you can use over the internet" to specific definitions of "virtual servers available over the internet". The term Cloud origins from a metaphor for the Internet and its combination with computing – access to networks, storage elements, software services (Knorr & Gruman, 2009*).* However, Cloud computing is not an entirely new concept but more a concept that has evolved from well known and mature technologies, such as grid computing or the classical high performance computing. After analysing over twenty-two different definitions, Vaquero et al (2009) sums it up:

> *'Clouds are a large pool of easily usable and accessible virtualised resources (such as hardware, development platforms and/or service)', these resources allow for 'an optimum resources utilisation' and adopt a 'pay-per-use model in which guarantees are offered by the infrastructure provider by means of customised Service Level agreements (SLAs)'.*

This paper is interested in looking at the cloud as an accessible, scalable yet flexible on-demand form of computing, for any user with a network connection. It does this by defining the cloud with new perspectives on human cloud interaction, such as the point of contact where humans and clouds meet in order for exchange to take place, means that ease of use and accessibility are some of the key features to gain the attraction of a large number of users. Scalability is also a must, when dealing with a high number of users who might want to use a high number of resources. Finally, flexibility enables the adaptation of cloud solutions to all users to ensure that they get exactly what they want and need. By that, Cloud computing not only introduces a new way of how to perform computations over the Internet, but some observers also posit that it holds the potential to solve a range of ICT problems identified within disparate areas such as education, healthcare, climate change, terrorism, economics etc. (Schubert, 2010; Sclater, 2010; Bristow et al, 2010). Cloud applications have been associated with promising outcomes for education and learning as they facilitate sharing, networking, and communication; the production and publishing of artifacts; and the curation and aggregation of information. Sharpe, Beetham, de Freitas (2010, book cover) posit that current learners operate as 'creative actors and networkers in their own right, who make strategic choices about their use of digital applications and learning approaches'. This would suggest that the level of control that Cloud-based learning afford would be beneficial to the learning endeavour.

In fact, Cloud computing has the potential for new interaction metaphors and new ways of thinking about learning design and learning experiences. The concept of the responsive experience – the adaptation of cloud environments to user needs – opens up the potential to deliver engaging experiences that will motivate new kinds of user requirements and user activities. The interesting question to ask here would be: What will the Cloud mean for the everyday user in relation to his or her education and learning? As the presence of the Cloud heightens, as it currently is (Nelson, 2011), the challenge will be to address the vast range of educational contexts that Cloud applications could be used in. For example, the Cloud might have the potential to give the control of learning to learners or to personalise the learning experience, by

providing flexibility in adapting to the specific user's educational requirements and her or his conditions of use (Kop & Fournier, 2011). It could hold opportunities for adaptable interface generation based on specific educational contexts, varied user locality when considering mobile devices etc., and versatility on whether the Cloud application would be used as a standalone application to support personal learning, or as part of an orchestration of collaborative educational environments. The Cloud has the facility to support multi-tenancy and this paper will explore if this will hold any potential for education. Cloud computing and its flexibility have been identified as possibly powerful components to provide people with the opportunities to author and distribute content and in doing so to develop skills to work with and be creative. It has the means to include opportunities conducive of creativity in current teaching and learning processes, including encouraging intelligent content in real time, multiple and collaborative social interactions, social reflections and social problem solving.

Creativity and social creativity

Articulating new and novel ideas, thoughts, feelings, being playful, experimenting, pushing boundaries, expressing, adding value, are all words that are associated with the term creativity. But what exactly does this term mean? What does it mean for education and learning in our rapidly changing and increasingly global world? Like the term Cloud computing, there are several variations and categories of creativity definitions; however, Warr (2007) brings these categories of creativity definitions together to form one more unified definition:

> *'Creativity in design is the generation of ideas, which are a combination of two or more existing bundles of knowledge to produce a new knowledge structure. For this new generated idea to be considered creative it should be: novel – unusual or new to the mind in which it arose; and appropriate – conform to the characteristics of a desired/accepted solution. Such creative ideas may then be implemented and embodied in a creative product' (Warr, 2007).*

Creativity is the ability to come up with ideas or artifacts that are original, surprising, and valuable. It has also been associated with a form of self-expression, which might be problematic in formal education as Runco, explains:

> *By definition, self expression requires that the individual student him or herself decides what to express. That assumes that the individual him- or herself first constructs an original idea. Otherwise it is not self-expression but the expression of someone else's thinking. This is not as easy as it sounds. Educators tend to have groups of students in the classroom, and there is a curriculum–a plan, if you will. Original ideas and self-expressions are often contrary to that plan. (Runco, 2008, p. 99.)*

This means that the educational structures themselves could be detrimental to creativity, but we will return to this later. In addition, Runco (2008) emphasised that more than originality is at stake to creativity. A second important component would be 'effectiveness', which would make creativity, a form of original self-expression, but with a particular purpose. He gave as an example of something that is not creative, the original ideas of a psychotic. His ideas might be original, but the lack of focus would disbar it from being creative. But how do we set in place/ initiate the emergence of these creative ideas?

Fischer et al. (2005) believe that creative activity grows out of the relationship between individuals and their work, as well as from the interactions between individuals. In fact, Warr & O'Neill (2005) show how social creativity has the potential to support greater idea generation than individual creativity, i.e. real groups have the potential to generate more creative ideas than nominal groups by taking advantage of shared domains of knowledge. Much of our intelligence and creativity results from interaction and collaboration with other individuals as Csikszentmihalyi (1996) points out. Fischer et al. (2005) take it a little further when they state that individual creativity and social creativity do not represent a binary choice; they can and need to be integrated to for instance develop innovative solutions to complex design problems, such as how the different knowledge, expertise, and perspectives that exist among individuals provide opportunities to collaborate toward more creative and sustainable solutions.

It has been suggested that the perfect setting to develop creativity would be an educational one. Amabile (1996, p203) notes that of all the social and environmental factors that might influence creativity, most can be found in the classroom. In her

book *Creativity in Context*, Amabile (p229/331) sums up the environmental stimulants for creativity, these include: freedom, good project management, sufficient resources, encouragement, various organisational characteristics, recognition, sufficient time, challenge, and pressure. She suggests that open classrooms with more personalised instruction and less emphasis on teacher control, might possibly be more conducive to creativity than traditional classrooms. Likewise, College environments that include teachers who give personalised attention to students outside the class serve as models of creativity activity and encourage students to be independent. She highlights that when students have the freedom to decide what to do or how to accomplish the task, a sense of control over their own work and ideas also can be conducive to creativity. Finally, she also notes that engaging in playful activities can increase subsequent creativity, in that it gives students the opportunity to explore new properties of objects but also because play can stimulate fantasy which in turn can make creativity more likely. Horwitz (1979) found in his research that a style of teaching involving flexibility of space, student choice of activity, richness of learning materials, integration of curriculum areas and more individual or small –group than large group instruction influenced the level of creativity in the classroom.

Moreover, Sahlberg (2009) believes that in education the challenge often is to help students find their own creative passion to learn and do things. He breaks it down into a number of steps: to work in an innovation-rich environment one has to develop mindsets able to identify and understand non-linear, systemic processes that are conducive to innovation. Second, there needs to be more of a focus on 'learning to learn together' and working productively with other people, for instance through co-operative learning. Third, teaching and learning in schools should be viewed as systemic processes that rely on principles of active participation, social interaction, dialogue and reflection. It is about using technology to set up spaces/environments that attract, and hold the attention of and inspire the learners; innovation-rich environments that draw the learner into learning and involve him or her with others in making sense of something. Creativity can occur when learners are confronted with challenges in which they need to share knowledge and experience with others in order to figure out and make sense of these in new and innovative ways. Of course, as the references from the literature above have shown, if the educational settings are too structured, creativity will be killed, rather than fostered. It is suggested then, that the active participation of learners in the learning endeavour in an open environment, such as the Cloud, and in collaboration with others are the important factors for creativity to materialize. But are they really?

Researching Creativity in a MOOC

To investigate deeper how creativity might be fostered in an educational context and what factors might be of importance, the researchers chose to study a Massive Open Online Course (MOOC) as a setting. MOOC is described here as a Cloud Learning Environment in that it uses cloud services/applications to implement the core features of the course. It is a web-based open learning environment made up of various cloud based applications, in which Open Educational Resources were produced, researched and shared by participants. The structure was limited.

The setting

The researched MOOC was organized by the National Research Council of Canada as part of their research in Personal Learning Environments, and took place in cooperation with Athabasca University and the University of Prince Edwards Island. The subject under scrutiny was Personal Learning Environments, Networks and Knowledge (PLENK). It was a free course which lasted 10 weeks and on which 1641 participants were registered. PLENK2010 did not consist of a body of content and was not conducted in a single place or environment. The learning environment was distributed across the Web through Cloud-based applications.

Two of the facilitators on the course were the founders of 'Connectivism' that has been earmarked by some as the learning theory for the 21st century (Siemens & Downes, 2008, 2009). Downes and Siemens have highlighted the importance of human agency on numerous occasions, in addition to the necessity of active participation in connectivist learning. They stress the importance of four types of activity for successful networked learning and these were incorporated as follows in the learning event:

1. *Aggregation:* The collection of a wide variety of resources to read, watch or play. One of the aggregators was using gRSShopper technology to collect course-related resources, and distributed these to participants as a daily newsletter called 'The Daily'.
2. *Remixing:* after reading, watching or listening to some content, it would be important to keep track of these somewhere – i.e., by creating a blog, an account with del.icio.us or by creating a new entry, taking part in a Moodle discussion, or using any service on the internet – Flickr, Second Life, Google Groups, Facebook, YouTube, NetVibes and reflect on what had been collected and make connections between different resources;

3. *Creating:* participants would then be encouraged to create something of their own. In the PLENK2010 MOOC the facilitators suggested and described tools that participants could use to create their own content. The job of the participants was to use the tools and just practice with them. Facilitators demonstrated, gave examples, used the tools themselves, and talked about them in depth. It was envisaged that with practice participants would become accomplished creators and critics of ideas and knowledge;
4. *Feed Forward*: participants were encouraged to share their work with other people on the course and with the world at large. However, participants were able to work completely in private, not showing anything to anybody if they wished to do so. Facilitators emphasized that sharing would always be the participant's choice.

Especially the 3rd stage was a creative production phase and quite a few examples of creative production on the course were apparent. A tag would be used to identify anything that was created in relation to the course, also outside the course structure on the Cloud, on sites such as blogs, social networking, photo-sharing and bookmarking sites. A hash tag was used as course identifier on micro-blogging tools such as Twitter, using the course tag #PLENK2010. This is how content related to the course was recognized, aggregated, and displayed in 'The Daily' newsletter for the course. This Daily was the central resource that participants could subscribe to if they wished to do so, and it displayed aggregated resources and artifacts produced by participants related to the course. In addition a Moodle Learning Management System with wiki was used to hold discussions and display course resources, schedule and speakers. This was the structure provided by four facilitators, who also provided learner support in the form of videos, slideshows and discussion posts in addition to blog posts, feedback to blogs and Moodle discussion posts. Their presence was also felt during the synchronous Elluminate sessions, once a week to introduce a guest speaker, and once a week for a synchronous discussion and chat session with participants related to that week's subject. Throughout the course Twitter and participants' and facilitators' blogs developed around the course subject, and Facebook Groups, Second Life and other Cloud-based social network environments were developed by participants.

Research methodology

If people are encouraged to move into the cloud and away from the institution for their learning, it is important to find out the relevance to the learning experience of the informal (online) networks in which they find their information and where they might develop and produce digital artifacts. A network in the context of this paper would be an open online 'space' where people meet, as nodes on networks, while communicating with others and while using blogs, wikis, audio-visuals and other information streams and resources. De Laat (2006) highlighted the complexity of researching networked learning and emphasized as key problems the issues of human agency and the multitude of issues involved, such as the dynamics of the network, power-relations on the network, and the amount of content generated. The research challenge was to investigate the cloud learning environment in relation to creativity and open learning. This means that the learning environment under investigation could not be controlled too much as this would restrict its flexibility and openness, the choices made by learners and the interrelatedness of tools used by learners. This in turn, could potentially influence the creativity displayed by learners. Subsequently, effective research would require a multi-method approach involving data-analysis of the traces of activity and communication left by learners on multiple Cloud-based applications. What was investigated was the level and nature of engagement with tools and people, the production of digital artifacts, and the factors influencing creativity related to these.

The NRC research team decided to use a mixed methods approach and a variety of research techniques and analysis tools to capture the diverse activities and the learning experiences of participants on PLENK2010. Learning analytics tools were used as a quantitative form of Social Network Analysis to clarify activity and relationships between nodes on the PLENK network (Fournier et al. 2011). Three surveys were carried out at the end of the course and after it had finished to capture learning experiences during the course: End survey (N=62); 'Active producers' survey (N= 31); 'Lurkers' survey (N=74)

In addition, qualitative methods in the form of virtual ethnography have been used. A researcher was an observer during the course and also carried out a focus group in the final week of the course to gain a deeper understanding of particular issues related to the active participation of learners. A large amount of discursive data was also collected and analysed. The researchers were interested in the processes taking place, the perspectives and understandings of the people in the setting, as Hammersley (2001,

p. 55) calls it: the "details, context, emotion and the webs of social relationships that join persons to one another". In Web based research the technology itself and the artifacts it produces should be taken into consideration in the 'online' ethnography, as these are part of the research setting and might influence the human interactions researched (Hines, 2005). Subsequently, the influence of cloud technologies on creativity and learning was taken into consideration in this research. As vast amounts of discursive data were generated in this form of networked learning in an open environment, computational tools, such as nVivo, have been used for the coding, analysis and interpretation of the qualitative research data. The #PLENK2010 tag was used to identify course related writing outside the course environment and informed consent was asked from participants to use these for the research.

The Moodle data mining functionality was used as component in the data analysis and provided participant details, their level of use and access of resources, information on course activities, and discussions taking place in the course forums. The gRSShopper aggregator statistics functionality provided details on course-related use of blogs, social book marking and micro-blogging tools such as Twitter. Some analytics and visualization tools, such as the Social Networks Adapting Pedagogical Practice (SNAPP) tool, were also used to deliver real-time social network visualizations of Moodle discussion forum activity, while the visualization tool NetDraw was used to create an ego network to provide an understanding of the role of a particular actor in a discussion.

Because of the volume of data generated by the 1,641 participants and facilitators and the restrictions on time to produce this paper, quantitative analysis of blog posts, Twitter and Moodle participation has been used, but the qualitative analysis of data for this paper has been restricted to the Moodle environment and some blogs that were representative of all the blogs produced by participants.

Who were the participants?

The professional background of participants on the PLENK course, were mainly employed in education, research and design and development of learning opportunities and environments. They were teachers, researchers, managers, mentors, engineers, facilitators, trainers, university professors. Chart 1 shows PLENK participants' age distribution and Figure 1 shows a Google Map representing participants' residence, which is available online as a two-page interactive map, and was instigated by one of the PLENK participants.

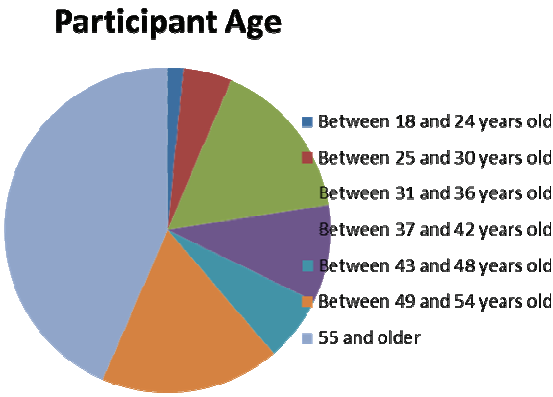

Chart 1. PLENK Participants' age

Figure 1. PLENK participant place of residence

Agency and active participation

Some people, experienced in learning on MOOCs, were very involved in using the Cloud-based tools on the course and were creative in their participation. One participant for instance produced a Google Map (see Figure 1) that has received 24,558 views so far and a blog that has been read in 69 countries. Another produced a creative concept map of a Personal Learning Network as shown in Figure 2. Other participants used Pearltrees to curate, visualize and share resources on the Cloud with other participants as shown in Figure 3.

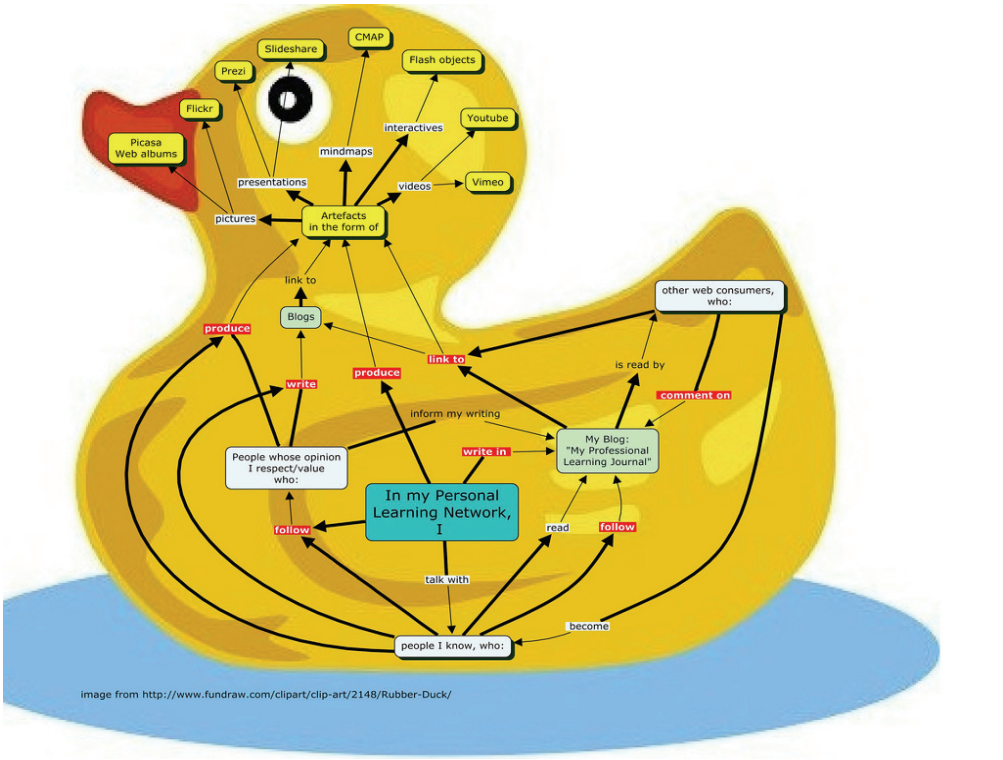

Figure 2. Example of learner concept map http://bit.ly/hRBMSR)

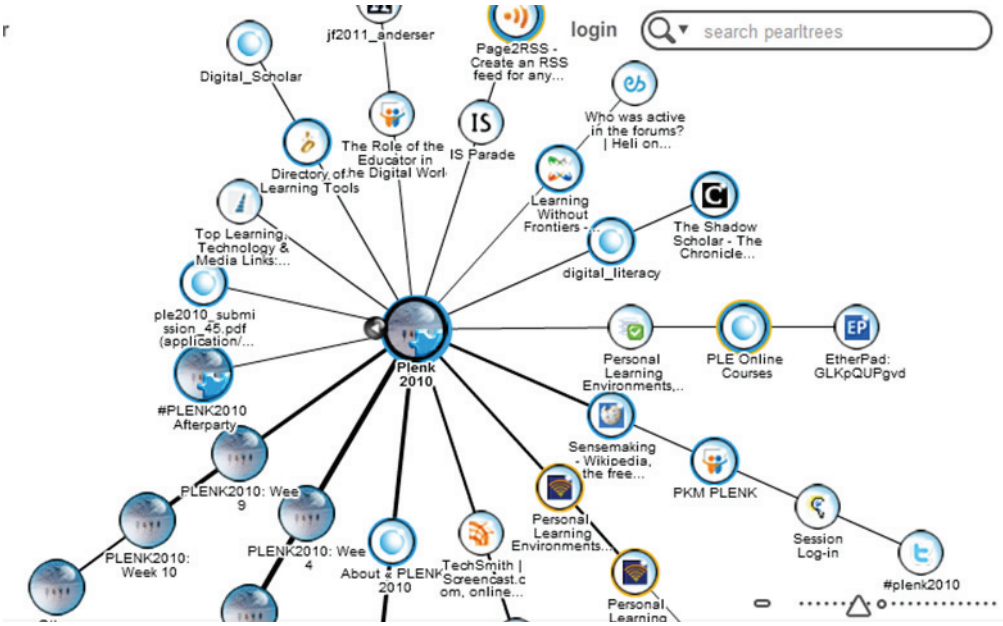

Figure 3. Example of Pearltrees of PLENK2010 resources (http://bit.ly/vwG4CH)

Not all participants contributed in a visibly active way. There were a high number of people who accessed resources, but who were not engaged in producing blog posts, videos or other digital artifacts. They seemed to be consumers, rather than creative producers on the course.

The basis of MOOCs has always been four activities:

1. actively aggregating,
2. actively relating these aggregated resources to earlier experiences and knowledge,
3. actively repurposing; producing a digital artifact with this mix of thoughts, and
4. an actively sharing stage.

Between 40 and 60 were active producers, the other 1580 were not active in this way. This was unexpected to the course organizers as before the start they saw the production phase as vital to the learning on a networked environment. Of course, as some participants mentioned in the discussion, if nobody is an active producer, it limits the resources that all participants can use to develop their ideas, discussion, thinking, inspiration and learning on, in short, it limits the creativity and innovation potential of the course. It is, however, in line with the level of 'lurking' that takes place on the Internet in general (Nielsen, 2006; Bughin, 2007).

The learners and facilitators on the course were very interested in this discrepancy between 'consuming' and 'producing' .The course subject was related to the use of technology in educational settings, and as the majority of participants were educators, researchers and developers of learning environments, extensive discussions took place on the subject. The researchers also held a focus group and carried out surveys amongst 'lurkers' and 'producers' to get to the essence of (creative) production or consumption for the learning experience.

In the words of one of the course facilitators in the Moodle environment:

> *Creating something is an important activity. When you create a blog post, podcast, or concept map, you're sharing your sense making activities with others. Others, who are at a similar point in the course, may find resonance with your artefact. Your sense making activity becomes a node that others can connect to and engage with. Multiple sense making artefacts offer more diversity than only*

centering activities around readings and resources that the instructor has provided.

The active participants on the course indicated in their responses in the survey that their active production and interaction with others enhanced their learning; it helped them to reflect, involved them in a creative process and they liked to give something back to the group. They also believed that the more people would be actively producing, the more engaging the course would be for all participants involved.

If it is seen to be important to be creative producers on a course of this nature, based and distributed in the Cloud, it is also essential to find out what would tempt people into creating something. In the active participant survey it became clear that different people have different ideas on this. 64 % of respondents indicated that the content of a discussion post by someone else and 56 % a blog post from someone else were triggers for people to produce something themselves. It would also spur people into action when others would connect different concepts (52 %), or shared a particular Cloud-based tool (40 %) as shown in Chart 2. In addition respondents highlighted issues such as the need for self reflection on what was being learnt from the various sources, inspiration from the connections the individual was making and the urge to share what was being learnt, in additional to examples of creative work by others.

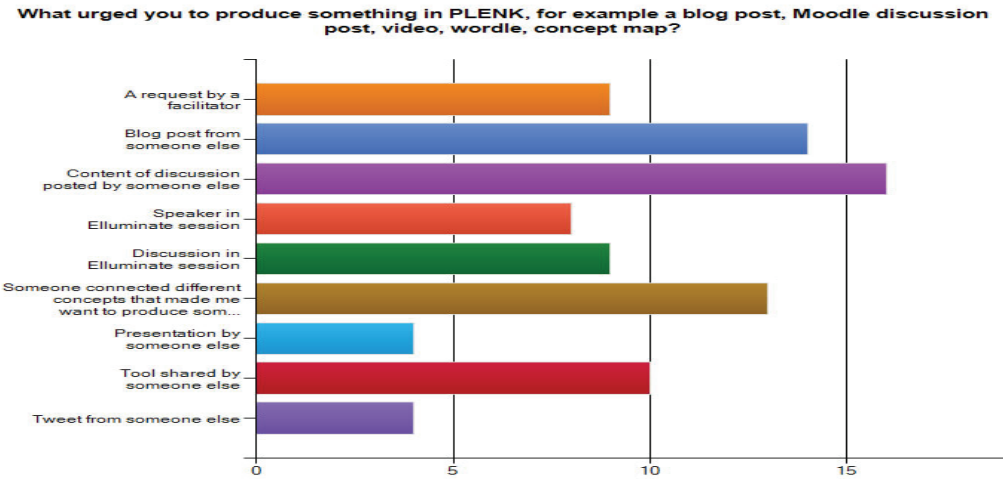

Chart 2. Learner motivation to produce a digital artifact in PLENK2010

It was clear that the dynamics of the course network, and the social interaction on the learning network stimulated creative production. People moved back and forth between microblogging tool Twitter, participant blogs and the Moodle discussion forum for communication, collaboration and sharing of resources and artifacts. Figure 4 and 5 show some of the dynamics on the course networks. Figure 4 shows that it is not only the facilitator (the red dot) who was important in the social interaction, there was a rich tapestry of connections and interactions between participants as well. Figure 5 shows that some participants were more important and involved in the Twitter discussions and sharing activities than others, they became hubs; distributors of resources and information.

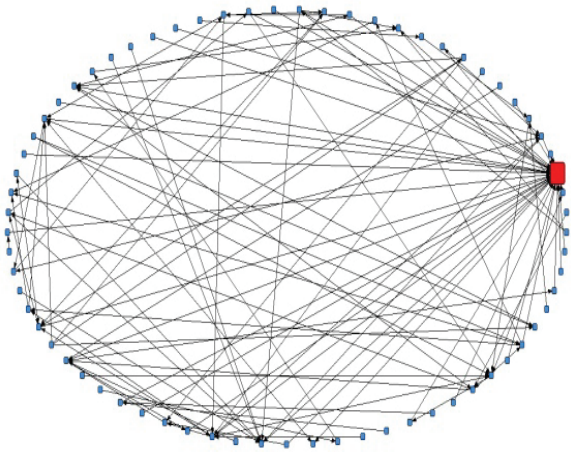

Figure 4. The complex network that a facilitator's post generated

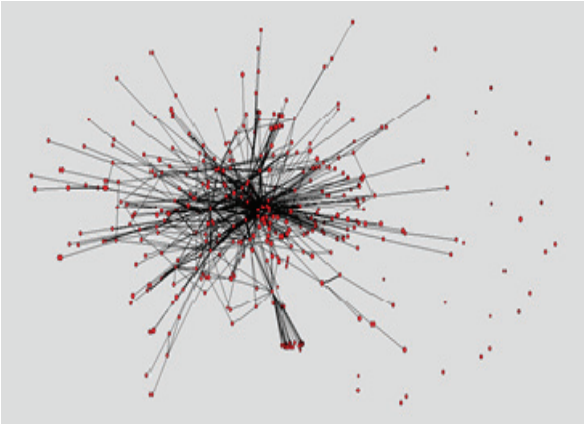

Figure 5. The PLENK2010 Twitter network

It was highlighted by numerous participants that there is a transitional process for people to move from being a 'lurker' to becoming a 'creator'. Novices to MOOCs expressed their insecurity in the learning community and their lack of confidence and trust that impaired their ability to produce in such a learning environment;

> *. . I'm learning and contributing as I go. . . I'm getting more and more involved as I go on and as my comfort level increases. . . . PLNs, despite best intentions can be quite cliquey (sp?) and as a newcomer, that can be quite intimidating. Will I get more comfortable sharing and experimenting? You bet! (A participant)*

On the other side of the confidence spectrum, people indicated that they were autonomous, self-directed learners with limited time on their hands and that creating and participating in discussion was not necessarily necessary to advance their learning. 54.5 % of respondents to the lurkers' survey indicated that they have always been self-directed learners and do not feel they have to actively share and reply to discussion forums and blogs to learn. In addition, 50.9 % highlighted that they are tactical lurkers who use particular strategies that are especially useful in their learning. The most important restricting factor to their participation in PLENK were issues outside the course, related to people's everyday life, such as time, job, family and other commitments, which were given by 80.6 % of respondents to the lurkers' survey. Other factors highlighted as important to lurkers were: being a listener and reflector, so not being active was the natural thing to do (34.3 %) and the perception that lurking is a legitimate learning strategy (29.9 %).

Moreover, there were indications in the end survey that communication, questions and feedback from others, especially 'knowledgeable others' would move forward people's learning. The creation and discussion of digital artifacts instigated reflection on the learning process and clearly advanced the learning of some participants (63.3 % of respondents). These artifacts might be blog posts, videos, pearltrees, animations, or innovative concept maps, such as in Figure 2. and would fly around the PLENK2010 network and clearly inspire others to investigate tools and to produce artifacts themselves.

Discussion and conclusions

Agency and activity are required to thrive in a semi-autonomous learning environment mainly distributed on the Cloud, outside the scope of institutional educational support. It was clear from the research that learners have their own ideas on what type of activities would suit them, their life styles and their confidence levels, and the majority chose to be involved in aggregating, 'remixing' and sharing of information, without getting involved in the creative production stage. However, the majority of participants believed that the creative production of digital artifacts by some learners, and the discussions that followed on the network, inspired them in the development of ideas and in their learning. It seems that to bring out the creative potential in people and to inspire them into the production of digital artifacts, they must feel comfortable in their learning environment and have a certain level of trust in fellow-participants. This in addition to feeling comfortable and confident in using the new tools that are available to them. There should be an atmosphere that nurtures an inner confidence in the learner to engage in playful activities, to experiment with new and different ways of articulating their thoughts, feelings and ideas, to push boundaries for creative expression and then share these with others.

The Moodle course site, and especially the Daily newsletter, which was based on gRRShopper software (Downes, 2008) and aggregated course resources and artifacts created by participants, proved to be an anchor in the vast Cloud environment. It provided an informal sense of structure to the seemingly vast cloud space and it gave people the support they needed to feel comfortable and connected to other participants. Although, novices to learning on the MOOC still felt overwhelmed, initially, by the experience of the high volume of resources and information, new contacts, applications and tools that needed to be managed, learners had the space (new yet vast) to explore something novel and allow their learning and creativity to flow in a way that worked best for them.

Given the high number of non-active participants on the course, in the sense of not producing digital artifacts, a valid question to ask would be if and how we might tailor the Cloud and its shared and sharable applications to ensure that learning and creativity is encouraged and that people make the transition from being a consumer to being an active creator? At the moment the daunting, yet very exciting aspect of the Cloud is its vastness. It is essentially a huge open space with tools and applications, potentially full of ideas, knowledge, and experiences that people can tap into if they are confident enough and not too risk-averse. As noted, people take risk when they

produce and share something on the Web. The interaction with others and the reaction to other's creative production has been a factor in people engaging in such activities themselves. It has become clear from this research that it does give people pleasure to express themselves and play with Cloud based tools and applications. We have documented learner satisfaction from producing something meaningful that can be shared instantly whilst also giving something back to other learners and possibly sparking ideas in others to advance their learning.

The research showed that it takes time for people to build confidence and to experience the spark that drives people towards taking that creative production step. It was also evident that the artifacts that others produced and the social interaction within the course network, by using micro-blogging tools and discussion forums, inspired and motivated people into creating.

The main difference in setting between the case studied in this paper and a traditional (distance) education one is the emphasis on a Cloud-based and dispersed learning environment. It is mainly controlled by learners, rather than educators and educational institutions and as was highlighted by Sharpe, Beetham, de Freitas & Conole (2010), the technological realities of learners are changing, which impacts on their learning expectations and learning experiences. They make their own choices of whom to communicate with, and what resources and tools to use for their learning. In this research, the use of the Daily demonstrated that some structure, provided in a very informal way, could anchor and focus people's learning journey within the vast Cloud-based learning space whilst it also seemed to allow learners to reap the benefits of its vastness. In various different degrees, it was seen to provide the necessary support for the many different learning contexts on the course, for differentiation and diversity, for collaboration and ultimately empowering learners to be creative and take control.

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Inspiring creativity in organisations, teachers and learners through Open Educational Resources

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Special Themed Issue on Creativity and Open Educational Resources (OER) Fostering Creativity – The Use of Open Educational Resources

Abstract

The design of educational material has a history of allowing people to present an individual expert view (the researcher as academic teacher) and a published base of knowledge (the academic teacher as text book writer). As learning has moved online and has now become more open a new dynamic of communication is emerging from the teacher to the learner, from the teacher to the teacher, and from the organisation to the world. In exploiting these new dynamics there are changes in motivations for creating and designing materials, but are there also chances to embrace a new creativity? In this paper we use an activity theoretic approach to look at three sources of evidence for impact from taking an open approach to learning resources. First impact on an organisation to identify its role as an enabler for creativity and change. Second on the educator and the way reuse of content allows selection of new patterns of design. Third impact is on the learner as open educational resources blends content with social. The cases present evidence that seeing open resources as change agents can lead to the release of creativity for organisations, for teachers and for learners.

Keywords: Open Educational Resources, OER, OLnet, OpenLearn, Activity Theory, Creativity

Planning for a more open approach

Higher Education has always required a mixture of skills from the participants. The learners are expected to be self-motivated, able to use existing knowledge base, and be entering a learning community with concepts of "Graduateness" (Walker, 1998) as well as of learning the content. The teachers also have expectations on them; that they are themselves experts, well connected with the field, have a sound basis of shared understanding, and also that they are able to communicate well. These skills may not always be in place and in a series of studies by Trigwell, Prosser and Waterhouse (1999) they have shown how the engagement of the teacher and their belief in the ways that students can learn are important indicators of how they function as teachers.

There is also a third perspective, that of the organisation. Universities are established as the primary providers of higher education and they are founded as "schools of education, and schools of research" (Whitehead, 1929) on the basis of acting as repositories of knowledge, developers of knowledge and building the base for future knowledge. In this view universities have an altruistic basis for their identity which has helped to lead to a more open approach to content exemplified by the position of the William and Flora Hewlett Foundation, summarised as "It takes a hardy and callous soul to reject the UN's millennium goal of education for all. We argue that one important step toward this goal is to provide high-quality digitized, free educational materials to everyone in the world." (Smith & Casserly, 2006) and as set out by Charles Vest, President of MIT at the time they launched their OpenCourseWare initiative, as having the core aim to "enhance human learning worldwide" (Vest, 2004).

The Hewlett Foundation has acted as a major funder of Open Educational Resources (OER). OER are free resources that have included clear permission for others to reuse. In the Open University UK we have been working with ways to make our resources more freely available as OER. In the OpenLearn initiative (McAndrew et al, 2009) content was both released from existing courses and new material developed for free access. In the research strand for OpenLearn we looked at the impact this had on the organisation, the educator and the learners who used content. A follow-on project, OLnet, has built on this experience to draw further lessons from the worldwide move to embrace more open methods.

The move to openness has an impact on each of the three perspectives. For the learner there are new sources of information available and new communities that they can connect to. The *always on* approach of the Internet competes with the more traditional

time bounded concept of taking courses and the requirements of the work place move from a factual base to skills and competencies (Trilling, 2001; P21, 2002).

For the teacher the change in available sources of content mean that they lose some of the privilege of being a conduit for facts and arcane, on the other hand they are also faced with a multitude of options for sources that they need to select from and use to provide the keys for others to learn from.

The organisational position in this new world can seem hard to justify. If learners can find resources themselves, demonstrate their own learning outcomes, and connect with expert communities for feedback and participation the value of the experience and accreditation offered by a university can seem much reduced.

The Role of Creativity

Dictionary definitions of creativity refer to the use of the imagination, original ideas and inventiveness and so the concept leads to a hope of the more unexpected or individual, but perhaps the more useful interpretation comes from (Robinson, 2011) who focuses on creativity as a "process of developing original ideas that have value". Robinson argues that creativity can be found in anyone, provided the conditions are right. The spark of creativity can help transform the individual as they spot innovations in how they can act. Can that spark also apply to institutions and staff? Arguably the greater the number of people involved in an organisation then the greater the inertia and the more likely that creativity will be stifled by the scale of operation and ingrained methods. On the other hand the impact of allowing innovation and creativity can be greater as the scale increases.

Establishing more open practices appears to remove constraints that match to some of the conditions for creativity: extended reach, changes and relaxations of rules, and the chance to make a difference. In this paper an activity theory framework is used to provide some tools that help understand the impact of those practice. For each of the three domains examples are presented that indicate how openness has led to a more creative approach. First from an institution as it implements access to open resources and how this is reflected in other institutions internationally. Second, how individual educators are responding creatively and the way in which consideration of how and where we design the learning experience can encourage use and reuse of the available resources. The third aspect is to consider the learner perspective and see the

emergence of new behaviours for learners grouped around the presence of free content as well as the use of free content.

Using activity theory as a theoretical framework

Extracting results and evidence from examining case studies has some difficulties (Yin, 2002). The studies carry context and can only be reported in brief so the reports inevitably carry some of the researcher's own perspective and the way they have drawn out relevant findings. In the case of open approaches to learning and teaching these challenges for research are amplified by bringing together three already difficult aspects: the systems are complex combinations of technology and practices; learning is multi faceted process where it is difficult to isolate factors; and, the openness of systems means that there is no formal link between the researchers and those providing them with data.

The primary framework that has been applied to studying these cases is drawn from Activity Theory, and in particular Engeström's interpretation of Activity Theory. This framework helps analysis to consider the combination of factors that influence any subject trying to reach any objective. The factors are identified by Engeström (1987) as interactions between the nodes and mid points of an activity triangle labelled as *Tools, Rules, Community* and *Division of Labour* impacting on the *Subject* and the *Object*. We have applied a variation of this form of analysis by using pairs of activity triangles to develop alternative perspectives on the same situation (McAndrew, Taylor, Clow, 2010) to help communicate the tensions in complex learning systems. In Figure 1 this dual perspective is illustrated with the front, semiotic, triangle showing the usual labelling recommended by Engeström, while the second, technological, triangle brings out elements of a user experiencing the system. In principle this multi-layered view can be repeated a number of times to represent difference perspectives, though in practice it has been applied only using two different view points. The value of an activity based approach to analysis is that it helps to take into account multiple data sources such as the view of those undertaking action research (Somekh, 2006) and anecdotal evidence alongside more usual forms of evaluation data such as semi-structured interviews, survey data and observed behaviour.

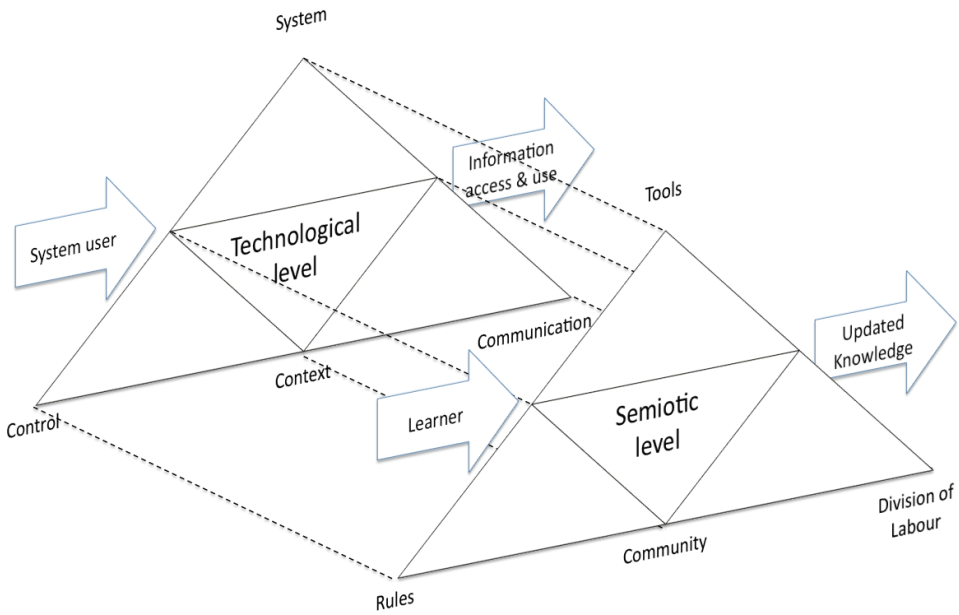

Figure 1. Activity triangles viewing a situation from alternative perspectives

Engeström's work offers a way to review situations while paying sufficient attention to key contextual factors and balancing the identification of negative indicators, such as contradictions and tensions, with the way in which objectives can be achieved. He has also pointed out the relationship with creativity in stating "… most important aspect of human activity is its creativity …" (Engeström & Miettinen, 1999:26). Other researchers working with activity theory have also used it to examine creative situations (Tikhomorov, 1999). This paper will only touch briefly on the analysis itself as the expansion of each case study into factors and examination of the evaluation data for confirming factors and contradictions is difficult to present within the context of a single paper. The use of activity theory in the analysis of OpenLearn in particular is described more fully in (Godwin, McAndrew & Sanots, 2008; McAndrew et al., 2009) and applied to particular cases in (McAndrew, Santos & Godwin, 2007) and (McAndrew, Santos).

It is also worth considering the way that Engeström (2001) has linked Activity Theory with an expansive view of learning and methods of working (Engeström, 2008). The value of the expansionist view is to understand how actions can build into a beneficial cycle that can bring effective working and opportunities for learning. In our work the expansive view of learning can be identified in both the way that educators can operate

"Social Production" of open materials and in how learners can move through both independent content driven and social stages in learning using OER.

In setting out this framework we have emphasised the use of Engeström's view of Activity Theory as the basis. In practice other references and forms of analysis were also applied including terminology and methods from Discourse analysis, applied to interpret the messages and positions of those involved in the OER movement ([Santos – flatworld]), Systems thinking to set out the design aims for OpenLearn ([Lane – systemic or the proposal]), Grounded theory (Glaser & Holton, 2004) to develop the interview-based rich case studies used as underlying data to understand users, and Cluster analysis, to pick out the different attitudes of learners. Such a holistic approach to combining research data is both a consequence of a relatively large project in action where researchers bring their own background and skills, and also an aim it itself to allow results to emerge from different sources. The strength of Engeström's work and other developments from it are that it addresses both analytic techniques and also communicative and explanatory roles. In the case studies that follow we also hope that having set out the theoretical lens that it will help them to act together as a set of evidence.

Influence of OER on an organisation

The impact of adopting a more open approach is examined primarily by reviewing recent experiences at The Open University. In 2006 The Open University launched the OpenLearn site to offer free access to educational material. OpenLearn was constructed as an experiment to explore how offering free content could be achieved. In the proposal to the William and Flora Hewlett Foundation, which supported OpenLearn financially in its first two years of operation, it stated:

> *'The University has an extensive reservoir of high-quality learning materials available in a variety of formats. It proposes to explore how best to make some of these freely accessible in an international web-based open content environment and, in so doing, to advance open content delivery methods and technologies by:*
>
> *– deploying leading-edge learning management tools for learner support;*
> *– encouraging the creation of non-formal collaborative learning communities;*

> *– enhancing international research-based knowledge about modern pedagogies for higher education.' [Ref proposal?]*

A key element in this description is that the initiative was designed to "explore" approaches and to enhance knowledge about what it meant to work with OER. In the period of funding there were no explicit aims for the University to gain directly from working with OER though it was certainly hoped that reasons would emerge for it to be able to sustain the activity beyond its time as an externally funded initiative. In practice this meant establishing an action research approach to working on the project and gathering evaluation data from a range of participants in OpenLearn through project meetings, interviews. A total of more than 70 public reports and presentations were produced and released, and many less-formal events also took place, these operated as a mix of gathering data, awareness raising and dissemination activity.

Reviewing the impact of OpenLearn across the institution (McAndrew et al., 2009) revealed that The Open University had gained in several areas by contributing to open educational resources. These gains can sometimes be measured: student recruitment; new partnerships; awards received; and, new projects. More often they are less tangible but clearly exist: opportunity to experiment; development of staff; low level collaborations; and, enhanced reputation. Some of these gains were as much due to changes in attitude and working practice as in a direct result of having released open content.

For example the way in which OpenLearn needed to operate as a large project that had been brought together in a very short period of time meant that people from different sections of the university were working directly together often for the first time. Academics, technical support, copyright specialists, researchers and communication teams all needed to interoperate and achieve ambitious targets in a short time. The benefits of this were brought out in an interview with the technical director mid way through the project who stated "[for me one of the changes was all working together and getting out of our silos]". This restructuring encouraged creative solutions and cut through the time taken to reach decisions, the way that content was structured had been under discussion for more than three years, within three months of starting OpenLearn it had been decided and implemented. Similarly the adoption of appropriate licensing for openly available material was achieved very rapidly with the head of intellectual property identifying the new factors of "wide acceptance worldwide, easily understandable terms" as reasons to go outside of in house solutions and legal advice and take the more radical step to adopt a Creative Commons licence

(http://creativecommons.org). The converse of this spur to creativity in the early stages was that over time OpenLearn generated its own legacy and relatively fixed methods to address work. There was some frustration with time spent checking through content, which was part of early practice. Eventually the work flow adjusted to one of allowing "beta" content to be released prior to final corrections and feedback, but such risks were hard to fit into the overall culture of quality.

The analytic framework supported by activity theory encourages each of the factors tools, rules, community and division of labour to be considered. The framework applies at different levels, for instance the analysis of the way in which content was available for reuse showed how different expectations on the tools and division of labour in reworking content and in particular the rules applied in other organisations about who may be involved in collaborative work meant that an early potential partnership with a South American university was much less fruitful than was hoped. Applying the same framework to the project overall though gives an indication of the factors that made it successful. Rules were relaxed and motivation gained through being part of an international community with altruistic aims, the division of labour brought in specialists to help meet overall goals and tools development was more rapid than is usual within the organisation. The approach also freed up the team to engage with innovative concepts such as the "permanent beta" philosophy that underlies Web 2.0 and the move to less formal models for learning.

Influence of OER on teaching

The existence of free high-quality learning materials, such as OER, could provide teachers with the opportunity to change the way they teach. Some of the intent of OER was to rebalance their role from creators of content to facilitators of learning and orchestrating the use of materials rather than undertaking the writing and creation of such material. The first wave of OER material, such as that from the MIT OCW, was intended to be a simple transfer of content already used for teaching on campus to make them available for the use of other educators on their campus. As the concept of OER has developed there has been a switch to the expectation that learners will be using the content directly and a second wave of OER 2.0, exemplified by OpenLearn, incorporate material that contains tasks that help it work for self-directed learning and are offered through online learning environments with tools that help learning happen.

The design of material on OpenLearn is based on the distance learning material that has been used for independent learning. This arguably makes it more transferable and indeed there has been take up as intended by those who developed the OER idea. For example, as described by Issack (2011), OpenLearn materials have been used in the context of both undergraduate and Masters level courses for the VUSSC in Mauritius. The use described includes "as-is" transfer of content with rebranding on to local servers, "repurposing" to include additional material that gives local context, and "value-addition" where the original content is used as a model for a derived version, with emphasis on preserving the *pedagogic design* rather than the format and modality of the original material.

In a study by Wilson (2009) she reports on the attitude from a range of educators to OER content and notes that seeing the content as able to slot in "as is" into curriculum is viewed as particularly strong when transferring from the original country (UK) context to international, while similar "as is" use is seen as an adjunct to existing course materials within the same country. This indicates a possible reluctance to accept replacement of content where the content is sourced from an organisation competing in the same market. In activity terms, the explicit *Rule* of OER that permits such use is contradicted by the implicit *Rule* of individuality and local ownership of course content that inhibits the adoption of content. In examining data from a review of Web 2.0 approaches Conole & Alevizou (2010) note the apparent paradox of the opportunities mixed with misgivings that new technologies and methods for learning bring, leading to "lack of understanding of the implications of adopting more open approaches and … fear of openness". Addressing such issues requires a change in culture and practice rather than needing formal changes.

Such contradictory feelings and pressures can therefore only be partly addressed by the provider of open content, when the rules and custom applying to the recipient also need to change. However, one issue of the reuse of open content is whether it can be made clear to another educator that they can understand the intent of open resources and how the design is meant to work in the context that they are considering. Research carried out in OLnet (Dimitriadis et al., 2009) explored the ways to represent learning materials as designs with mixed results. The representations did increase the way in which the original intent in materials could be communicated, this matched with positive results for using a learning design approach to constructing teaching materials in teams (Conole & Weller, 2008). However, any representation has limitations and can also act to enforce a particular approach while the openness of OER and the lack of a direct connection from the supplier to those reusing the material encourages greater

freedom. In activity terms the act of providing such designs can give rise to a contradiction between the *Rule* of openness, the *Division of Labour* where a design is supplied and the *Community* that is expected to own the reuse process. This can be mitigated by generating additional designs that can then be shared back. The benefits of such an approach can be seen in the community sites that are focussed on exchange of "lesson plans" such as http://www.thegateway.org. However, building well represented learning designs is usually time consuming (Koper, 2006) and not part of the existing work pattern of higher education.

An alternative is to consider a patterns approach to identifying ways to support learning with OER. A study by Dimitriadis et al. (2009) worked mainly with collaborative patterns and then carried out focus group sessions that gathered feedback on both the use of designs and patterns by experienced teachers. In contrast to the use of designs where there was resistance to the model of teaching imposed by the design, patterns were felt to offer a manageable range of options that could inspire new uses of content breaking through both the original design and implied sequencing of the order of material. As the patterns are themselves generic and describe learning situations rather than specific to content they are more reusable and fewer patterns are needed than the content linked designs. The activity model that this leads to is a form of "social production" as shown in Figure 2.

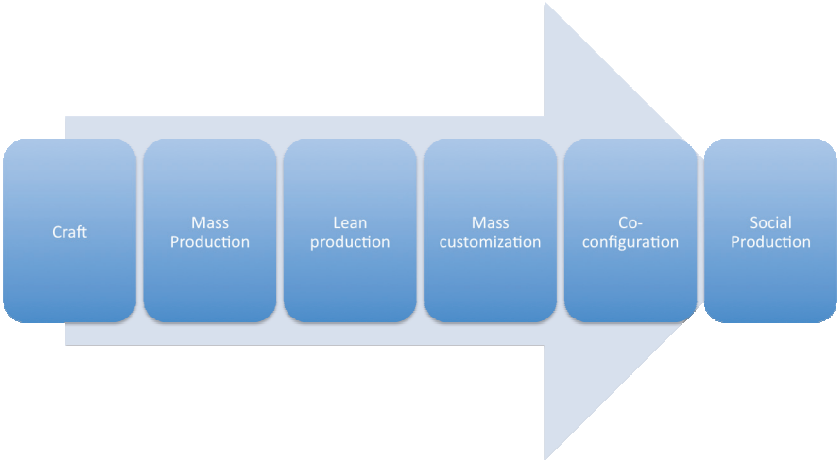

Figure 2. Evolution of production methods (simplified from Engeström, 2008)

The sequence illustrated in Figure 2 considers a sequence of different methods of production and working argued by Engeström (2008) as a natural evolution with openness a key component of social production. As with other examples of social

production, the social approach to producing educational content is in its infancy and so the working practices have yet to be finalised. However the steps in the evolutionary sequence also imply an increase in the opportunity for creativity and influence; the individual teacher or the organisation can both take the chance to adopt materials from a large number of sources, and also change or initiate their own content back into the system. For example academics at a university in Brazil (Mendonça and Santos, 2010) first adopted the use of some content from OpenLearn, then translated to Portuguese for local use, then added back in those translations, then extended the material with new content in both Portuguese and in English. The same group then went on to develop outreach courses to support learning by their students' families using the open resources to keep costs as low as possible.

Influence of OER on the learner

The most important user in OER is the learner. Unless the content and structure can act to support learning then the rationale for OER has no basis. The previous sections have considered how organisations can act to adopt and use OER to change their practice and draw greater value from existing work producing content, and how the educator can mediate OER to take them from one context to another. However OER also provide a more direct link from learners to resources. The openness and free-from-cost route to access content lowers significant barriers to opportunity for learners and obviates the need for explicit relationships with either an educator or an organisation. In an early survey of a sample of users of OpenLearn we found more statements that related to "free" and "fun" rather than as a "taster" before more formal learning or to learn particular "content" (Ravenscroft & McAndrew, 2007). The typical response "I like the idea of learning for pleasure as opposed to learning to achieve targets." outweighing those who aim "To upgrade skills … and to meet the requirements for the jobs" or "…to try OU course units before registering for the course."

OER also enables the overcoming of physical barriers of distance and health. One example that showed how working openly was different occurred shortly after we set up OpenLearn. In examining logs of data from the server, which represents too much data to sift through in detail, we picked an unusual entry where someone had accessed the site quickly but for a lot of files. As the person was registered as part of the OpenLearn community, and had given permission to be part of the research element of OpenLearn they could be contacted. On making the contact and asking about their use of OpenLearn, it was found that they worked for the local Government of an island

in the middle of the Atlantic and had been downloading content as quickly as they could while they had a usable connection and then printing the content to learn together with colleagues and address the lack of locally available material.

This story both provides an illustration of the reach of the OER content, and of the partial data that we have as researchers – there are over 14 million unique users of OpenLearn and it is impractical to ask them all what is their motivation or experience. Rather it is necessary to find a way to include isolated examples such as these alongside more targeted research on groups of interest. Cases that were examined included looking into the experience of disadvantaged groups, the young and the elderly. The value of OER to groups such as those who are past normal age for tertiary education came through in survey responses such as "This is a way of keeping my brain active, whilst my body deteriorates …" or to those who have difficulty accessing education for practical reasons "I am currently in the Army on a 6 month tour … difficult for me to get computer access consistently but when I have been able to go on open learn I have enjoyed the opportunity …" Organisations such as University of the Third Age (U3A) have also been able to plan actions to use OER to support blended learning building links with their existing face to face meetings of U3A and the online learning clubs that OpenLearn can set up around content of common interest.

In this way OER can be argued to provide an additional access route to learning even facilitating access in prisons (Hancock, 2010), but does it also lead to new ways of learning? The lack of restrictions on the content has enabled new groupings for learners to take some control themselves. On OpenLearn this is reflected in "Learning Clubs" which allow anyone to start their own interest group and link together resource sets, additional guidance and a schedule of activity without any imposed control. We also explored the motivations of the learners using OpenLearn in a variety of ways. One that was particularly revealing was a cluster analysis of features used and desired that showed two different categories of user: volunteer students who were interested in the course structure and facilities, and social learners who were more interested in the community and tools to share opinions (Godwin & McAndrew, 208; McAndrew, 2010). In the Peer to Peer University (P2PU) they have gone further with their tag-line of "Learning for everyone, by everyone, about almost anything" to allow learners to construct their own structures around modules that have an open sign up. P2PU still retains their reference to course structures, cohorts and fixed timetables but also bring out the social element in depending on participation and peer activities for most of the learning. The explicit design of content varies across P2PU, however an implicit design

of 'read – think-reflect – share-comment' occurs in how groups were expected to operate (de Liddo & Alevizou, 2010).

Openness gives the chance for learning to go outside the usual boundaries of cohorts and content from instructors, so called Massive Open Online Course (MOOC) offer the chance for learners to follow a set sequence of activities guided by resources and a lead "teacher" but often with their choice of where and whether they carry out the tasks. The MOOC approach assumes that learners can find their own place to blog their assignments, or play with software, tools and video to give alternative reports. Links between learners are controlled by the identifying "tag" that helps track activity and outputs. The eventual success in completing the course is then evident in the posts and outputs each can show, though in some cases there is an option to pay for these to be reviewed and receive credit. This view of individualised learning has been taken further by those who set out their own agenda for learning, again relying on the openness of their work to act in place of formal accreditation (Kamenetz, 2010).

The activity of learning in the open therefore has been addressed in two ways by both creating online experiences that feel like they are formal courses, and by those that depend on social connection and reduce the role of content. Even with more individual actions the trigger is often the shared interest in a topic and in learning. Content then acts to bring such people together and remains an important aspect in creating the critical mass of participation that helps social learning work.

Conclusion

This paper has looked at the experiences of use of OER from the three perspectives of the organisation, the educator and the learner. An underlying activity theoretical approach has brought out how in each case the move to openness can help to align actions with emerging rules, communities and ways of working, but also be inhibited by conflict with existing practice and expectations.

For organisations the initial opportunity is in using OER as a change agent by relaxing rules and offering alternative motivations that also bring benefits to the organisation. The potential is also to realign to a more forward looking model of social production that brings in educators (and others) who are beyond the boundaries of the organisation. This is starting to happen but the culture of being an academic means that there is some uncertainty in engaging with all the chances the openness gives.

For the learner too there are alternatives. Seeing OER as part of a continuum of learning to fit with other studies, provides options for individuals to bridge more formal learning with many options for subject and source of support material. More revolutionary is the chance to change attitudes and include creative actions in the open and social exchanges alongside designed learning activities. For the individual learner the reduction in control allows them to follow their own path and make individual decisions, however the overall structure of learning is not without benefits in guiding and scaffolding the learning process. The alternative to control can be chaos. Openness and choice can lead to multiple paths, potentially as many as there are individuals, and among the chaos there will be the "bad", aimless and time-consuming, as well as the "good", constructive and creative. Openness along with enough resources of value and examples of practice may offer a route to learning at the edge of chaos that fits with other changes in society and reduces the dependence on ingrained institutions and approaches.

The opportunities for organisations, teachers and learners to leave behind some of the limitations of developing content and curriculum are apparent. For the organisation there is the chance to create new ways to learn or to teach with it; if the existing universities and educational institutions do not take that chance then others may or indeed learners and teachers may bypass the need for conventional accreditation. Openness offers many paths for the future of learning, that future may indeed be a bit more complex and chaotic, but could also offer the seed for inspiration and creativity by all involved.

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YouTube as a Repository: The Creative Practice of Students as Producers of Open Educational Resources

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Fostering Creativity – The Use of Open Educational Resources

Abstract

In this paper we present an alternative view of Open Educational Resources (OERs). Rather than focusing on open media resources produced by expert practitioners for use by peers and learners, we examine the practice of learners as active agents, producing open media resources using the devices in their pockets: their mobile phones. In this study, students are the producers and operate simultaneously as legitimate members of the YouTube community and producers of educational content for future cohorts. Taking an Action Research approach we investigated how student's engagement with open media resources related to their creativity. Using Kleiman's framework of fives conceptual themes which emerged from academics experiences of creativity (constraint, process, product, transformation, fulfilment), we found that these themes revealed the opportunities designed into the assessed task and provided a useful lens with which to view students' authentic creative experiences.

Students' experience of creativity mapped on to Kleiman's framework, and was affected by assessment. Dimensions of openness changed across platforms, although the impact of authenticity and publication on creativity was evident, and the production of open media resources that have a dual function as OERs has clear benefits in terms of knowledge sharing and community participation. The transformational impacts for students were evident in the short term but would merit a longitudinal study. A series of conclusions are drawn to inform future practice and research.

"The most important thing in our rapidly changing society is not to amass some certain knowledge forever, but to be able to throw out obsolete knowledge, to be ready to start over, to see the world with fresh eyes" (Kupferberg, 2003)

Keywords: OERs, Creativity, Mobile, YouTube, Producers, Community

Introduction

UK Higher Education (HE) in the 21st Century is changing. Government funding of HE has gradually shifted from the government funding provision directly to funding via a graduate contribution system, putting students as customers whose demand drives the number of places in different universities and how teaching is delivered (Browne, 2010; Hall, 2010). As students invest more in their education and look forward to a long period of debt, employability looms large with the vocational and practice-based elements of degrees assuming increased significance for students. This shift is beginning to be recognized by HE institutions and by academics as they design and deliver curricula.

There is a long tradition of education being linked to practice: Dewey saw experiences as both the means and the goal of education (Dewey, 1998), first published in 1938. Practical outcomes need not be mundane, indeed creativity is valued by employers. However creativity is scarce as an explicit learning outcome in the UK academic curriculum, and companies that employ graduates invest in training for them to learn creative ways of thinking (Norman Jackson, 2002).

Converging technologies and web services offer new opportunities for mediating personal, social and organisational practices. 'Everyday' devices and services such as smartphones[1] and social networking and knowledge sharing services like Facebook, Twitter, blogs and wikis have become part of the tapestry of our daily lives – personal, study and work (COMSCORE, 2010). These devices can be used to capture, remix and share media, which has led to a rise in participatory culture, an acceptance of imperfection and the authentic experience of creativity as a social process (Gauntlett,

[1] A smartphone is a mobile phone that combines aspects of computers, phones and cameras. They run operating systems that provide a platform for application developers to offer applications that improve the usability and functionality of the phone beyond what is available through the purchase of the phone itself.

2011). Whether or not we can define exactly what staff and students will do in converging technology contexts where personal devices are used for both 'work' and 'play', we can assert that engagement in authentic and reflective practice offers opportunities for creativity and relevant learning.

The context for our study is the Professional Sound and Video Technology (PSVT) degree, a vocational undergraduate degree that prepares students for employment in the broadcast industries – industries that are themselves in a state of flux due to technology and media convergence. Possibilities for learning, teaching, creating and publishing across multiple open platforms and mobile devices mean that it is increasingly important for students on vocational programmes to not only 'know the subject' but also to prepare themselves for dynamic industries where the only thing that is certain is change. The final year Advanced Multimedia module combines vocational relevance with a critical approach whereby students are encouraged to reflect on their professional practice and develop an understanding of past, present and future developments in their chosen industry. The reflective nature and creative ethos of the module sets it apart from others on the programme, with its focus on open media production and communication rather than technology per se. As well as defining a range of competencies through learning outcomes, the module places an increased emphasis on platform-agnosticism[2], individual interests and learner-centred assessment. For the past 2 cohorts, students have been assigned assessed group work of using their mobile phones to make short films that are published openly.

In an HE context where employability is a key driver, and the links between subject content and professional practice are valued, emerging technologies offer students opportunities to engage in authentic and up to date creative experiences. The outcomes of those experiences can be published media resources, in this case on YouTube, open to review by anyone. We have an incomplete understanding of the effectiveness of this type of learning activity influencing student practice. In this paper we aim to increase understanding by addressing the following question:

How does students' engagement with open media resources relate to their experiences of creativity?

[2] Platform agnosticism (in technology) is generally used to refer to an application that will run on any computer operating system. In this context, we use the term to describe an approach where students are free to produce and publish media on any platform of their choice.

We examine the literature on Creativity, Open Educational Resources and Mobile Phone filming, followed by a description of our research methodology, the details of the case, and the results. In the next section, we analyse and discuss student experiences of creativity and their relation to Open Educational Resources. Finally we draw conclusions to inform future practice and research.

Creativity

The nature and definition of creativity has been the subject of debate for hundreds of years, yet it is only in recent times that creativity has been conceptualised as a life-skill; no longer the preserve of the arts or exceptional individuals, creativity has entered the discourse as a societal as well as personal *competence* which is essential for a learning society in the modern age (Loveless, 2002). However the idea of 'core competences' is not uncontroversial; for example Kupferberg sees the notion as reductive and a relic of an industrial mindset. Competencies - despite their necessity – may even act as barriers to original thinking as due to their rigidity (Kupferberg, 2003; Leonard-Barton, 1995).

In education, creativity is no longer tied to particular disciplines or epistemologies, but is now a feature of recent curriculum frameworks alongside employability, enterprise and innovation (Kleiman, 2008). Whilst it still conceptualised differently across disciplines, creativity is generally defined as the development and production of something 'novel', of 'value', with distinctions drawn between the product and the process (and also person and place). Further theoretical frameworks have been used to view creativity through multiple lenses, for example as a social practice (Amabile, 1996; Knight, 2002), as a digital literacy (Walsh, 2007), in terms of its relation to new technologies (Sefton-Green, 1999), or as a combination of these conceptualisations (Gauntlett, 2011).

Aspiring to creativity as an outcome of education does not guarantee its delivery, as education can stifle rather than promote creativity (Knudsen, 2010; Robinson, 2007). At the same time, while the constraints imposed by educational processes can be seen as prohibiting creativity, creativity can also be viewed as (or even triggered by) a reaction to constraint, working "across the boundaries of acceptability in specific contexts" and "exploring new territory and taking risks" (Jackson & Shaw, 2005)

Kleiman's (2008) conceptual map of creativity in learning and teaching frames our analysis of student practice in mobile video. Constraint, process, product, transformation and fulfilment are the categories of experiences of creativity derived inductively from interviews with 12 UK academics across a range of disciplines. **Constraint** provided a focus for creativity when academics saw constraints as possibilities for enabling student creativity, when 'systems' imposed barriers to creativity, and when constraints formed a trigger to the academics' own experience of creativity in producing 'workarounds'. **Process-focused creativity** can be seen as leading to an explicit outcome (possibly a creative product); leading to an implicit outcome (say, having a creative experience); or with no outcome where the creative experience could be of playing for its own sake. Where the focus is on the **Product**, the emphasis could be on newness and originality or on the production of utility and value. Of course in the re-mix culture, originality is re-interpreted, particularly in media-sharing communities such as YouTube, where re-mixing of media is seen as participative and creative. Kleiman sees **Transformation-focused** experiences of creativity as "an engagement in a process that is transformative, either in itself, or is undertaken with the intention (implicit or explicit) of being transformative". Creative experiences with a focus on **Fulfilment** are characterised by personal commitment and a sense of achievement.

These conceptions of creativity include disorientation and encountering the unexpected – unconventional approaches to learning and teaching in contrast to the more conventional pedagogical devices of scaffolding and frameworks. We build on Kleiman's conceptual framework derived from academics' perceptions of creativity by applying it to student perceptions of creativity in the context of a media creation project that challenges some of what they have been taught on other parts of their degree programme. Media constraints and disorientation are viewed as discontinuities in the learning process (Lanzara, 2010) that have the potential to transform learners through facilitating deep learning and reflection.

Open educational resources

In this paper we explore creativity as something that can be experienced by groups of students when they are asked to create a (public) media artifact using a tool that is a personal device rather than one that would form part of their normal learning resources. Although resources may include print and even people (Downes, 2007), Open Educational Resources are generally seen as digitised materials offered freely and

openly for educators, students and self-learners to use and reuse for teaching, learning and research (Hylén, 2007). However, these resources exist within communities that produce, use and sustain them (Downes, 2007)and form part of participatory pedagogies (Brown & Adler, 2008) that characterise the student as active and engaged. Demand-pull learning emphasises student authentic participation in communities that go beyond their classroom.

> *"passion-based learning, motivated by the student either wanting to become a member of a particular community of practice or by just wanting to learn about, make, or perform something" (Brown & Adler, 2008).*

However, in much of the discussion on OER, the emphasis is on *teachers'* creation and finding of knowledge for students to use. Postgraduate student work is increasingly 'owned' by institutions (Stacey, 2007) and although joint content development by teachers and students is predicted (IIEP, 2005) cited in (Stacey, 2007), students are primarily seen as consumers rather than producers of OERs.

Hoyle' distinguishes between big and little OERs (Hoyle, 2009) where big OERs are institutional repositories of teaching materials with explicit aims and quality control procedures and little OERs are produced by individuals, have low production values and shared through third party services (Weller, 2010).[3]

Why mobile phone films?

In this study, we are introducing mobile phones as creative tools whose use is free from the normative constraints of established practices using high-end equipment. Mobile phone film-making lends itself well to a creative pedagogy based on user-generated content (UGC) and open media production/consumption, as short-form video is easy to produce on a mobile phone and is ideally suited to viewing and sharing between mobile devices and across the web. Through the rising genre of mobile filmmaking a new aesthetic has emerged, emphasizing the importance of location and the everyday (Baker, Schleser, & Molga, 2009). 'Mistakes' such as pixellation and shakiness are viewed as characteristics of the medium. The projects set for students are

[3] Weller publishes his paper at a Conference and stores it in the Open University repository Open Research Online, both of which have explicit quality criteria (big OER), using the concept of big and little OER that he acknowledges from Hoyle's blog post (little OER).

in the spirit of the 'good enough' movement that combines a new aesthetic with the experience of creating digital media, where the importance of the content (subject matter) and its context of use overrules low production values (Engholm, 2010). This pragmatic approach is consistent with the Deweyian tradition of experiential learning that pervades vocational degree programmes. Mobile phone films offer an authenticity in content which can lead to a heightened sense of verisimilitude; as short-form films gain importance as a type of web-based media, so it becomes clear that the understanding of, and ability to produce such content is desirable for these students.

Students engage actively with a range of digital technologies through the production of open media resources. They are encouraged think about user-generated content in a different way and develop an appreciation for the potential for mobile devices as creative tools. The intention is for them to develop an appreciation for participatory media production and to think 'outside the box', developing skills in the production of (UGC) and thinking editorially, as opposed to the more traditional narrative-based approach to film-making. Through engaging with a range of open media resources as both consumers and producers, and producing mobile films which necessitate the development of innovative approaches to overcome constraints of the medium crossing the boundaries between traditional and new paradigms, we offer the learners greater opportunities for creativity in their practice.

Researching Two Years of Mobile Film Projects

Action Research (AR) is an approach that allowed us to solve practical problems in a higher education module, and to test and generate theory (Baskerville, 1999; Mumford, 2001). AR is essentially cyclical in nature, e.g. Checkland's Framework for AR (Checkland & Holwell, 1998) and Susman and Evered's 5 stage AR Process (Susman & Evered, 1978). Our approach was consistent with the 'new Action Research' where the emphasis is more on individual flourishing within a community and less on contribution to scientific knowledge (Oates, 2004; Reason & Bradbury, 2001). The first author designed the learning activity, collected data and conducted ongoing reflection throughout the process, with the second author acting as 'critical friend' (Kember et al., 1997). Both authors reviewed the literature before, during and after the student projects, writing and reflecting via a shared private space. Students were also participants in the research, contributing valuable process data and reflections via their blogs and wikis; and making their own practical achievements. The AR project ran from November 2009 to December 2010, involving 2 cohorts of students (n=25 in 2009, n=23 in 2010). Two separate mobile film/OER projects took

place, each lasting for 6 weeks (Nov-Dec 2009, Nov-Dec 2010). The personal reflections of the tutor during and after the 2009 project informed the design of the 2010 project: in 2009 an appreciation of the scope for creativity emerged as the overriding theme in student evaluation and feedback, closely followed by their acknowledgment of the benefits of publishing work openly. However, further study was required to identify why and how students were experiencing creativity and how this related to the publication of open media resources (if at all). A more targeted approach was taken to data collection in 2010. Research data was collected from a range of sources, both online and offline:

- Mobile films and comments on them (open resources hosted on YouTube)
- Reflective blog posts (open resources hosted on Wordpress)
- Group wikis (open resources hosted on Wikispaces/PBWiki)
- Photo-diaries (open resources hosted on Flickr)
- Module evaluation questionnaires
- Participant observation + session notes

The information generated from the dataset, while mainly qualitative in nature, was coded into emergent themes through intertextual analysis of the films alongside the other open resources that were produced. Critical incidents were recorded, alongside 'vignettes' which highlighted key (both expected and unexpected) issues. Open blogs and wikis have not been quoted verbatim (in accordance with University ethical approval) as a web search could reveal the identity of the author.

The Mobile Video Case

The BSc (Hons) in Professional Sound and Video Technology at the University of Salford is a course in production skills for the broadcast industry. Students, who are typically in their early 20s, aim to work full time as engineers, production professionals or technicians. All entrants to the BSc conversion year have successfully completed a two-year HND course that is practice-based with a heavy emphasis on technical skills. Two-thirds of these students come from other institutions, and many have no prior experience of video production; the remaining students have studied at Salford and already have some skills in the production of video using high-end equipment. For all students, making short films using mobile phones is novel, and counter-cultural to the technology focus of their previous practice. They are working away from their 'comfort zone' as they are not able to rely on high-end equipment.

The module under study (Advanced Multimedia) encourages students to engage critically with mobile and web-based technologies, developing their online presence and digital identity alongside experimentation with open participatory media production with a view to identifying how these technologies can be used professionally. The emphasis is on using digital media effectively across a range of open platforms, encouraging the learners to work openly and creatively and to consider issues and techniques in relation to multi-channel content production.

In this project, PSVT students worked in groups to produce short practice-based films shot entirely on their mobile phones, developing imaginative and innovative filming techniques through exploring the affordances of the technology. Each cohort was introduced to mobile film-making through a masterclass delivered by Hugh Garry from BBC Audio and Music, winner of a Media Guardian Innovation Award in 2009 for "Shoot the Summer", a film shot entirely on mobile phones. The aim of the masterclass was to inspire the group to consider techniques and approaches that challenged students' received wisdom and exploited the affordances of the medium. They were free to make their films on any subject of their choice, and were asked to collaborate on the development of ideas and negotiate their chosen subject/genre within their group – openness was a theme of the module. With an emphasis on open content and open platforms, groups were responsible for managing their own projects through wikis, which were authored collaboratively and used to document the overall research and production processes and present the final project report. A visual diary of the 'making of' each film was presented in Flickr, alongside textual commentary (using overlay notes and descriptions) that linked to the corresponding wiki, offering the viewer a rich insight into their creative and technical processes. Each student was also asked to write 3 reflective blog posts at key stages of the project: beginning, middle and end. By producing open content across multiple spaces, both as a group (film, wiki, Flickr) and individually (reflective blogs), the students were able to publish their final creative product (the film) and describe and reflect on the creative processes which led up to that product. The films were presented to students and staff in a mini 'film festival'. All materials were made openly available online – a total of 13 films were produced: 7 in 2009, 6 in 2010.

Results

Table 1: Mobile Films produced in 2009/10 (hyperlinked to available films)

	2009	2010
No. of students	25 (2 female/23 male)	23 (3 female/20 male)
% who own camphones	60%	90%
No. of films produced	7	6
Films (titles with links to those we have permission to publish in this paper)	The Move FilmSoundFound From Busk 'til Dawn 8MP Desperados Live at Newton A Mobile Intrusion Mobile Productions	MOAR House and Whatever Life Cycles Killing in Your Eyes Mobile Cyphers Carry The Torch iPhone Adventure

Camphone ownership increased significantly from 2009 to 2010, although the low ratio of female/male students remained fairly constant. Each group produced and published a final film, a collaborative wiki and Flickr photo diary, and individual reflective blogs. Films were between 3 and 5 minutes in length and demonstrated a range of influences, although owing to the collaborative nature of the project the audio-visual montage was the key feature of many of the films, particularly in 2010 when most students were able to film on their own devices.

Discussion

Through using multiple media across a range of open platforms the students were able to immerse themselves in the technologies as mobile networked learners and open content producers. Following the five conceptual themes that emerged in Kleiman's study (constraint, process, product, transformation and fulfillment), we explore the students' experiences of creativity in using and creating open media resources.

Constraint

The technical constraints of the mobile phones were generally experienced as opportunities to produce 'workarounds' and experiment with filming practice away from the orthodoxy. Many students (n=24) appreciated the way that the device limitations influenced their thinking about how to create the footage, and also added

grittiness and realism. This is consonant with much of YouTube footage, immediate rather than slick.

However students did not always fully-embrace the more accidental aspects of the medium. One group had mistakenly filmed in different aspect ratios and orientations, but rather than treat this as a characteristic of the genre the group saw it as a failure and re-filmed in order to ensure consistency across scenes. A student from this group saw the solution in standardising video formats, a view that demonstrates how conventional film-making practice was still guiding the perceptions of some students, and their aversion to breaking the rules in spite of being encouraged to do so. There was a marked reluctance to move away from the constraints of conventional practice that could be related to lack of ego (Runco, 2008) or lack of confidence in risk-taking (Kleiman, 2008). This reluctance was not dispelled by the film "Shoot the Summer" (shown to them at the beginning of the project) that contained footage that ran counter-cultural to convention such as the camera falling over during filming. Despite our discussion of this being a relic of the medium, some students still did not feel comfortable or confident in using this kind of accidental footage. However, others expressed their appreciation for this new freedom from their prior experience of filmmaking techniques.

Process

The process-focused outcomes of the project were both explicit (the generation of a creative product, the films themselves) and implicit (having a creative experience within a group). Playing for its own sake was not an expectation of the project for either staff or students. Students clearly *had* fun but were not doing it *for* fun; although significantly, some of the students have gone on to make their own mobile films after taking part in the project.

One of the main aims of the mobile-film making exercise was for students to think about what they could do with a phone that they couldn't do with a normal/high-end video camera, and they were specifically asked to develop imaginative and creative techniques. They demonstrated a range of innovative practices, often involving the placement of the phone e.g. inside a glass inside a fish bowl, stuck to a record as it spun around, placed inside a post-box. An interesting example of students developing their ideas in process was of one group where a student identified places where a phone camera would fit (down a grid, on a kite) and then used these ideas to develop the narrative with his group.

Although, in general, students were much more focused on making and editing the films than the process-related artifacts (images, blogs and wikis), one student did express the hope that their group's wiki could be used in future as a reference, and another hoped that their film and their accounts of the development process could inspire others to make their own films.

Out of the 12 student films published on YouTube (originally 13, but 1 was taken offline after publication at the request of the subjects) only 2 groups were open about their project being part of their university coursework, explicitly mentioning the PSVT course – although 2 other groups did allude the film being part of a project. No group linked to their wiki/Flickr/blog posts from their film on YouTube, although linkages were made from the blog posts, wikis and Flickr to the film. Their films were presented as independent YouTube artifacts, suggesting that media published on other open platforms were seen as being peripheral to the film itself.

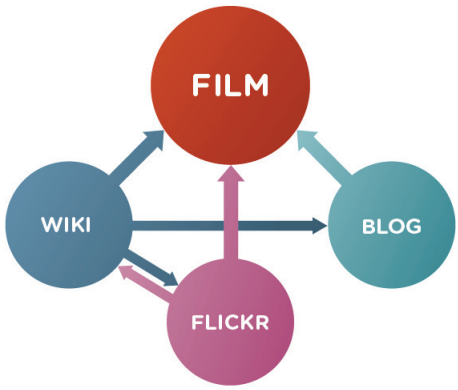

Figure 1. Links between platforms

Their attitudes towards, and levels of engagement with, the open platforms differed according to process and purpose:

- YouTube – the 'cool' space (tied to culture, high level of engagement)
- Wiki – the report space (tied to education, mixed level of engagement (high-medium))
- Blog – the personal space (tied to individual identity, high level of engagement)
- Flickr – the 'strange' space ("why do we have to use Flickr?", low level of engagement)

Product

Due to mobile phone films being seen as an emerging genre, this project lends itself well to the creation of 'new' and 'original' products - in fact, all students felt that they had been creative and innovative in their projects. The re-interpretation of originality which underpins remix culture also featured strongly, whether through sampling (in the case of the David Lynch quote at the beginning of the film "Life Cycles" or through reinterpreting the work of others (in the case of "MOAR House and Whatever", which was a remake of a house track using household objects). If we consider the films as creations that are new, original *and* having value, then it is important to consider personal value versus domain value.

One of the most successful films (according to Youtube views/ratings and class response) in 2010 (MOAR House and Whatever) received over 4,000 views, 3 YouTube awards and 7 pages of comments in 24 hours, all of which were highly positive. This response and the unwillingness of groups to identify the work as a 'student project' underlines the experience of students as legitimate members of an external community such as YouTube. As a piece of open content produced by students, this will serve as an inspiring example for future cohorts (it will be interesting to observe the influence of this film) and has also been lauded by a senior producer for a major broadcaster.

In contrast to this, one of the films rated as the best by the class in 2009 ("The Move") received only one YouTube comment on its release, which was negative. It was interesting to note the reaction of the 2010 group when being shown this 2009 film in class. They noticed the negative comment on YouTube and this influenced their attitude towards the film, as they considered it to be low in domain value. This was in sharp contrast to the 2009 cohort, who were not influenced by its reception on YouTube and rated it as being the best film produced across the whole group. Stylistically it played on the graininess and low-fi quality of the camera which added to the verisimilitude of the film – however people viewing the film out of context as a single YouTube upload (the invisible audience) were not aware of this and rated it as being low quality. The 2010 cohort veered away from this style after seeing the YouTube comment, even though the 2009 cohort had rated it highly, knowing the context of the film and the rationale for the amateur footage style. These experiences put the classroom and YouTube communities into contrast.

Transformation

Kleiman (2008) highlights risk-taking, chance (encountering and exploiting), serendipity and opportunity as factors that influenced creativity as a transformation-focused experience. The mobile phone, by its very nature as a pervasive, accessible, unobtrusive recording medium, lends itself to creativity through chance encounters and this is something that is evident in 11 out of the 13 films produced. The authenticity of serendipitous footage can be seen as being a characteristic of the genre, although the ease of recording authentic footage does raise issues around copyright and ethics and these had to be addressed by the students in order to publish their work openly online. The act of filming on a mobile phone did enable students to move beyond the technology and think more imaginatively. One student confirmed that he was inspired to creativity by filming with his phone, looking at the world through the '*eyes of my phone*', liberated by its portability and inconspicuous nature. Another student felt liberated by the freedom to film shots unbound by video production norms.

Serendipity lay at the heart of the more memorable aspects of many of the films, such as quotes from people in the street, or sound samples being remixed and reused: in one of the films, a sound sampled from an unusual instrument played by a busker became the musical theme for the entire soundtrack. Risk-taking also featured in many films, mainly in terms of how the phones were actually used in the filming process: attached to sledges, zip wires and skateboards before being propelled at great speed, the students felt able to take these risks as they were using their own devices.

While intended to be a complement to more traditional instruction in video production, there does seem to be some evidence from student comments - and in line with (Kleiman, 2008) that in this sense the creative freedom of the project may have had a "positive yet disruptive, disorienting force … the potential to disturb and even threaten educational and pedagogic structures, systems and processes."

Fulfilment

Fulfilment as personal commitment and a sense of achievement was clearly demonstrated by the students throughout the project, and was evident in the evaluation, blog-based reflections and observations. A student confirmed that the learning acquired from editing video had inspired him to make video for tracks he made – his own and found video. Another reported that he had purchased a FLIP

Mino HD Camera for future experimentation. A sense of enjoyment came through in their comments.

They welcomed the opportunity to develop their skills in the production of short-form content, seeing this as something that is relevant for them as future production professionals and they clearly felt a sense of satisfaction and achievement. One student from a mainly audio background became so interested in the process of syncing the video with the audio of the original that he is considering editing music videos as a future career.

After completion of the project/module, many students have carried on making films using their mobile phones and have begun to engage more seriously as producers in the YouTube community. It seems that the mobile film project has had a genuinely transformative effect on many of the students, both personally and professionally.

Creativity and OERs

There were two major expectations of the students doing their projects, *openness* (this was encouraged not enforced) and the *use of mobile phones for filming* that enabled the students to produce 'little OERs'. These expectations can be viewed as constraints. In publishing films within the YouTube community unacknowledged as student project work, the groups engaged in an authentic knowledge sharing and participatory pedagogies (Brown & Adler, 2008). Rather than restricting themselves to classroom 'communities', students were keen to engage in the YouTube community where their presence and identity can transcend their temporary roles as students, and they own their own work. In this setting, they are producing open media resources rather than specifically OERs. The 2010 cohort were interested to see how the 2009 videos fared on YouTube, and the previous films provided good teaching and discussion examples. The strongest experiences here were product- and fulfilment-focused. Some students clearly had transformation-focused creative experiences, considering different career paths, challenging disciplinary orthodoxies.

However, student experiences of creativity were variable and difficult to tease out whilst students are being assessed when they may feel that claiming creativity is expected and beneficial to their assessment outcomes. Certainly the blogs, wikis, and Flickr images were generally regarded as records of process, of interest for assessment rather than as persistent artifacts.

Conclusions

- **The analysis using Kleiman's framework does reveal that students have experiences of creativity** that may be triggered by constraints, experienced through the process of developing a product, leading to personal transformation and fulfilment. We found that Kleiman's framework fitted student experiences: the opportunities designed into the assessed task were realised by students. Therefore, academics wishing to incorporate activities leading to creative experiences for students can benefit from using Kleiman's framework.
- **The dimension of openness worked in different ways.** We have found a link between the tutor modelling/projecting the idea of openness and creativity and students experiencing it (or not). In this project students were introduced to films produced by a recognized media innovator and their subject tutor (and in 2010, prior students' mobile film productions), along with other YouTube resources as inspirational learning artifacts and triggers for working beyond the constraints of the medium. The link between mobile phone films and the 'good enough' movement (Engholm, 2010) was apparent. However despite the acceptance of imperfection in participatory culture (Gauntlett, 2011) some students struggled to accept this, and did not always fully embrace the more accidental aspects of the medium.
- **Students did produce and consume OERs, although openness of resources operated differently for different media.** Creativity was evident in the student-produced films themselves but less apparent in other platforms. Records of group processes such as the wikis were more important for formal education purposes i.e. assessment, while the blogs enabled individual reflection which may be considered less important as OERs as they were linked to expressions of fulfilment. The films themselves were most significant in terms of creativity. This reflects earlier findings of student use of computer-mediated communication in that media came to occupy their own niche (Haythornthwaite, 2001).
- **Self-conscious reference to creativity may be engendered by assessment requirements rather than a free expression of students' experiences.** 'Creative freedom' was the most common theme that emerged in the evaluations, although much of the feedback (evaluation questionnaires, blog-based reflections) tended to reflect what they had been told in class or what was stated in the assessment brief. Emphasis had been placed on the potential for mobile phone filmmaking practice with regard to innovative, imaginative,

creative techniques – in fact this was a requirement of the assessment. The majority of student responses and reflections acknowledged their appreciation for the extended scope for creativity in this project, however these responses may also have been reflective of an assessment-driven approach, a desire to please the assessor. At the same time, their engagement with their mobile phones as tools for production did appear to stimulate the creative process, as they were both freed from the constraints of 'traditional' practice while simultaneously having to work around the constraints of the new medium.

- **Tensions exist between the need for scaffolding and frameworks and the removal of constraints that temper creativity and authenticity.** As shown in Fig.1, their engagement with the four platforms (YouTube, wiki, blog, Flickr) varied and they viewed only YouTube as the 'public' space - this would be the space that they would make publicly available to their friends through sharing via Facebook and other social network services. The majority of students portrayed themselves as YouTube publishers rather than students.
- **The impact of authenticity and publication on creativity was evident**. The constraints of the medium (mobile phone) challenged the students to develop workarounds, innovative practices and practice creative ways of thinking (Jackson, 2002). This particular learning activity did not stifle creativity (Robinson, 2007) but actually promoted it. The students experienced creativity as a social process (Gauntlett, 2011). Most importantly, the phones belonged to them personally unlike the other platforms. The novelty, ubiquity, and freedom of using their personal devices in this way appeared to free them constraints and structure, unlike the online platforms, which by design tend to dictate the form and the structure of the product.
- **The production of open media resources that have a dual function as OERs** has clear benefits in terms of knowledge sharing and community participation (YouTube success may inspire others) and also drawbacks (in-class discussion may be hampered by a negative YouTube community reaction).
- **Transformation in the short term was evident in participants but a longitudinal study is needed to measure any long-term impact on practice.** A limitation of the current study is that it is not possible to say what external impact – if any – the productions have as open media resources or OERs. However, the consumption of student OERs by later cohorts legitimizes their own productions as OERs. Furthermore, a core benefit of open publishing is that possible future problems regarding copyright, attribution etc. can all be resolved so that a growing body of student work becomes available as an

archive for as yet unknown uses (although unknown uses also risk removal of context). However, even if the wider impact of student-produced OERs is limited, the impact of producing OERs can be significant to the practice of students now and in the future, with their acknowledgement of the status of OERs and their improved skills and knowledge in copyright and attribution.

- **Further work is needed to explore in detail the relations between OERs and creativity.** While there is a clear link between academics' perceptions and student experiences, the links between OERs and constraints are less apparent. Future work will include detailed focus groups and further analysis of the relations between student-produced OERs, creativity and practice, once assessment is no longer present as a potential influence.

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