

Collaborative ICT-supported Learning for Sustainable Development

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Abstract

To prepare students for an increasingly globalized and changing world, a transformative pedagogy is needed. The challenges of global warming and depletion of natural resources in combination with increasing populations and consumption demands must be met by new attitudes, creativity and new orders of thinking. Graduates need several skills in addition to specific subject knowledge in order to function well in a global workplace. Information literacy, the ability to search and assess information and use relevant and valid information in problem solving is a necessary. Competence in the fields of intercultural communication, teamwork in physical as well as virtual rooms and time management are prerequisites for many employment opportunities. The ability to confidently manage conflicts and apply various tools and heuristics in solving previously unknown problems must also be a part of the training. Postmodern, international education for sustainable development will address gender issues, inequality and resource management and distribution. Traditional methods are inadequate to meet seemingly overwhelming problems like rapid resource depletion, violent conflicts, disasters and extreme poverty. Students must be trained to be proactive, in independent activity and research as well as teamwork. ICT-supported, quality education, effective pedagogical approaches with intensive online tutor presence, collaborative learning, and training for sustainability are among the main factors for a new deal in education for sustainable development. An example of how this can be done is the MSc Development Management (DM)

programme at the University of Agder. The main objective of this fulltime two-year study programme is to address the fundamental challenges of sustainable development through education and research. The study programme is internationalized, attracts students from all over the world and has gained two awards for an outstanding learning environment.

Keywords: ICT, e-learning, sustainable development

Introduction

In the quest for a more sustainable development, education is the key, and there may be opportunities to leapfrog several stages. The education sector may jump directly to state of the art in e-pedagogy for building blended or purely online learning environments. Investments in the training of teachers might be even more crucial than investing in technology. Simply said, education is a way to generate human and intellectual capital. Education is about learning to know, learning to do, learning to socialise, learning to think and learning to be. Education is complex, and there are few if any cheap, quick fixes or shortcuts.

Many governments hope for new ways of making education more automatic and thereby cheaper through technology. The education sector therefore in many countries invests heavily in Information and Communication Technology (ICT). Unfortunately, the competence to use this technology efficiently may be wanting. Education should be more learning than technology driven to succeed. The magic of dazzling technology must be matched with appropriate pedagogy.

The quest for sustainable development requires change in attitudes, and intercultural and global cooperation. The combination of ICT-supported and transformative pedagogy can be efficient tools for such change. Traditional education is inadequate to meet the challenges of a global environmental crisis. Education for sustainable development demands a pedagogy for change. Traditional education systems are to some degree based on "Copy, Cram and Reproduce", or the "CCR-pedagogy": Paulo Freire calls it the "Banking pedagogy" (Freire, 2010, pp.71-73).

Access to education is limited, its quality poor and the curricula often irrelevant to the needs of the learners and of social, cultural and economic development. Emerging new industries need entrepreneurs, managers and skilled labour in order to be competitive; our outdated education systems continue to produce graduates without the requisite knowledge and skills (UNESCO, 2000, p.1).

The "cram school" is the dominant pedagogy in most former colonial countries, China and India included. Parts of Asia have enjoyed economic growth in spite of the "CCR-pedagogy" and the fact that creativity and critical thinking are not encouraged. This is known as "The Asian paradox" (Elmgren & Henriksson, 2010, p.22). One result is that the environmental situation in parts of Asia is in a critical condition. This pattern of growth is not sustainable (American Scientist, 2006).

Sustainable development can be associated with safer, more resilient and robust communities with healthy ecosystems and increased social cohesion rather than just economic growth and increased consumption. Creativity and entrepreneurship operate within a "green" economic framework where sustainable livelihood, healthy ecosystems and reduced ecological footprints are significant values. National governments, local communities and NGOs should therefore work for a social transformation that includes the vulnerable rather than excluding them. This would be in accordance with the Millennium Development Goals (MDGs). The MDG ambition is to eradicate extreme poverty, hunger and ensure environmental sustainability. The vulnerable will multiply with increasing pressures from climate change, unusual and extreme weather and conflicts over natural resources. The future will be increasingly unpredictable, changes more rapid and dramatic, and sustainable development therefore demands a quality education system that builds generic and problem solving skills, creativity, innovation and critical approaches to established "truths". According to the Dakar framework for action, a quality education is inclusive and provides education to all. It is partly participant-driven, builds tolerance and helps handling conflicts constructively. It is based on respect for human rights and provides expertise and skills in critical thinking, environmental and crisis management (World Education Forum, 2000 pp 3, 6, 8, 24 and 42).

The Globalised World and Education

The world is getting smaller, in the sense that one can communicate with anybody on the globe in seconds from almost anywhere to anywhere. To produce something for the market, one no longer competes only with fellow countrymen, but the world. Modern industry cannot survive with a cheap workforce. The workforce must be competent, flexible and aware of the latest trends. The producer must also be in contact with highly educated and creative innovators to discover and improve on cutting edge innovations. A globalised "postmodern" market therefore demands self-directed, creative and innovative "knowledge workers". For the individual, this means that the global worker must be adaptive, flexible and a lifelong learner to stay competitive within his or her niche in the system. "The different niches of an economic ecosystem, such as the various machinery and equipment sectors, thrive as a self-reinforcing web of engineers, high-skill production workers, operational managers and factories" (Rynn, 2008). These ideas are not brand new. According to Haughey (2000, p.22) emphasis on life-long learning is a way to help keep employees, or help employees keep themselves, informed about the changes in their own areas of expertise.

Challenges for developed countries in the last decades have been to stay economically competitive, keep welfare at acceptable levels, keep unemployment rates down and still be able to invest enough in the basic societal functions to stay on top also on longer term. A crucial factor is seeing to it that the population is among the best educated and stays that way. This is obviously no small task. As can be observed, tertiary education in the USA and in Europe is becoming increasingly expensive. With the economic crisis, the danger is that the general level of education is going down instead of up.

The challenge for the developing world is to educate the broader masses, avoid isolation and take a part in the globalisation process without being run over by the big multinational corporations. Democracy is needed rather than "corpocracy". This can be quite difficult to achieve, since multinational corporations often have better working environments and have more resources than local ones. Ensuring that local interests are given appropriate attention requires resourceful, engaged and highly trained civil servants.

In developing countries, human knowledge resource development through initial and continuing education is not only crucial for economic growth and competitiveness, but also has far-reaching social impact. For example, it assists in influencing the birth rate, increasing the independence of women, and improving standards of health, the rural environment, good governance, democratic organisation and sustainable development in general (UNESCO 2002, p.17). The rapid growth of multinational corporations and the increasingly open national borders expose local, small markets to aggressive international trade and weakens the position of the national states economically and politically. As states are weakened, most universities and colleges receive less public funding, and are compelled to find other additional sources of financing.

This trend forces higher education institutions to see themselves as actors in the economic marketplace, exploring not only their possible and potential impact on the national economy, but to some extent also as part of the marketplace, buying and selling products. One possible solution to the problem of the rising cost of education is more emphasis on flexible, distance learning. According to UNESCO, two main factors have led to an explosion of interest in distance learning. First, it is the growing need for continual skills upgrading and retraining; and secondly, the technological advances that have made it possible to teach more subjects at a distance (UNESCO 2002, p.3).

Some higher educational institutions, as a consequence, now consider a flexible, more market-oriented dual-mode delivery of education with an increasingly heterogeneous body of students that may choose between full-time on-campus studies, part time studies in combination with distance education, or high-quality flexible distance education as the main option. Most teachers and professors are disturbed by suddenly finding themselves in competitive market-driven environments, with students demanding the latest in Information and Communication Technology (ICT). Teachers are not the only ones finding that their education might be perceived as obsolete. Most people in the information age find that they frequently have to adjust to changes in their workplace and the ways they learn. The need for continuous education is growing while the time to leave the workplace at fixed hours increasingly becomes the most wanting commodity.

As a consequence of this, there is a tremendous growth of mega-universities offering flexible, open and distance learning (ODL). More or less automated online courses are particularly adapted to adult learners. An educational network like Coursera, can boast of over five million students attending close to 600 courses in the last three years (Coursera, 2014). Open Learning may be defined as "...organised educational activity, based on the use of teaching materials, in which constraints on study are minimized either in terms of access, or of time and place, pace, methods of study, or any combination of these" (Perraton, 2000, p.13). ODL may bring down costs of higher education, and may make lifelong learning possible for adults wherever they live and work.

Several teachers have experimented with making lecture notes, maybe even video-taped lectures available on the Internet, calling it e-learning. Some quickly realize that many students drop out long before graduating with this type of education. They sooner or later see that e-learning is more about pedagogy than technology. Some may also realize that the personal networks and the social circumstances that students find on campus are of importance.

An overemphasis on the delivery of knowledge as a package of materials profoundly misunderstands how people learn, where they learn, and when they learn. Not only is this a passive view of learning, it also misses much of the real value of a university education (Brown & Duguid, 1996, p.13). The globalized world asks for creative, critical thinkers with collaborative skills, the ability to communicate cross-culturally using ICT and an intrinsic motivation for dynamic, life-long learning.

Commodification of Education

Tertiary education institutions entering the market of ODL, find that they can just as well offer their online courses globally. If it is good – why only offer it locally? This means that a student living in Italy can be an active online student in England, Norway, India or South Africa. Like any consumer in the global market, s/he can shop education much the same way s/he is buying a car or a book. Educational institutions competing on the global market must meet the customer's demands, or risk losing the customer. Key words in ODL are flexibility, cost efficiency and rapid adaptation to new demands.

During the next 50 years, global world population is estimated to increase by three billion people - the total world population of 1960. This growth in population outpaces the capacity to give people access to universities. According to the Open University's vice chancellor, Sir Daniels, a sizeable new university would now be needed every week merely to sustain current participation in higher education. The costs of such a scheme are rather daunting. It seems that mega-universities delivering ODL are considerably cheaper, about half of the average cost per student compared to traditional on-campus students (Daniels, 1997, p.2). With good quality assurance systems in place and implemented, the quality of the online, open education might even surpass the quality of the traditional, on-campus versions. High quality online universities are well aware of this:

The Open University (OU) has once again achieved one of the highest ratings for student satisfaction amongst UK universities in the 2013 National Student Survey - achieving an overall satisfaction rate of 92%... The result means the OU has been ranked as one of the top five universities each year since the survey was first carried out in 2005. (OUUK, 2014).

Traditionally, professors have been using the instructional approach to teaching. Focus has been on curriculum and content, and according to Ross (2000, p.38) the professor's role has been to transfer that content from his own mind to those of the students, with little recognition that the content might be changed in the process. ICT has made content transfer easier. Lecture notes and multimedia presentations can be put up on the Internet while the professor can focus more on individual attention, guidance and building up good learning environments in collaboration with colleagues and students. At several universities in developed countries, this has opened up the classroom. Suddenly, faculties are producing materials not just for the select group of own students but for anyone who wants to look, including colleagues (Ross, 2000, p.38).

Increasingly, it seems universities in OECD countries try to focus more on learning than teaching, on lifelong learning more than formalised schooling ending with adulthood, and on customised learning looking at needs, interests and desires of the individual. This trend will probably force all higher educational institutions to rethink their structure, pedagogy, and organisational systems. It may also entail that competition for the best

students will increase, and that courses and study programmes will be assessed on the ability to “sell” on a global market.

Transformative Pedagogy

Education is often seen as a mechanism for achieving development goals and addressing challenges to sustainable development like environmental issues, population explosion and climate change. In a transition process towards knowledge-based economies, higher education institutions are pressed to change by a fear of being left behind. When an institution deliberately plans to change, it often means a long term commitment to sustainable transformations (Senteni, 2009). The traditional transmissive “banking” pedagogy presupposes docile human beings, constructed as passive receptacles of information. In contrast, transformative pedagogy has a “perspective transformation”, with three dimensions: psychological, with changes in understanding of the self; convictional with revision of belief systems, and behavioural with changes in lifestyle.

Transformative pedagogy includes the process of knowledge creation and facilitation. ICT and ODL may broaden educational access, improve the quality of education, facilitate peer-to-peer collaboration and give learners a greater sense of autonomy and responsibility for learning. Transformative learning and “perspective transformation” occur “when individuals change their frames of reference by critically reflecting on their assumptions and beliefs and consciously making and implementing plans that bring about new ways of defining their worlds” (Imel, 1998, pp 13).

In transformative pedagogy, the teacher's role is to establish a learning environment that builds trust and care among learners. The teacher shall strive to create a community of knowledge. As a member of the community, the teacher also acts as a role model demonstrating willingness to learn and change by deepening the understanding of both subject matter and teaching. The participants take an active part in creating the learning environment. The learners share the responsibility for constructing and creating the conditions under which transformative learning can occur. Teachers already know the “transmission pedagogy” from their own school days. Transformative pedagogy, however, is not intuitive and must be taught and learned at the teacher training colleges and universities.

Teacher training is an area where ODL has made a major contribution. This includes initial training for formal qualification, in-service supplementary training for formal upgrading, and continuing in-service training in particular subjects and topics. Many examples, particularly from developing countries, show that teacher training at a distance may reach large groups of teachers and have profound impact on the development of national education systems. The use of ODL for teacher education is therefore a crucial strategy for quality improvement in the public education system (UNESCO 2002, p.9).

Continuous education for teachers has proven to be successful in most ODL programmes. This group, maybe more than any other group, can reach the great masses of the people in the developing world, inspire to renewed efforts of development and bring hope for a better future. According to the Inter-Agency Network for Education in Emergencies (INEE, 2010, p.3 and 77), quality education at basic levels provides competence in reading, writing, numeracy, information management and a relevant curriculum tailored to age groups and contexts. MDG 2 demands primary education for all boys and girls. A quantitative approach is however inadequate. Education must meet real needs; addressing hygiene, nutrition, disease prevention, freshwater management, entrepreneurship, sustainable finance and sound resource management to meet the demands of MDGs 3, 4, 5 and 6 on gender equality, reduction of child and maternal mortality and reduction in infectious diseases.

If the next century is going to be a truly African century, for the social and economic progress of the African people, the century of durable peace and sustained development, the success ... depends on the success of our education systems. Nowhere in the world has sustained development been attained without a well-functioning system of education, without universal and sound primary education, without an effective higher education and research sector, without equality of educational opportunity (UNESCO/Thabo Mbeki, 2000, p.1).

Reforms of educational management is urgently needed - to move from highly centralised, standardised and command-driven forms of management to more decentralised and participatory decision-making, implementation and monitoring at lower levels of accountability... it is necessary to harness new information and communication technologies. (World Education Forum, 2000, pp 55).

Going From High-Brow Speeches To Implementation - What Works?

According to the most extensive meta-study ever done, involving tens of millions of students and teachers, some methods give higher learning achievements than others. Professor in education, John Hattie, who was in charge of the study, found that excellent teaching requires a planned and intentional transfer of experiences, knowledge and decisions. The students must be appropriately challenged by difficult and specific goals that are known to the learner. The tasks must be structured so that the participants can reach the goals. Decisive is the amount and quality of feedback. Main findings emphasise the formulation of learning intentions and learning outcomes; clearly defined success criteria; a classroom environment that not only tolerates but welcomes errors, attention to the challenge of the task, the presence of feedback from teacher to students and from students to teacher to reduce the gaps, and a sense of satisfaction and further engagement and perseverance to succeed in the tasks of learning (Hattie, 2009, p.199). "It is critical to ensure that "errors" are welcomed, as they are the key levers for enhancing learning. It is critical to have appropriately challenging goals as then the amount and directedness of feedback is maximised". This is in contrast to the traditional teaching in British classrooms where "mistakes were embarrassing, and teachers strove to minimize public mistakes to avoid the child losing face. The emphasis tended to be on needing to express correct answers and on teacher approval"(Hattie, 2009, p.248). This is not very fruitful, as "errors" are associated to the person, and not to the subject that is to be learned. To avoid damaging the "self-image", students tend to be strategic, surface learners by seeking the "correct" answers and avoiding difficult challenges. It seems that many modern pedagogues now regard instructional teaching as old-fashioned and "bad" because that usually leads to "surface" learning.

Constructivist teaching on the other hand, is regarded as superior, since this approach seems to give deeper understanding. However, a balance is needed. "You need surface to have deep, and you need to have surface and deep knowledge and understanding in a context or set of domain knowledge" (Hattie, 2009, p.29). In order to start deeper knowledge building, you need surface knowledge. You need to collect information and get an overview. Then you can proceed to the next step of knowledge building which includes "thinking of alternatives, thinking of criticisms, proposing experimental tests, deriving one object from another, proposing a problem, proposing a solution, and criticising that solution" (Hattie, 2009,

p.27). When tasks are very complex for a student, the quality of meta-cognitive skills rather than intellectual ability is the main determinant of learning outcomes because learners have to improvise and use heuristics rather than call upon knowledge and skill components that are associated with intellectual ability.

Collaborative Learning

Collaborative learning can be quite effective pedagogically. Interaction with peers and tutors can increase learning outcomes considerably, especially when there is an environment of mutual trust, where peers regard each other as collaborators rather than competitors. Peers can influence learning such as "helping, tutoring, providing friendship, giving feedback and making class a place students want to come each day. Peers can assist in providing social comparisons, emotional support, social facilitation, cognitive restructuring and rehearsal of deliberative practice. Friendships can play an important part in the classroom environment, as they often involve higher levels of caring, support and help, can ease conflict resolution and thus lead to more learning opportunities, thence enhancing academic achievement" (Hattie, 2009, p.105). "Cooperative learning has a prime effect on enhancing interest and problem solving provided it is set up with high levels of peer involvement". Furthermore, it has been found that "cooperative experiences promote more positive relationships among individuals from different ethnic backgrounds" (Hattie, 2009, p.213).

A common approach to learning in groups is problem-based learning (PBL). The PBL approach is distinguished by being student centred, learning occurs in small groups, as a rule a tutor or teacher is present as facilitator and authentic problems are presented. The problems encountered are regarded as tools to achieve the knowledge and problem solving skills required. The participants acquire new information when needed in a self-directed fashion of learning. "PBL emphasises meaning and understanding more than reproduction or surface level knowledge. The application of knowledge, not development of knowledge is the heart of success of PBL" (Hattie, 2009, p.212).

Online Education

"Everybody" seems to agree that e-learning is the education of the future. Online education can be decentralised. It can be flexible in the sense that there is no particular time for work as long as the work gets done. It can also be flexible in the sense that it is well adapted for change. Some also discuss the automated education. Maybe we can replace teachers with smart machines and robots? However, it is important to bear in mind that "learning occurs when the student learns, not when the teacher has satisfactorily taught"... "Computers can increase the probability of learning, but there is no necessary relation between having computers, using computers and learning outcomes" (Hattie, 2009, p.215 and 221).

Self-instructional e-courses are mainly based on the notion of education as transmission of information. In traditional teaching, one tends to perceive the teacher as a kind of medium for the transmission, and the idea is that a machine may play this role just as well or even better. However, as a rule a physical teacher has many additional human qualities that the machine does not have. The teacher can manage and lead the classroom, arrange social activities, give comfort to some, encourage others and correct those who may need it. The teacher is crucial to keep up motivation over longer periods of time. The teacher can choose different pedagogical approaches, and adapt to the situation. The teacher can be instructional at times, and when s/he finds it appropriate, alternate between one-way lecturing and more modern pedagogical forms such as problem-based learning, discussions, group work and various other forms of collaborative learning. It is therefore important to be aware of the difference between the traditional perception of the rather rigid role of a teacher and the much more multi-faceted reality that is typical for modern pedagogy, where emphasis is on learning processes rather than on information transmission. It is thought-provoking that on average, students are engaged with their lessons about half the total class time. The lowest engagement is recorded when the teachers were lecturing or when the students were asked to watch television, highest when students are working in groups or laboratories (Hattie, 2009, p.185).

Education for sustainable development should emphasise concrete and relevant knowledge, learning by doing, encourage creativity, information literacy, collaborative and cultural competence, individual and team management, ecological ethics, economic and social responsibility.

The traditional Copy-, Cram- and Reproduce (CCR)-approach should therefore be replaced by the more complex 'Pedagogy of ECECITES': Ecology, Creativity and Entrepreneurship, Comprehension, Inclusion, Transformation, Empowerment and Social responsibility. ICT-supported education may facilitate this, and might be the only option in many rural areas, where remoteness makes daily access to schools difficult.

ICT should be important tools in education for sustainable development. New pedagogies can be adapted to new communication realities connecting the entire globe in an ever closer electronic network. This approach is also in line with MDG 8 that asks for global partnerships for development. Many schools in poor countries struggle with expensive and outdated books if they at all have books. An environmentally friendly solution could be a transition to e-books available online. The internet increases capacity annually while prices drop, and technology now may combine laptop functions with the increasingly ubiquitous mobile phone and I-pads.

A common idea in ICT supported education seems to be that students use the Internet as a source of information. The teacher teaches the traditional way, while the Internet supplements. Veterans in the area of online education are keen on pointing out the difference between "knowledge" and "information" and prefer to define information dissemination in the form of websites, online lectures and self-instructional e-courses as E-teaching. Emphasis is on traditional 'instructivist' teaching, where the point is "getting the message across", and "bank the correct answer" in the students' heads. Information is transmitted from the one who knows to those who do not. Focus is on the teacher and on content delivery. The cognitive learning processes hoped to take place in the recipients are of less interest. However, there is more to education than delivery and technology. The ICT must be placed in a productive context. A buzzword is "e-learning" rather than "e-teaching".

Critical Learning

Teachers and students are increasingly exposed to current global events. Access to an ocean of updated Internet information implies that the traditional, instructivist teaching mode should change. Studying involves more than cramming a student's head with facts and information fragments. Students need to understand, see connections and challenge the

information presented. Emphasis must be on learning how to learn and how to understand. Higher levels of education are different from cram schools, in which the “goal is to enable the students to “parrot,” that is, to unthinkingly repeat information that is deemed necessary for particular examinations” (Wikipedia 2010: Cram school). In the information age, students should be encouraged to be critical, and maybe even question the teacher. “Information literacy” is the ability to search for relevant and reliable information, and critically assess the quality. Rather than being passive recipients of information, the students must become proactive information literates, and the society might even find ways to a better democracy in the process (Momo, 2008). Students must be actively encouraged to become critical thinkers. There are several easily understandable instructional online videos available on YouTube (Bjørke, 2013). These short videos are well suited for “flipped classroom” activities, where the students watch the videos at home, and then return to a common room for discussions. The flipped classroom pedagogy works well in any Learning Management System (LMS). The students get access to the information individually, and then work together in learning processes structured by the tutors and participants (Kachka, 2012).

ICT in education demands communication between individuals, groups and networks. Merely using the Internet for obtaining information is useful, but it is the two-way or many-to-many communication that may change power-structures. Two-way communication takes place when a teacher sends lecture notes on e-mail or makes them available online. In response, students can send their questions by e-mail or upload on the internet as well. For students who are unable to attend a campus, the lecturer may videotape her lectures. With ‘blended’ approaches, where on-campus teaching is combined with e-learning, the difference between on-campus students and near-by students disappear. All interact and learn in learning communities, whether “distant” student or not. Combining virtual learning environments (VLEs) with interactive collaborative learning will entail a more socio-constructivist approach, reducing the traditional emphasis on instruction.

Only dialogue, which requires critical thinking, is also capable of generating critical thinking. Without dialogue there is no communication, and without communication there can be no true education (Freire, 2010, p.92). The transformation from teaching to learning will have implications on the way education is constructed and delivered. When the technological

steps have been more or less managed, the next, more formidable step is that of a new, transforming pedagogy for the information age and may help in steering development in a more democratic and sustainable direction..

Leap-frogging

A traditional view claims that poor countries have to develop through the same stages as the industrialised countries. Rostow (1960) claimed that development happens at take-off stages. The goal of development is to reach the mass-consumption society, with the American middle class as a role model. However, it is now gradually being realized that the mass-consumption society is not sustainable. This means it will collapse sooner rather than later, and has per definition developed in a wrong direction. Development in a true sense is rather reaching a state of resilient, sustainable livelihoods with healthy ecosystems. Secondly, development does not have to go through stages. People can take shortcuts, or leapfrog over stages of development. A stunning example is the rapid dissemination in the use of mobile phones all over Africa:

The experience is that technological shortcuts which 'leap-frog' to a high-tech solution can be absorbed effectively. ...Our priority should be to identify and support open-minded, creative individuals who will make any useful leap-frog possible. For this reason, it is extremely important that people continue to be exposed to technologies and in developing countries, ICTs should be mainstreamed across the different sectors (health, education, agriculture, governance, water, etc) making it possible for shortcuts to be identified and exploited, taking into account local human capacity and local priorities. In this way, development can truly be fostered. Let's not assume that people always need to be exposed to low-tech and medium-tech solutions first before they can cope with high-tech solutions (Figueres, 2010).

It should be possible to implement the state of the art online education technology in large parts of Africa and Asia, almost as rapidly as it happened with the mobile phones. One of the issues is of course the power supply. The prices for photovoltaic cells have dropped dramatically lately, and there is a possibility of electrifying large parts of rural areas by solar power. Running laptops by solar electricity has been successfully tried

out e.g. at the ARC-Kenya resort with its newly opened FabLab (ARC-Kenya, 2010, Danson, 2013).

The broadband capacity is still an issue. A pedagogical challenge is to find solutions that make online education work despite outages - and affordable to ordinary people. Online education does not have to be synchronous with live video streaming and same-time interaction between students and teachers. Asynchronous e-learning can be just as effective, or work even better than the more technologically demanding synchronous modes. The ubiquitous mobile phones and ipads gradually makes m-learning possible. If the laptop and the internet are temporarily down, the mobile phone might be able to at least partly take over some of the functions necessary to be in contact with peers and tutors. Working with new technologies invariably involves the delegation of responsibility to learners and successful learning outcomes will depend on the learner's ability to work independently and autonomously from the teacher and, increasingly, to take control of the learning processes (Noss and Pachler, 1999, p. 205).

Asynchronous modes facilitate this, and transfer power from the teacher to the students. To some extent, learning can be defined as a social process: "Effective learning relates to four themes: Active learning, collaborative learning, learner responsibility and meta-learning or learning about learning" (Watkins et al. 2002). The asynchronous on-line conferencing and collaboration seems perfect for metacognitive activities. Time to reflect combined with relative anonymity, may encourage openness, honesty and deeper thoughts that otherwise would not have come up in a "real-time" discussion. "People will be more honest, or more intimate, or more personal, or more reflective, all of those things combined lead to people saying things online that they wouldn't ever reveal face-to-face" (Prendergast, 2003).

Again referring to the findings of Hattie, he claims that computers are used effectively when there is a diversity of teaching strategies; a pre-training of teachers in the use of computers as a teaching and learning tool; multiple opportunities for learning; when the student is in control of learning, peer learning and feedback are optimised (Hattie, 2009, p. 223)

Development of Online Education

Whether education is the priority issue when people starve and children die from easily preventable diseases can be discussed, not to mention the presumably luxurious online education. However, without education, it will be increasingly difficult to break a downward spiral. A wise strategy is raising the general competence level, not reducing it, when facing new and complex challenges. Online education can enhance education and make it available to many more. State of the art e-learning pedagogy will take time to implement, as online pedagogy is not intuitive, but a skill that teachers need to learn. Teachers may try delivering education with computer games, taped lectures, an online library of articles, auto correcting quizzes, animated graphics, and You-tube videos. The next step will be to make the education more learning-centred (Phelps, 2010). Students may be encouraged to interact with each other, e.g. by making role plays or utilise the power of ICT through digital storytelling (Bjørke, 2013, *Digital storytelling*).

A step up could be to deliver complete educational systems for development and delivery of degree-giving education with more or less 'blended', partly face-to-face, partly online, or completely online solutions. Study programmes and courses may be more or less peer interactive, tutor-guided and paced. Computer Supported Collaborative Learning (CSCL) has been quite successful at the UK Open University, the Indira Gandhi University and other places.

Partners in Networks

Making good online learning resources and developing good study guides with appropriate learning activities can be expensive, demanding and time consuming. In addition, to achieve some important aspects of education, international cooperation is important. It might therefore be of high value to collaborate in a partnership network of educational institutions. An international network can give substantial synergy to any study programme when managed well. There is power in the ability of sharing knowledge. Hoarding information is old-fashioned. It is smarter to link with others, who in turn might be linked and interacting on a broader scale.

The E-Pedagogy

ICT emphasises communication while e-learning adds peer interaction, tutor guidance, and a holistic view on education. In addition to computer skills, the teacher needs the more advanced competence of being able to combine subject mastery with appropriate learning activities, progression, assessment, quality assurance, grading system and student support system - all required to ensure the achievement of learning objectives or learning outcomes. The World Bank in 2002 published a report entitled *Constructing knowledge societies: new challenges for tertiary education*. The report states that modern, globalised education is demanding and a prerequisite for development. A global networked education system should therefore encourage increased student mobility by systems for recognition of relevant prior experience. The report emphasises the importance of ICT and its enhancing impact on learning and finds transition from remembering facts to methodological knowledge and analytical skills of utmost importance. Generic skills and learning how to learn are highlighted. An interactive pedagogy facilitating transformation from student audience to student actors, and collaborative learning more than individual is encouraged. The report recommends multi- and trans-disciplinarity, a focus on methodological and analytical skills and internationalised, borderless education. To facilitate this, it is deemed necessary to develop international standards, degree equivalencies, tuition exchange schemes, internationally recognised degrees and qualifications combined with credit transfer systems. The report emphasises learning outcomes and student competence rather than input and process (World Bank, 2002).

Collaborative Learning Theories and Methods

In constructivist pedagogy (Bruner 1960 & 1973), instruction is based on the study of cognition. Learning is an active process in which learners construct new ideas or concepts based on their current and past knowledge and experience. The learner selects and transforms information, constructs hypotheses, tests these empirically and makes decisions, relying on a cognitive structure to do so (Kearsley, 2011). Constructivist theories and methods have been further developed and adapted to different learning environments, in particular in social constructivism, which in turn is associated to psychologists like Vygotsky, Saljø, Bruner, Engeström, Lave, Wenger and Biggs. Transformative pedagogy has some of the same

roots. Socio-constructivism means that students join a knowledge-generating community, a “community of practice”, and in collaboration with peers solve problems and assignments in a context of reality. In a socio-constructivist environment, the generic skills of collaboration, intercultural communication, negotiation of meaning; problem-solving and creation of new knowledge are important goals. Learning is a social activity where the students use information they gather actively by applying it in discussions with others. The students support their statements by referring to reliable and verifiable sources. Studies should, in principle, be undertaken for a purpose, and the participants should critically assess information according to relevance and usefulness in solving the task at hand (Watkins et al, 2002).

Virtual Learning Environments in International Networks: The Case of the Msc in Development Management

The Development Management Master of Science (MSc DM) is an online study programme of the Agder University, Norway, mainly taught online and operating within an international network, with partner universities in four African countries, Bolivia and Sri Lanka. The first official pilot course was run in 2003. The first official complete master degree programme was implemented from autumn 2005 to spring 2007 (University of Agder, 2013). Since then, a new cohort of between 20 and 27 students have enrolled annually. Students are recruited in Norway and at the partner universities; each university has a coordinator in charge of communication in the network and assisting ‘home’ students when necessary. With the exception of two face-to-face periods in Norway and Sri Lanka totalling seven weeks, the students study from their respective universities, from home or any other place. Working in an international network adds extra dimensions to globalised studies. Such a network facilitates building tolerance between people of diverse cultures and value systems. An international, networked educational system facilitated by tutors creates new and powerful learning opportunities.

Asynchronous Threaded Discussions

Some teachers insist that synchronous communication is essential for successful online education (see e.g. Jancso, 2008). The DM experience indicates otherwise: asynchronous threaded discussions can be just as motivating, inspiring, and inclusive, or even more so, at least in

heterogeneous, international groups, and can be pedagogically more efficient. Asynchronous dialogue gives opportunity for active participation, in-depth reflection and thoughtful responses. In addition, working in an international network can be successful, adding extra dimensions necessary for studies in a globalised world. A network, by its international design, provides a global perspective much needed by students and their professors to help build tolerance between people of diverse cultures and value systems. A networked multi-nation educational system facilitated by instructors, coordinated by network administrators and guided by participating institutions will create new and powerful learning opportunities (Schlais and Davis, 2001). Synchronous activities in a global classroom are simply not desirable due to the time constraints, with a very small window of opportunity for gathering all participants.

A main pedagogical tool for the MSc DM study programme has therefore been asynchronous, threaded discussions arranged in a discussion forum in a Virtual Learning Environment (VLE). The asynchronous mode is less demanding on the broadband capacity than the synchronous alternatives and enables an intercontinental study programme to overcome complex time frames. Participants always know what to do, even if the Internet is down for a couple of days. There is no waiting for online lectures. Asynchronous interaction encourages reflection and gives room for information gathering and critical assessment before expressing opinions. The otherwise more timid participants are more easily included and it allows those with externally fixed schedules to participate. It seems that asynchronous, tutor-guided, peer interaction is conducive to cross-cultural and cross gender communication. Otherwise quiet women raised in patriarchal societies realise after some weeks that nobody can prevent them from contributing as equals. This seems to agree with the findings of Hattie:

Various forms of synchronous distance education include audio and video interactive conferencing, and this has become the fastest growing form of DE in American universities. This is contrasted with the asynchronous DE, where students work independently and their work is supported with an instructor or tutor. Effective online learning includes interactions between students and the teacher and between students. Whether and how much students interact with peers and instructors seems to be a differentiating quality of distance programmes (Hattie, 2009.p233).

Framework System for Course Structures

The MSc DM course description presents a detailed overview of the course according to the philosophy of 'constructive alignment' (Biggs 2003), with items like title, workload, aims, objectives, content, methodology, estimated number of student workload hours and intended learning outcomes. Study guides, with a calendar containing deadlines, provide the course contents, with detailed goals, tasks, learning activities, working procedures, pacing in the form of timeframes and cut-off dates.

Most of the MSc DM course literature consists of articles accessible online, or e-books written by the course instructors (Bjorke, 2012). The students only have to buy a handful of books over the four semesters. In addition to the course literature provided by the course instructor, the students are encouraged to supplement with literature sources of their own findings. The students are expected to use about half of their sources from the given course literature, about half from sources the students have provided themselves when they write their essays. They are expected to provide at least some assessments of their sources with regard to reliability, currency, validity and relevance.

Students have online access to the university library and to online learning resources with videotaped lectures, interactive e-books, articles and website collections giving participants some degree of autonomy and self-determination. Tutors are guiding and facilitating the learning process. An essential learning resource is the participants themselves. All students are placed in groups of 5-6 participants for the semester. Care is taken that the group is as heterogeneous as possible with respect to cultures, gender and geography to ensure that all have to practice cross-cultural communication. They all have to sign a group contract committing them to positive and regular participation. A basic pedagogical principle is to **develop reciprocity and cooperation among students**. The belief is that people learn through socially constructing their understanding based on their experiences (Dreon, 2013). As a rule of thumb, the students are expected to hand in one or two group assignments and two individual assignments for grading for each course. The course instructor gives detailed feedback to every hand-in, and suggests ways to improve. Part of the final grade is calculated on participation.

Most EU countries (including Norway even though it is not a member of the EU) are committed to the Bologna process, which involves increasing transparency, comparability, interchangeability and mobility of education and students in the EU. One of the main standardisation tools followed by the DM programme is the European Credit Transfer and Accumulation System (ECTS) (European Commission, 2004). One semester contains an estimated 850 - 900 hours of work for an average European student. The 'estimated student workload hour unit', is not an exact unit, but a crucial concept in the ECTS. Twenty-five to thirty student work hours correspond to 1 ECTS credit (European Commission, 2004). In order to calculate credits, focus is on student workload, not on the traditional delivery of lectures, contact hours and number of literature pages to be studied. This means that the course development tends to become modularised, focusing on learning outcomes and learner-centred approaches rather than on delivery and teacher-centred approaches. The DM programme is a four-semester, full-time programme covering 120 credits in the European Credit Transfer System (ECTS).

The introductory face-to-face two week session offers intensive training in online collaborative studies, study techniques and study strategies, how to search for and assess sources, avoid plagiarism, effective academic writing skills and how to use the various electronic tools efficiently. The students are introduced to the curriculum, what is expected from them, and what they can expect from the teachers. In addition, they are also socially well acquainted with their peers and teachers.

After the first face-to-face session, the students leave for their 'home' universities in Ghana, Uganda, Ethiopia, Tanzania, Sri Lanka, Latin America, various places in Norway and elsewhere and continue working the same way as they were trained to do during the face-to-face period. During the first two semesters, three 10-credit courses run in parallel. Each course is planned to demand between 240-300 hours of student work. This workload is distributed over four months. Each course is accessible continuously 24 hours a day, seven days a week, from course start until course completion. In the third semester, there is one 10-credit course, a 5-credit thesis seminar and then the thesis work (45 credits) for the remaining study time. The students, under the guidance of the tutors and a course instructor, together build an online learning environment, where asynchronous, friendly, but critical interaction creates a dynamic group

pressure where all are included and all contribute to the learning community.

MSc DM Characteristics

Several good trends were evident from the beginning, such as low drop-outs (less than 10%), and improved academic skills. However, instructors' experience and student evaluations from the first cohort indicated several challenges; e.g difficult working conditions for the students located in Africa, weak links with the partner universities and coordinators, heavy workload and time pressure, lack of streamlined communication, inability to assist all students and problems with enabling group synergy.

Certain improvements were deemed necessary and were implemented during the second and third cohorts. The original pilot programme was institutionalised as part of UIA's regular degree programme offerings. Good connections with the students' own universities through local coordinators were established. The number of assignments was reduced. More time was given to tutors and course instructors for assisting the academically weaker students. Communication became more streamlined. The recruitment process was improved. 'Group Contracts' were introduced to clarify expectations and improve working practices in students' groups (Schibbye and Bjørke, 2009).

The MSc DM study programme, with tutor-guided, paced and collaborative approaches can now report high degrees of student cohesion. The combination of continuous peer collaboration, frequent and daily tutor feedback and mutual dependence in virtual communities of learning and practice seem to establish a supporting group pressure. The learning outcomes as a rule are above average and the drop-out rates are low. Of the 94 enrolled students between 2005 and 2010, six have dropped out. This in contrast to most distance education programmes, where the drop-out rates often are above 50%. "...dropout rates are high, graduation rates relatively low, and... the quality of graduates' degrees is below that of conventional institutions" (Perraton, 2000, p.100). "One widely quoted dropout figure for students in massive open online courses is 90 percent" (Rivard, 2013).

In questionnaires that MSc DM participants have to answer at the end of the second semester or end of fourth semester, more than 80% of the

students state that the collaborative approach had been decisive for their motivation to go through with the study programme. They confirm that social learning activities increase their study resilience and motivation. The students also mention common problems, and complained that some group members tried to be 'free-riders', taking too little responsibility. Others felt that some participants were too dominant and impatient, making collaboration on equal terms difficult. As a rule, it may take almost two semesters of collaborative studying before these problems are handled efficiently. Almost all report that after two years, they have built personal networks, have gained experience in cross-cultural communication and been trained in expressing their own thoughts, managing groups and been obliged to work more with the subjects than they would have done alone.

Some Questions and Replies taken from the Student Questionnaire

*(NB! Since the questionnaire has varied somewhat between the cohorts, the number of respondents can vary).

Table 1: Student rating of study approaches

The collaborative and at least partly constructivist approach has been:	
..decisive for my motivation to go through with the study programme	47
.. not had any influence either way	9
..mainly been a waste of time, preventing me from really studying the material	0
Not answered	2
Total	56

Interview with former students: Ajith Wasantha Liyanage, from Sri Lanka, graduated from the DM in 2012: "...The opportunity to work with students from a wide range of countries really added value...The programme really boosted my confidence, through the collaborative academic work, and through individual projects." Sherry Adomah Bempah from Ghana, graduated from the DM programme in 2010: "If there is anyone who has benefited tremendously from the competence gained from the DM programme, I will count myself as the first but certainly not the last. The discipline and self management qualities I learnt have helped me to handle my role as a project manager".

Table 2: Some positive factors mentioned

The mandatory group work has been rewarding because:	
You have gained experience in cross-cultural communication	21
You have gained experience in expressing your own thoughts	19
Total	40

Table 3: Cross-cultural communication

Do you think that you have increased your ability to communicate efficiently cross-culturally during the study programme?	
Yes, very much so	25
Yes, to some extent	32
Uncertain	10
No	0
Total	67

Interview with former students: Borghild Berge graduated from the DM in 2012. She now works as an Advisor in Doctors without Borders. "The multi-cultural expertise I have from the DM programme is important in my job. Doctors without Borders is a major international relief organization, and cultural understanding and multicultural communication is crucial" (University of Agder, 2013). The MSc DM study programme was awarded the TISIP prize for innovative E-pedagogy 2008, and won the prize for the best learning environment at the University of Agder 2012.

To succeed in online education, it is crucial to build competence among teachers. Many will probably already know the basics of e-teaching and ICT-supported education. This competence must be increased in quantity and quality. The competence to give such training is not likely to be easily available. It might therefore be an idea to build this competence in international networks. Operating international networks will require some standardisation, e.g. a common quality assurance, grading and credit transfer systems. Collaboration over the borders on development of digital learning resources will require a common metadata system and agreements on ownership rights and how to share resources. UNESCO has developed an ICT competency standard for teachers that might be helpful (UNESCO, 2008).

Conclusion

Globalisation impacts on many aspects of lives on economy, workplaces, how goods are produced, consumed, as well as interaction, communication, development and delivery of education. ICT has facilitated global communication and instantaneous contact between persons, organisations and businesses situated on different continents to a reasonable price. The number of people with access to the Internet is rapidly increasing. According to Internet World Stats (2014), the internet penetration is over 15% in Africa, 27% in Asia, 63% in Europe. Africa has had the strongest growth, with an increase of over 3000% during the period 2000-2012. There are obvious challenges in the form of unstable and expensive electricity and unreliable broadband connections. However, it seems internet access and prices in most African cities have improved the last years. The people connected to the Internet have the opportunity of synergic collaboration; access to services and updated information in all areas, and can work more or less independently of governments and national restrictions. Rapid population growth and lack of qualified teachers in developing countries make the need for online education, maybe with a focus on training new teachers, ever more urgent.

Teacher training must emphasise new pedagogical approaches. Teachers must be aware of various methods and be able to define appropriate learning challenges and choose the appropriate approach according to content and desired level of understanding. There are at least two levels of understanding involved: surface knowledge (such as vocabulary programmes in reading) and deep understanding (such as creativity programmes) It is necessary to have both levels, and most often there is a simple order in applying them - one needs to know something before one can think about it. Hence, phonics precedes comprehension and placing too much emphasis on the latter before the former is learnt is not effective" (Hattie, 2009, p.160). It must be obvious that learning requires active involvement of the learner and that learning primarily is a social activity. New knowledge is best constructed on the basis of what is already understood and believed. "We learn by employing effective and flexible strategies that help us to understand, reason, memorize and solve problems; learners must know how to plan and monitor their learning, how to set their own learning goals and how to correct errors (Hattie, 2009, p.246).

Online collaborative learning works best the same way as on-campus learning. When learners have passed the initial surface stages, collaborative learning activities, negotiation of meaning, sense making, critical new media literacy, good working and metacognitive skills and social intelligence are what counts. Creativity, innovation skills and talent can be developed through novel and adaptive thinking and transformative approaches to learning and teaching. ICT can be important tools for social technologies, global interconnectivity, cross cultural communication, equal access regardless of gender, race and political affiliation; trans-disciplinarity and virtual collaboration. Modern education must emphasise learning-centred activities. Active learners learn more than passive receptors. Students that produce digital stories and videos will learn far more than those watching them. In the global job-market, talent and creativity will emerge as the most important capital.

ICT is a vital tool for development. However, technology is not enough. Education must always be more learning than technology driven. Transformative, collaborative pedagogy is probably decisive for building good online learning environments. This approach also encourages information literacy, deep understanding, creativity and critical thinking. These may be crucial factors for our ability to meet the challenges of a seemingly imminent global economic and environmental crisis and steer development in a sustainable direction.

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