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NEW TECHNOLOGIES FOR SUSTAINABLE TEACHING AND LEARNING: A CASE STUDY FROM SLOVENIA ON DIMINISHING STUDENT WORKLOAD AND INCREASING MOTIVATION THROUGH ICT

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Abstract

If education is to become culturally appropriate and improve environmental, societal and economic conditions, it needs to consider that current cultural development across the globe is increasingly connected with the use of new information and communication technologies. A close analysis of a blended higher vocational education course design and its two annual implementation cycles in different schools shows that careful introduction of information and communication technologies can have a positive impact in an educational context from the perspective of sustainability; new-media affirmative teaching and learning methods can increase both the hour-per-credit value of a course and student satisfaction. Current discussions about time management and student workload as well as a symptomatic local situation concerning sustainability issues in Slovenian education show that integrating information and communication technologies into models and practices of sustainability should not only remain a profoundly disputed topic within reflections about sustainability in education, but also become an important practical method for achieving its goals.

Key words: workload; time; information and communication technologies; blended; Slovenia; Moodle.

Technology shifting culture

Based on a case of successful information and communication technologies (ICT) use in the educational process, the present article discusses concrete possibilities for a sustainable future in the realm of education; not only that “computer technologies align with the principles of sustainability by reducing use of resources for printed materials, reducing waste, and making information and programs available to audiences in areas distant from teacher-education facilities.” The *Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability* also foresee that “ICT can help students take responsibility for finding information and evaluating it and ultimately take responsibility for aspects of their own learning” (UNESCO, 2005, p. 57). Although importantly introducing the technological aspect into the vision, this pivotal document

in the field of education for sustainable development comes short of recognizing the sustainability potential of e-learning as a method. Especially with the rise of blended learning (combining online and presence teaching phases), the use of new technologies in educational processes can importantly contribute to gradually realizing the vision of a sustainable society.

After introducing selected cultural and educational issues connected with sustainable development and the topical implementation of ICT – firstly on prescriptive levels globally, then by way of an example in Slovenia – this article deals with a report on local teaching practice. Leaning on an empirical study and analysis of blended learning methods shows it is possible to significantly rationalize the use of basic resources (i.e., student workload) by implementing new technologies in education. It is beyond doubt surprising to discover that technical media and especially the Web are potent for decreasing the stress and raising not only the motivation of students but also the credit value of their education. This seeming paradox opens an illuminating view on the possibilities of future teacher education that could update the ICT-related competencies of teachers. If this can be proved correct in the case of Slovenia as a new EU Member State, the blended course-design model could inspire similar resource-balancing efforts in the work of other teachers and school leaders. Thus, the article eventually arrives at one of the many answers to the question of “what kind of education would best serve humanity in the future?” (UNESCO, 2005, p. 59).

ICT as pillar of sustainable future

After the United Nations (UNECE, 2009) and the European Union (EC, 2008) accepted sustainable development as a priority paradigm in implementing the important strategies of cultural, social and economic development since 2005 and 2008, respectively, the realm of education has seen important conceptual shifts. A new definition of sustainable development influences all areas of human existence by connecting and balancing the many possibilities opened up by new technologies and the leaps of scientific as well as popular thought. The abovementioned initiatives align in that ICT is not only closely connected with the globalization process, it also plays an important role in renewing educational processes that, in turn, significantly correlate with social and cultural change. The raging consumerism and globalization of markets and financial systems that have presently brought the world economy into severe recession are, perhaps more than ever, both ready for (and in urgent need of) change towards a paradigm of sustainable consumerism that would enable the continuous use of resources and benefit the few evident social and environmental potentials left unspoilt. Yet such a process can be brought about only by educated people (critically) who are conscious of their gradual but inevitable behavioural change, and above all, proud of possessing both the means and the competence to implement sustainable future visions. This is why not only topics but also the methods of a development-affirmative, technology-emancipated teaching and learning practice are at stake here. Popular as well as high-tech trends in the use of new media (especially of the Web in combination with the personal computer – and of course increasingly in their mobile, multi-local and omni-accessible hybrids) lend these technologies an increasingly important role in all segments of human existence. Thus, these technologies naturally come into educational use, the Web being implemented as the most potent (if also unreliable or even dangerous) source of information and study

materials as well as a medium and platform for learning processes at large (Purg & Zakrajšek, 2009).

Among the key competencies of Education for Sustainable Development (ESD), Tilbury (2007) defines several that support the understanding of ICT in education from the point of view of sustainability: complex systems in the context of educational settings call for a systemic approach to communication that should incorporate both human and technological factors. Such an affirmative position towards a techno-cultured human (Strehovec, 1998) enables a smooth envisioning of a future that both emancipates man from machine (Purg, 2007) and instrumentalizes the latter for a sustainable future. A critical approach toward technology (especially as used in marketing through mass media!) demands a rich experience and profound knowledge of it – such that it is carried into the educational setting by young learners (e. g. as implicit expectation), and is thus expected from teachers (e. g. as explicit goal of teacher training). In such case an occasion-specific blend of traditional and progressive learning methods should prove viable – not least within partnerships for change in teacher-education processes that include teachers as participants in a sustainability-compatible pedagogical (techno-) culture. In the following section, this article discusses the Slovenian situation among teachers, learners and schools, showing a need for adopting concrete measures of ESD and incorporating a positive implementation of ICT into this process.

Slovenia between ICT and education for sustainability

Under the influence of the abovementioned UN and EC initiatives, the education systems around the globe, but especially those of western societies, have started to systematically incorporate the topics of sustainable development into education processes. Also, in Slovenia, the initial stage mostly deals with sustainability as a topic (rather than method), especially in the natural (chemistry, biology) and social sciences (sociology, economy, culture studies). Numerous projects have initiated to raise environmental awareness and stress egalitarian social principles because both came under serious threat due to the rapid transitional processes of the 1990s. The second stage of mainstreaming these principles at more complex and systemic levels, including sustaining critical discourse and assuring participation across cultures and economies, as well as turning the topics into methods (i. e. structuring educational processes) has, however, rarely been implemented. While depending on a spontaneous acquisition of ESD by the emerging teaching staff, based mostly on their youth (somewhat systematic introduction to the basic aspects of ESD during teacher training only after 2005), the Slovenian education system largely failed to distribute these competencies across generations (teachers, school administrators, teacher trainers etc.) as well as across sectors (of subjects, programmes) and geographical regions. Still, the principles of ESD managed to enter the (recently quite systematically renewed) curricula at all educational levels. However, due to abovementioned reasons they have not been implemented to the extent needed to have the envisioned impacts. What is more, the implications of ICT use in the line of ESD guidelines are virtually nonexistent, this not only in the case of Slovenia, but also in the broader European or even global context.

According to Arh, Rajkovič and Blažič (2005), the introduction of ICT into schools and teacher training had been quite intense in the years 1996–2002, but has since then faced a steep decline due to weakened financing in the sector. As late as 2006 a national

e-learning strategy was passed (Arh et al., 2008), but has been somewhat efficiently implemented in the realm of online training materials only since 2008, and has – with a revived political and structural support – gained noteworthy systemic momentum in early 2009 by providing schools with individual consultancy and on-demand training, as well as equipping strategies and programmes. All this is in tune with the EU's recent priorities that try to catch up with the USA, Australia and Canada that have been for decades building on their successful distance education systems (owing their high priority mostly to the countries' geographical characteristics). The authors find that the first level of computer literacy (mastering basic computer use to access information and materials for teaching, using e-mail and databases) has been so far achieved by not more than a fifth of all teachers in Slovenia, whereas the next stage (ICT-based autonomous search, editing, interpretation and evaluation of information, including hypertext, hypermedia and digital interaction competence) has been achieved by less than 5%. So far, only a third of all Slovenian secondary and primary school teachers have participated in any kind of pedagogical training connected with ICT – and with a total of 5 days a year dedicated to any kind of teacher training, this is not likely to increase significantly. The current alarming situation is due mostly to a severe discrepancy between teacher training programmes and real classroom needs on the one hand, and on the other hand, to an over-(techno-)euphoric introduction of new technologies to schools before 2000, when teachers were not yet (and above all not systematically) sufficiently acquainted with the possibilities of the (then) new media. As a result many teachers developed a fear or loathing of them. The authors estimate that 10% of teachers would be both ready and capable of mastering contemporary teaching styles that would include most recent developments in the area of ICT and active teaching methods in very short time. Another 60% would take several years to achieve the necessary competencies and an alarming third of all teachers would most probably never accept or implement new teaching concepts and techniques. As the present article shows, not only the topics, but the methods of ESD demand “a complete transformation in our teacher training programmes” (UNESCO, 2005, p. 59) that places urgent attention to the pedagogical use of ICT.

Significantly, blended learning methods seem to be in the foreground of the most optimistic scenarios of introducing ICT into educational processes in a sustainable way, and this is why teacher training in the near future is likely to focus on this particular area (Nekrep & Slana, 2006). Only a highly motivated, community-involved, quality-aware and personally responsible teacher (also as training participant) will be able to embrace the complexity of both ESD and ICT, especially if they are integrated in an inevitably paradoxical manner. Successful Finnish examples (FNCS, 2006) show two factors for efficient realizations of ESD guidelines: including elements of sustainability into graduate study programmes of pedagogy, and constant in-service teacher training that includes the practice of how to teach them inter-generationally and inter-culturally. The answer lies in a new-media savvy yet socially binding blend of participative and cooperative training as well as didactically structured empowerment towards ethical pedagogy that maintains the highest standards of professional dedication and intercultural competence. Although structurally similar to Slovenia, Finland, for example, presently boasts of one of the most progressive educational systems, not least owing to the efficient management of study materials, and according teacher training systems. Produced digitally – and interdisciplinary, to the highest media-production standards –

they are delivered mostly online and call for well-established networks of excellence in quality control that can assure trustworthy teaching and just-in-time/just-for-the need learning materials. Practically, some of these materials are not language-bound or culturally specific, and are above all and are often royalty-free, thus lending themselves for local use in other countries (ibid.).

For three years Slovenia has increasingly produced high-quality e-learning materials and developing robust joint platforms for their management and systemic support of blended educational processes. Only partnership- and collaboration-based networks as well as widely (cross-community and cross-culturally) accepted platforms can combine all these elements into a sustainable education system that will coherently incorporate all the heterogeneous elements and different stakeholders. Each of them can benefit from this process by decreasing the workload imposed by the conflict of traditional (paper- and chalk-based) teaching technologies, and increasing both learning outcome attainment and student satisfaction. Students especially need to significantly decrease their workload using ICT to make the classroom a place for new, better integrated and more sensible learning activities (Praprotnik, 2003). Topical local research has also found that sustainable consumerism is an important focal point that may replace environmental protection as the primary issue of ESD. Even more significantly it is ICT that can influence a reorientation away from unsustainable consumerist practices that affect both local and global global markets (Erčulj et al., 2008), mostly in terms of transport and infrastructural resources, but also in terms of administration, support personnel and immediate material costs. Of course, such shifts introduce new needs for resource consumption such as electricity or hardware-production and maintenance costs (along with supporting personnel), yet in practice these costs prove significantly lower than the traditional, presence-only educational model. Teacher training programmes should be tailored to the local needs and capacities of the specific school or community, and only include locally accessible technologies and know-hows that are likely to be (immediately) implemented in the educational process. “The first place (and perhaps most effective place)” to improve these aspects is beyond doubt within each teacher’s “own classroom and the curriculum area” of which s/he is “directly responsible” (UNESCO, 2005, p. 40).

How new technologies decrease workload and increase motivation

The Internet and the World Wide Web have sped up human communications, economic transactions and information processing, making different parts of the world come nearer to one another. One can claim that the (perceived, but also measured) time required to transmit and process information has drastically decreased due to electronic, digital and, above all, mobile communication technologies. Also, the phenomenon of “information overload” significantly increased: the immanently multitasked and multimedia-enabled human brain still easily gets overburdened by the soaring computation speeds of new technologies that force the slowly evolving brain into memory malfunction or attention deficit disorders (Klingberg, 2008). The present article presents a practical (and empirically closely observed) instance of carefully implemented ICT with a firm sustainability objective – decreasing the workload (as perceived time investment) and increasing student motivation. This research shows that if certain ICT-based course design elements are correctly implemented in a blended way, they can significantly

raise the “hours per ECTS credit point” (i. e. “actual” credit) (Purg & Zakrajšek, 2009, p. 192) value of the course without additionally burdening the students. After having been reserved predominantly for the workplace – now taking a firm hold also in the higher education sector – the workload issue has been spreading also into lower stages of the educational system, enabling both critical and future-oriented vertical comparability and transparency, as well as horizontal equity among different programmes, countries and cultures.

Decreasing workload through ICT

When students begin to take over the responsibility not only of their own learning (UNESCO, 2005), but also for the time they need for this learning, they are managing a particularly scarce resource – and one that is beyond doubt not distributed evenly. Purg and Zakrajšek (2009) find that while financial and material assets are being discovered as relative and inconstant, the resource of time is still widely accepted as a linearly, equally distributed good, of which every individual or group is granted an equal amount – at least at the beginning, and theoretically, excluding, for example, Einstein’s Theory of Relativity (1920). But practically there are many divides remaining in the realm, such as e. g. life expectancy – even if it more than doubled in the last two hundred years, it remained largely different throughout countries and even social strata (Riley, 2001). And similar is also true for forms of unfree labour (ILO 2005) etc. The invariable flow of time is, however, challenged also by human subjective impressions or states of e. g. “boredom” (time appearing to run more slowly than usual) or its antonyms of “excitement”, “interest” or “pleasure” and even “stress” (time seemingly passing faster than usual). Even if contemporary western societies proverbially value time as money (that is also said to make the world go around) – and even if at the cost of unsustainability in terms of negative globalization (Garson, 2002) – important future-oriented solutions are emerging (e. g. the “time-based currency” concept that lets people exchange services according to an absolute unit of time, instead of against relative money units; such a unit of exchange is usually called the “man-hour” and defines the amount of work performed by an average worker in one hour, thus being comparable to the ECTS concept explained below).

Purg and Zakrajšek (2009) recognize similar divides in other resources mentioned also in the realm of the knowledge resource spread unequally among countries and social strata – even if perhaps somewhat balanced with the globalizing effect of migrations and especially new technologies. As formal learning is increasingly becoming a life-long activity, the process of studying is perceived as underlying the same personal (or group-based) economy of resource management as e. g. labour. Within the so-called Bologna process, time is directly connected to credit value through the European Credit Transfer System (ECTS), defining a quantitative unit of study (one credit point) by time spent studying (25 to 30 hours). ECTS credit points award “all learning activities (such as lectures, seminars, projects, practical work, self-study and examinations) required to achieve the expected learning outcomes” (Education and Culture DG, 2006) and may as such easily obscure the importance of spending learning time in sensible, didactically well-designed activities and subject-relevant contexts (as linked to learning outcomes). The impression of time passed is strongly subject to factors of motivation that are dependent on teaching methods as well as forms and contents of study materials, and

not least the forms of assessment – which is why teacher training should pay particular attention to these topics. Apart from learning the right methods in terms of skills, it seems important that teacher communication and community competence is being fostered as well. Kember (2004) stresses the strong impact of personal relationships between teacher and student (group) discovering that the perceived workload also depends on student overall satisfaction with a course, the collective learning climate, and interpersonal relations in the group.

Increasing motivation through ICT

The research on workload assessment and satisfaction conducted between 2006 and 2008 (Purg, 2009) among first-year students of the “Media Production” higher vocational education programme shows that workload in terms of learning activity as well as assessment-based stress could be effectively distributed along the entire duration of the course run. This was especially because the blended course design prevented students from postponing their learning activity toward the end of the course – otherwise a major problem in Slovene (and many other Central European, i.e. historically Austro-Prussian influenced) educational systems. In terms of expanding the *recommendation 8.4. of the Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability* that suggests matching “student preferred learning styles and modalities (e. g., especially students from oral-based cultures whose preferred learning modality is listening, not reading)” (UNESCO, 2005, p. 57), the study discovers that the freedom of choosing the best medium for an individual to construct and present knowledge or skills (e. g. preferring video-recorded presentation to live, or forum discussions to in-class debates) indeed has a relieving effect – blended learning settings can be often seen as temporally optimized and personalized teaching and learning systems. Here the scope of the concept of “culture” is to be expanded to the globally emerging techno-cultures (Strehovec, 1998) that, especially among the young, again recover the (pre-literary, oral) preference for multi-modal information processing and exchange (Giesecke, 2005).

The empirical research of Purg and Zakrajšek (2009) on individual workload-relieving influences of ICT in education (conducted within the course “Introduction to Media” of the abovementioned study programme in years 2006-2008 in three different parallel course runs, on representative samples of over 150 students in total) has proven that spontaneous after-class discussions can be just as effective as regular semi-structured moderated discussions. In blended and distance learning settings, forum discussions or even chats can help optimizing student workload as well, whereas independent student forums and chat-rooms or other, more complex Web 2.0 applications such as portfolios, wikis or blogs offer significant added value for the media-cultured user. Blended and autonomous learning settings thus call for more complex models that necessarily include ICT-enhanced methods not only in immediate course delivery, but also in assessment processes. Through the use of a web-based learning management system (such as e. g. *Moodle* here) not only the teacher, but also school management can transparently follow and control the entire study process, from topical and temporal organization to course activities and grading aspects – which enables professionals to compare it horizontally to other courses and vertically to previous academic years (ibid., p. 198), assuring the necessary equity through a transparent systemic and regulatory approach.

Similarly, Hall (2008) finds that Web 2.0 can support and positively represent diversity, especially where cultural, racial, economic etc. differences deepen the digital divide, whereas Kupiainen, Suoranta and Vadén (2007) assume that technology-enhanced learning processes may play a certain critical and revolutionary role, creating a new set of politically-relevant productive competencies gathered under the conception of “digital social creativities”. As if contrary to the empirical base of the present article that founds its argumentation on quantitative assessment as well, the authors call for letting go of strict assessment and regulation practices that disable constructive and politically correct use of social media in education, which can – thus in terms of positive temporal resource management – ensure enough time and space for discussion, reflection, and debate.

Education for sustainable development with ICT

On the background of comprehensive studies, the above discussed case shows a practical example of addressing the guideline that effective “ESD is based on local needs, perceptions, and conditions.” So if “fulfilling local needs often has global effects and consequences” (UNESCO, 2005, p. 16), it needs to be recognized that exactly these students (of media production) are the ones who will, through their creative and decision-making roles in the media-production process, influence important structural and systemic change in the entire (media) society. Indeed, carefully designed new-media and web-based teaching and learning methods motivate students to reach higher course-defined competence, with less perceived effort or stress – and thus importantly structure their educational experience as integrative of ICT. If used correctly, ICT can help people learn faster and with less perceived effort. But most importantly, new media in education fosters interactive knowledge and skill acquisition that is more sustainable in terms of being centred on the learner’s actual needs, preferences and capacities, as well as sensitive to the ever changing environment (Purg & Zakrajšek, 2009, p. 198), thus directly addressing “content, context, pedagogy, global issues, and local priorities” (UNESCO, 2005, p. 16). From the point of view of new technologies, one can definitely see education not as a problem but rather as a “solution in working toward a sustainable future” (ibid., p. 59). If “all education for sustainable development must reflect environmental, societal, and economic conditions” and “be culturally appropriate” (ibid., p. 16), then it needs to openly consider and gradually embrace the condition of techno culture, moving technology into the focus of ESD in a reflected and critical, but also affirmative and participatory manner – thus fostering ICT as one of the pillars to a sustainable future.

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