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Deal with Reality: How ICT Enables Education to Go Green

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Abstract

Within institutional education, the implementation of distance and blended learning is starting to realize the potential of ICT. As e- and m-learning rapidly develop, the Internet, Smartphone, iPad, Apps, App stores and WiFi networking are affording ubiquitous computing. But Earth is suffering from worsening environmental pollution, climate change, and a sixth mass extinction. Educational institutions are seeking to adopt responsible environmental practices as environmental consciousness develops. Blended learning environments are favored, within which online distance components are then implemented. Integrated scheduling allows for student participation in distance online learning for a significant portion of study time, and effects environmental savings from reduced commuting costs and usage of institutional facilities, while providing increased capacity to service students. Learning Management Systems and educational MUVEs may merge, as Open Learning Networks incorporate Personal Learning Environments to provide effective autonomous learning environments to support traditional, blended, and distance learning.

Keywords: *ICT, EFL/ESL, MUVE, LMS, MALL, PLE, OLN, SLA, education, climate change, environment, sustainability, mass extinction, blended learning, distance learning, e-learning, autonomous learning, convergence, Korea.*

1. Introduction

The need for society to adopt a sustainable lifestyle is becoming pressing in the face of three critical issues: environmental pollution, global climate change, and an event that many scientists consider to be nothing less than a (sixth) mass extinction of species. Educational institutions, courses, teachers, administrators and students can contribute to that needed reorientation in a variety of ways. Educational content can focus on green issues and potential solutions, and adopt ICT for research, collaboration and presentation. Through wise use of ICT to develop blended learning environments, environmental advantages that accrue from the use of distance e- and m-learning can be integrated and exploited. Language learning in particular can benefit from multimedia, and from communication technologies that enable free or affordable distance synchronous text, audio and video chat and conferencing, as well as asynchronous communication. EFL/ESL courses offer special potential to help raise awareness and act as a conduit to access a multiplicity of relevant English-language online resources, notably global research and educational material.

2. Environmental Pollution + Climate Change = Mass Extinction

2.1. Environmental Pollution and Climate Change

The 2007 Intergovernmental Panel on Climate Change (IPCC) reached a consensus: climate change is happening, and it is largely related to human activities [1]. Estimates of global

warming during the next century vary, but generally fall in the range of 2°- 4°C. Rises as high as 7°C are projected for much of the United States and Europe, with even higher temperatures expected in northern Eurasia, Canada, and Alaska. The UK environment ministry Defra, faced with the latest projections that suggest the potential for major change which include southern England being on average 2.2°- 6.8°C warmer by the 2080s, has recently unveiled climate-proofing plans. These include building roads to the same standards as the scorching south of France; moving fish from the overheated Lake District to cooler waters in Scotland; taking action to protect lighthouses threatened by rising seas; and raising concerns about keeping railway passengers cool in heat waves, ensuring that rail lines do not buckle in high temperatures, and preventing embankments collapsing as a result of flooding [2].

Figure 1. Manmade environmental pollution is resulting in massive climate change and causing the mass extinction of species

2.2. Mass Extinction Events

Figure 2. Life on Earth has experienced five previous mass extinctions, caused by natural phenomena including massive volcanic eruptions and asteroid impacts

Wake and Vredenberg detail how, in each of five great mass extinctions on this planet, a profound loss of biodiversity occurred during a relatively short period [3]. The oldest mass

extinction occurred at the Ordovician-Silurian boundary (≈439 Mya), when approximately 25% of the families and nearly 60% of the genera of marine organisms were lost. The next great extinction was in the Late Devonian (≈364 Mya), when 22% of marine families and 57% of marine genera disappeared. The Permian-Triassic extinction (≈ 251 Mya) was by far the worst of the five mass extinctions, when 95% of all species (marine as well as terrestrial) were lost, including 53% of marine families, 84% of marine genera, and 70% of land plants, insects, and vertebrates. The End Triassic extinction (≈199-214 Mya), associated with the opening of the Atlantic Ocean by sea floor spreading related to massive lava floods that caused significant global warming, most strongly affected marine organisms, where 22% of marine families and 53% of marine genera were lost, but terrestrial organisms also experienced much extinction. The most recent mass extinction was at the Cretaceous-Tertiary boundary (≈65 Mya), when 16% of families, 47% of genera of marine organisms, and 18% of vertebrate families were lost.

Merely 74,000 years ago, humanity nearly became extinct, as a consequence of the Toba super eruption, which it is thought plunged the planet into a volcanic winter. The world's population plummeted to perhaps 2,000, a genetic bottleneck from which all modern humans are presumed to have descended [4]. And currently, the BBC is drawing attention to the urgent need to alleviate projected global suffering in the next 20 years by increasing worldwide food supplies by 40%, fresh water by 30%, and energy by about 50% [5].

2.3. The Sixth Mass Extinction

Figure 3. This current sixth mass extinction is different, in that it is resulting from the intense pressure of human activities and settlements on the environment

According to Wake and Vredenberg [3], many scientists argue that we are now either entering or in the midst of a sixth great mass extinction, and that this is happening as a consequence of intense human pressure - both direct and indirect - that is having profound effects on natural environments. Habitat destruction and climate change particularly impacts upon narrowly adapted and distributed species, and little time may be left to stave off a potential mass extinction. Scientists from many fields warn of burgeoning threats to species and habitats. The evidence of such threats as human population growth, habitat conversion, global warming and its consequences, impacts of exotic species, and new pathogens, suggests that a wave of extinction is either upon us or is poised to have a profound impact. Unlike previous mass extinction events, the principal cause of the present extinction spasm appears to be human activities, which are associated directly or indirectly with nearly every aspect. The sheer magnitude of the human population has profound implications because of the demands placed on the environment. Population growth, which has dramatically increased since industrialization, is connected to nearly every aspect of the current extinction event. Other (non-human) species have been severely impacted by habitat modification and destruction,

which frequently has been accompanied by the use of fertilizers and pesticides. In addition, many other pollutants that are byproducts of human activities have negative effects on other species. Humans have been direct or indirect agents for the introduction of exotic organisms. Furthermore, with the expansion of human populations into new habitats, new infectious diseases have emerged that have real or potential consequences, both for humans, and for many other taxa. Perhaps the most profound impact is the human role in climate change, the effects of which so far may have been relatively small, but which may shortly be dramatic [6]. Extrinsic forces, such as global warming and increased climatic variability, increase the susceptibility of high-risk species that have small geographic ranges, low fecundity, and specialized habitats. Multiple factors acting synergistically contribute to the disease, declines and global extinctions of certain species, and the critical loss of biodiversity that ensues.

3. The Imperative to Go Green

If we are to act responsibly as a species, it therefore follows that there is a clear imperative to rapidly adopt informed environmental attitudes, and to work together towards avoiding a global catastrophe. It is my considered belief that this catastrophe is a direct consequence of our global civilization's widespread denial of reality, immature world-view, and unhealthy lifestyle. Educational institutions need to recognize and must inevitably bear a major responsibility to meaningfully and effectively address these issues.

3.1. Green Content

The most obvious way in which EFL/ESL educators can promote green-aware and responsible lifestyles is by including green issues into educational content. Study topics can include green issues, and tasks can be set that address matters relating to environmental consciousness. For example, oral examination topics I have set pairs of students include:

- You are a committed environmentalist, who is very worried about global pollution. Convince your partner to buy a bicycle, then go for an imaginary bike ride together in Seoul or in the country, and talk about what you both experience.
- One of you is strongly in favor of the Grand Canal scheme linking Busan to Seoul proposed by President Lee. The other is firmly opposed to it. Debate the issue, and try to convince one another of whether it is a good idea or not.
- You have recently learned of the Sixth Mass Extinction. Describe it to your partner. Partner, ask appropriate questions, and suggest what might be the consequences for Korea and for Koreans.
- Discuss with your partner the causes and problems of Global Warming, how they are likely to affect you in Seoul and in Korea, and what you might do to deal with the problem.
- You are a committed environmentalist, who is very concerned about pollution in Korea. Your partner is a litterbug, who regularly leaves his/her rubbish behind after having a picnic at the beach. Convince your partner to be responsible for the mess he/she makes. Then switch roles.

Recent tasks that require students to post online responses have included topics that allow for environmental issues to be introduced and addressed:

- Where would you like Korea to be in the next 10 years? How should that happen?
- What is the most urgent problem confronting Korea, and what should be done about it?

3.2. The Green L2 College

A more pervasive and effective means of promoting an environmentally responsible lifestyle might lie in a restructuring of the educational environment at different levels, so that students, teachers and administrators consciously adjust their lifestyles to live more in accord with green principles. At the institutional level, initially this may not even need to involve ICT, and might simply involve a rescheduling of classes and contact hours to reduce commuting time of staff and students; with some planning and ingenuity this need not even imply a reduction in contact hours.

Case Study 1 - Teacher Commutes to and from a Suburban College: A suburban college employs 12 native English-speaking teachers. Teachers are required to teach 4 classes of 3 hours per week, plus keep office hours of a further 3 hours per week. Most teachers have just one class per day, and so are required to be present 4 days per week, with office hours being worked on a chosen class day. The college is situated on the edge of Seoul, and accessible by public transport by a regular bus service from a nearby subway station. Most teachers live in Seoul, and commute times of teachers range from 40 minutes to 2 hours or more each way. The typical commute time is of perhaps 90 minutes each way, and involves walking or busing from one's apartment to a nearby subway station, a subway ride with or without transfers, and a bus trip from the destination station to the college. Students also tend to commute for substantial periods, as few live nearby.

Analysis: The significant environmental costs associated with requiring staff and students to be physically present in a classroom at particular times could be reduced.

Proposed Solution: A restructuring of class times could reduce course hours to one class of two hours per week per student. Most students are of relatively low academic level, and for many, the motivation for learning English is not high. This should therefore entail little loss in educational quality, as teachers agree that the third hour is quite unproductive. Teachers would then be required to teach 6 classes of 2 hours per week (plus office hours as before). The 150% increase in classes would be offset by reducing class sizes to 2/3rds of the present level, which would substantially improve the quality of education. Teachers would face some increase in administrative duties because of the extra number of classes. But the total number of students each teacher managed would remain constant, and as the classes taught by a teacher tend to have the same level, textbook and syllabus, little extra work is involved. A significant improvement for teachers would then lie in rescheduling classes, so that teachers taught 2x2 hour classes per day, and were thus only required to be present for three days of the week rather than four. This provides an incentive for attracting and retaining well-qualified teachers, while reducing the overall commuting time and associated energy costs for teachers by 1/4. Similar savings are possible for student commuting times.

3.3. The Green L2 Classroom

As I elsewhere discuss [7, 8], ICT and Convergence are having a radical impact on society, and the effects on educational pedagogy and institutions are profound. Telecommunications

and multimedia are providing for highly effective distance learning, communication and collaboration. Mobile computing among students is becoming ubiquitous, following a progression of cell-phone, SMS and dedicated electronic bilingual/multilingual dictionary, smart-phones, email and instant messaging, and associated apps, laptops, and now tablet computing as exemplified in the Apple iPad [9]. Teachers are gradually adopting e-learning through a progression of home or office computer use for preparation and administration, through a teacher's console in classrooms with associated OHP and Internet access, intermittent use of fixed computer labs for online tasks, quizzes and exams, experimental use of student cell phones and smart phones for educational tasks, and culminating in laptop or most recently tablet computing, where students use personal devices. Blended learning environments are integrating the best qualities of traditional face-to-face learning with online learning, multimedia, access to online resources, and distance communication, and are now being adopted. Learning Management Systems (LMS) being implemented integrate administrative duties, and provide services that include social networking between students and potentially between classes whether local or distant, access to learning tasks, quizzes and exams, access to task uploading and teacher assessment, automatic scoring of quizzes and exams and a medium for efficient teacher grading of set tasks and essay style answers, a medium for teacher assessment and grading including overall scores, and a means of students accessing their grades while preventing them from viewing other student grades [10].

As an inevitable consequence of these various changes, the status of the traditional classroom is increasingly being called into question. Given the sophistication of telecommunications, is it really necessary for students and their teacher to always be present in the same physical space for effective learning to occur? The learning space is increasingly virtual, as students use course homepages, social networking sites, blogs and online forums to learn from and teach one another and interact with their teacher. While Web 2.0 technologies that enable students to create, load and edit content are exposing the limitations of commercial LMS, Bates claims LMS still have major advantages: they provide an institutionally secure environment, enable the management of learning, and integrate with administrative systems [11]. Once blended learning is implemented allowing ready teacher-student and student-student online communication and collaboration, there is no need for physical presence in the same classroom to be full-time. Blended learning can incorporate components of online distance learning, which together with appropriate scheduling can reduce the need for commuting, and for physical meeting spaces and services. Of course, virtualization requires a measure of autonomy on the part of the student, who increasingly needs to take responsibility for her learning. Students are thus partaking in the global shift that is taking place from consumer- to participatory-culture, that is described by Jenkins, Purushotma, Clinton, Weigel and Robison as having:

- Relatively low barriers to artistic expression and civic engagement;
- strong support for creating and sharing one's creations with others;
- informal mentorship as what is known by the experienced is transmitted to novices;
- members who believe that their contributions matter; and,
- members who feel some degree of social connection with one another and who care what other people think about what they have created [12].

Case Study 2 - Student Commutes to and from a Suburban College: Using the same example of a suburban college, most students also face lengthy commutes five days a week during semester to and from college, as few students live within close proximity. Substantial brick and mortar facilities are needed to cater for peak usage, but are often unused for substantial periods of the day.

Analysis: Offering blended learning across all courses (not just in EFL/ESL) permits all courses to include distance-learning components. This helps reduce the number of commutes students are required to undertake, while making for effective use of college facilities that constitute a major investment, such as buildings and classrooms.

Proposed Solution: Two solutions are suggested that implement blended courses with integrated schedules and online distance learning components. Courses would therefore employ mixed usage of traditional classroom use and virtual online classes. The virtual online classes would mainly be distance learning, with students not physically present, though some time would be allocated to using virtual facilities in computer labs on campus (with students physically present), for orientation, familiarization with online learning and collaboration, introduction of work segments, presentation and evaluation of course work, and quizzes and exams. This would require students to exercise discipline in participating online in the distance component of courses each week. Given Korea's very high penetration of high-speed Internet access and ubiquitous supply of PC rooms, this should prove feasible, as those without personal computers have easy access to cheap commercial computer facilities (typically 1,000 won per hour). Virtual online classes would include collaborative as well as self-directed engagement and learning. Students who lived near one another might elect to work together in local groups, taking advantage of the rapid uptake of WiFi-enabled mobile computing such as hotspots in cafés and home WiFi networking in apartments. With some imagination, a teacher could structure all students into diverse localized groups, and take it in turns to visit and be physically present with one such group each class, while maintaining virtual contact with all groups and students. This could be combined with the topics and themes that are addressed in class, so localities might include (group) visits to museums, art galleries, zoos, exhibitions etc. Such mobility is a key affordance provided by the iPad.

The first alternative is to implement blended courses with integrated schedules that require students to physically attend college on just three days a week, but that requires online distance participation in courses on the other two days of the week. Classes that involved online distance components would be staggered by course (presuming 5 day-a-week student use of facilities is desired). In this first case, student commutes and requirements for physical facilities such as classrooms could be cut by 40%.

The second alternative is again to implement blended courses with integrated schedules, but this time pair classes so that partner classes alternate weekly between physical attendance and distance participation. An effective way to implement this would be to also pair their teachers - so that one would be tasked with traditional teaching and the other with online teaching. The teachers would alternate classes each week; with students alternating weekly between physical attendance and online distance participation. Further, teachers conducting online distance components could in principle do so from home, without themselves needing to commute to college. In this second case, student (and teacher) commutes and requirements for physical college facilities such as classrooms (and offices) could be cut by 50%.

Figure 4. Class homepage offers numerous links to encourage student exploration

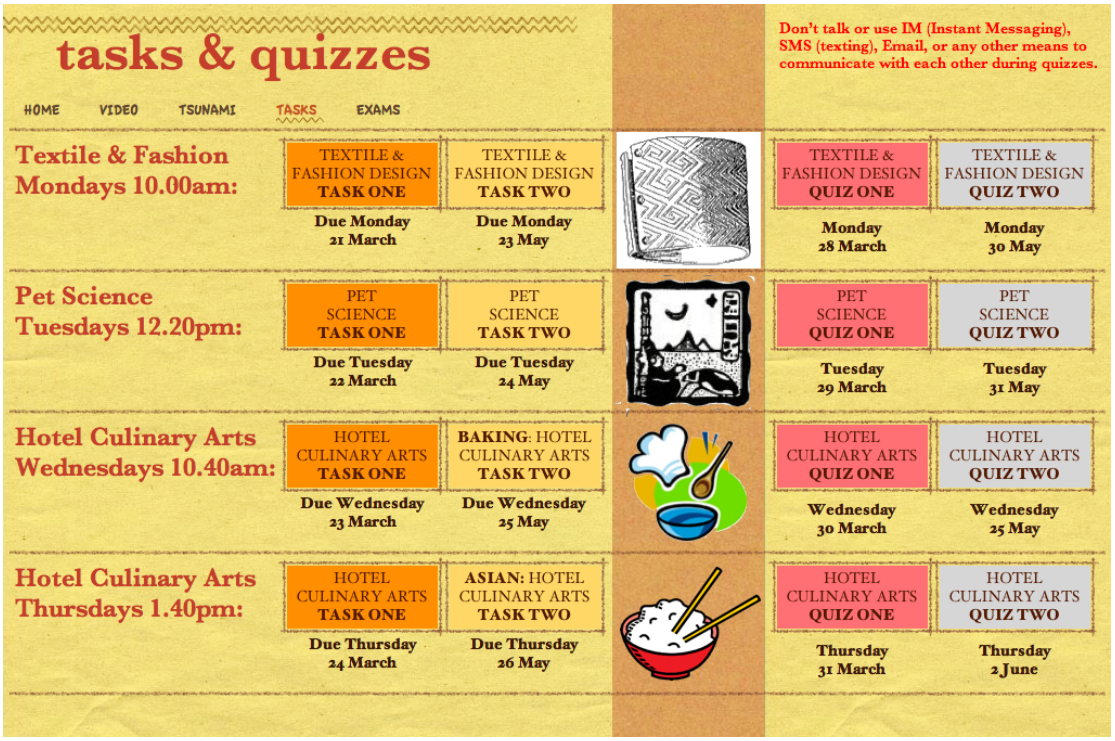

Figure 5. Students access all online Tasks and Quizzes through the Tasks webpage

In both cases, while significant investment is required to recruit skilled and motivated teachers, and provide them with adequate technological and administrative support, environmental savings would be substantial, and extend to the educational institution as well as to the students. In addition to the considerable time saved in avoiding unnecessary commuting, typical yearly commute fees for a student would be halved:

0.5 x 2 semesters x 2 ways x 16 weeks x 5 days x 1,000 won = 160,000 won per year.

Case Study 3 - Student Handouts for Courses: Over seven years I have moved my classes towards blended learning environments, but with distance online activities limited to asynchronous tasks. Lack of access to adequate institutional computing facilities has meant substantial compromises have been needed. Last year I taught four classes of freshman students, with average class sizes of 28 students, for a total of 2 x 4 x 28 = 224 students. Presuming no computing facilities are available and no LMS or online exam management system is used, each class on average requires 28 x 25 = 700 A4 pages for handouts. But in practice significantly more are required, as more handouts are needed for forgetful students, so conservatively estimate 800 A4 pages per class (though wastage is higher). This is 8 x 800 = 6,400 A4 pages per year. This year, with dramatically larger class sizes, savings are greater.

Figure 6. Similarly, all exams are online and accessed through the Exams webpage

Analysis: A significant environmental cost in terms of paper supply, copying, and room cleaning is associated with providing students with physical hardcopy handouts for syllabus and course information, and particular quiz, task and exam instructions and content. Handouts are often left abandoned in classrooms, and students quite often request further copies, which is also rather time-consuming. This is hardly an isolated issue; in December 2010, WWF, the

world's leading environmental organization, announced its .wwf file format in a bid to stop unnecessary printing and wastage of paper. The .wwf format, based on PDF, is unprintable to encourage the avoidance of printed products and printing documents onto paper. Amongst other environmental benefits, this should save trees, notwithstanding union opposition [13].

Proposed Solution: Implement an LMS (such as Moodle) together with an online Assessment System (such as Cognero) to manage content, create and assign tests, and deliver tests through a secure online test center, while providing complete reporting and data dissemination. Early in each semester, create a course homepage in the Moodle LMS as in Fig. 4, with needed instructions and hotlinks to online tasks and quizzes as in Fig. 5, and to online exams as in Fig. 6, to be provided when required. (While the instructor is afforded some capability to customize the course homepage, it would be beneficial to use an LMS that affords considerable latitude to students to also customize and decorate the class site, particularly to encourage participation and a degree of ownership of the site pages). Train students to expect to log in to that homepage to locate desired course information and to access tasks, quizzes and exams, and encourage them to bookmark the login page on their PC. To manage classes effectively, use individual Student ID numbers for IDs and for passwords, but encourage them to edit their profiles, personalize their shared virtual environment, and utilize social networking site capabilities. Design tasks that are to be performed and submitted online e.g. online questionnaires using Google Forms or Moodle Survey activity, or Moodle Q and A forum for blog posts and responses. Where scoring is required (rather than a simple binary determination of whether the task been performed or not), this should preferably be conducted automatically, so make quizzes online, e.g. either use Moodle Quiz activities, or use Cognero to provide online tests using Multiple Choice, Multiple Response, Completion, Matching, True/False, Yes/No type questions. (Opinion Scale/Likert, Subjective short answer and Essay type questions can also be used, and require the instructor to assess the response rather than use automatic grading; ensure that this assessment can be effectively conducted online; e.g. blog posts in Moodle Q and A forums can be graded online as well as responded to, but in Moodle 1.9, the process is not particularly user-friendly, requiring a number of quite unnecessary dialogue boxes to be navigated for each grading or teacher response/post).

4. Strategies for Integrating Online Distance Learning

With blended learning implemented, online distance learning components can be to:

- Simply provide asynchronous online tasks for students to work on individually, in pairs or groups, including online quizzes and exercises such as online crosswords.
- Provide links to online content that students are expected to view and respond to.
- Provide lecture material online, for students to view; e.g. podcasts that could initially be audio only, but later introduce podcasts in video format.
- Require students to use synchronous communication tools, e.g. chat platforms. As d'Eça observes [14], good ones are available on the World Wide Web, and some are free. These can be employed in text, audio or video modes.
- Provide MALL (Mobile Assisted Language Learning) programs that employ student-focused, media-rich, flexible and collaborative learning strategies.
- Be available online for videochat counseling of individuals or small groups.

- Host videoconferencing sessions where students are expected to participate e.g. SKYPE hosting of videoconference sessions for $5 per day or $9 per month fee. Free group videoconferencing alternatives include iChat, QNext, Tokbox, Tinychat, and Sifonr [15].
- Use, modify or develop educational MUVEs (multi-user virtual environments).
- Use OLNs (open learning networks) to integrate PLE (personal learning environments), as suggested by Mott to overcome the limitations of LMSs and PLEs [16].

4.1. MUVEs for Teaching and Learning

MUVEs (multi-user virtual environments), commonplace to gamers in Korea, offer potential for substantive teaching and learning. Dieterle and Clarke show they can support the situated and distributed nature of cognition within an immersive, psychosocial context [17]. MUVEs enable multiple simultaneous participants to:

- Access virtual contexts;
- interact with digital artifacts;
- represent themselves through avatars;
- communicate with other participants and with computer-based agents; and
- take part in experiences incorporating modeling and mentoring about problems similar to those in real world contexts.

Figure 7. Students can access web-based videos on pedagogical material

Figure 8. Web-based videos on current natural events with scientific explanations

Dieterle and Clarke discuss River City as a case study of how MUVEs can be designed to support the situated and distributed nature of learning, thinking and activity; cognition is situated within both a physical and a psychosocial context, and distributed between a person and his/her tools. Distributed cognition and situated learning are complementary and reciprocal. Cognitive processes need no longer be confined within the head of an individual, but include cognitive activities that are distributed across internal human minds, external cognitive artifacts, groups of people, and space and time. The mental burdens of activity can therefore be understood as dispersed physically, socially, and symbolically between individuals and their tools. Through collaborative experiences of teaching and learning from other students and virtual agents in the world, students distribute cognition socially. Cognition can be symbolically distributed through symbolic systems such as mathematical equations, specialized vocabularies and representational diagrams. Concept maps transform thoughts and notions into tangible systems, and may be used as graphical organizers, tools for collaborative knowledge construction, and assessment instruments. Students learn to use the specialized language, customs, and culture of the scientific community to overcome barriers to symbolic distribution of cognition in the classroom resulting from a dearth of language for thinking, cultivate a common vocabulary about inquiry, explanation, argument and problem solving.

Avatars are also examples of symbolic distribution of cognition, as the virtual, symbolic embodiment of users within the virtual space. Customizing expression, gestures, facial expressions, clothing and other symbols or symbolisms used to define identity in face-to-face settings are virtually created and projected by participants in MUVEs, and define who/what participants want to be, providing the user with an ability to create singular or multiple online identities, thus allowing exploration of how an individual is recognized or known.

In the situated perspective of cognition, learning is a phenomenon that occurs in the course of participation in social contexts. Concepts are not independent; rather, activity, concept and culture are entwined among the physical and social contexts for knowing and understanding. Knowing is an activity, not a thing; always contextualized, not an abstraction; reciprocally constructed between an individual and his/her environment, not defined objectively or created subjectively; and a functional stance based on interaction and situation, not a truth. Cognitive apprenticeships offer a three-part sequence of modeling, coaching and fading.

MUVEs change both what and how students learn and teachers teach, and lend themselves to capturing student learning. One reason for developing MUVEs is their ability to leverage aspects of authentic learning conditions that are hard to cultivate in traditional classroom settings. They also allow for the design of situations that are not possible or practical in the real world. MUVEs can offer scenarios with real-world verisimilitude that are safe, cost-effective, and directly target learning goals.

Cultures are coupled with the technological advances that evolve with them. MUVEs have become a major force, shaping how we communicate, participate, learn, and identify ourselves. But teaching practices have not changed to embrace such technologies [17]; schools focus on individual performance, unaided thinking, symbolic thinking, and general skills. Cognition outside schools is usually socially distributed and tool use is prominent, involving particularization and contextualization of abstraction, and learning that focuses on situation-specific ideas. The best learning environments for students are authentic, situated, and distributed across internal and external sources; but these conditions are difficult to create in classroom settings. MUVEs can create learning experiences that are not only authentic, situated and distributed, but also provide a context to change standards by which student achievements are judged and the methods by which their accomplishments are assessed.

4.2. Integrating MUVEs from the Present Pedagogical Situation

Clearly a full integration of MUVEs into readily available educational technology has yet to occur. Perhaps the uptake of MUVEs in education will parallel the adoption of tablet computing. Tablet computers have been available for quite some years now, but it was not until Apple provided an adequate solution when it introduced the iPad together with a supportive environment of iOS, multi-touch technology, apps and app stores that tablet computing has finally taken off. Educational MUVEs have yet to see adequate solutions that offer the required mix of virtual environmental sophistication for the student with ease of design and customization for the teacher.

Meanwhile, Dieterle and Clarke's summation of the affordances MUVEs offer [17] suggests that existent LMS such as Moodle can be regarded as rudimentary MUVEs: they allow multiple participants access to virtual contexts which can be simultaneous; a limited ability to interact with digital artifacts; a very constrained ability to represent themselves as avatars; an ability to communicate with other participants in chat rooms; and the potential to take part in experiences incorporating modeling and mentoring. An interim solution for developing widespread distance learning components to blended environments is then to offer a virtual replacement to the traditional classroom that teachers can readily adopt, structure and implement, and students can readily access. So the traditional sense of community in a classroom and ability to collaborate in learning could in transition be provided in a virtual environment, where students express and develop their own identity, and use Web 2.0 technologies to structure their classroom in a virtual environment that they come to own.

But this is just an interim solution, where new technology is used to create a virtual similitude of the traditional physical reality of the classroom. As we move towards a post-convergence age [18], the virtual environment will inevitably develop beyond simply replicating existent physical forms. One problem to be dealt with in using MUVEs at present is that we encounter a disparate nature of virtual and physical reality. But as technology evolves, we look towards more integrated relationships, so that boundaries do not remain hard and distinct, but allow for soft interpenetrations and hazy definitions. In that realization, we move effortlessly back and forth between physical and virtual worlds, as the ubiquitous computing provided by the iPad and WiFi networking already allow. And we envisage an augmented age in which reality is greatly enriched, as we learn to more properly inhabit the infinite possibilities of the virtual realm, within which lie secure reserves of physical reality.

5. Conclusion

Faced with critical issues of environmental pollution, global warming, and the sixth mass extinction of species, society urgently needs to adopt a sustainable lifestyle. Educational institutions, courses, teachers, administrators and students can contribute to that needed reorientation, particularly in EFL/ESL. Educational content should address green issues, explore potential solutions, and move aggressively towards integrating ICT for research, collaboration and presentation. Blended learning environments should be utilized, where, together with the provision of effectively ubiquitous computing provided by WiFi networked campuses together with the iPad, environmental advantages of distance e- and m-learning can then be integrated and exploited. While LMS may be regarded as rudimentary MUVEs, the two will likely merge, as sophisticated educational MUVEs are developed to accommodate LMS functions. OLNs may integrate LMSs with PLEs that learners modify to facilitate their learning [11, 16], thus providing effective autonomous learning environments that fully support traditional, blended, and distance learning in an environmentally responsible manner.

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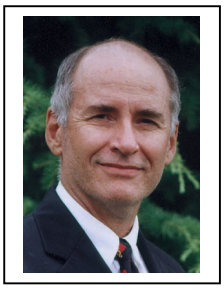

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