Technology Enhanced Learning for People with Disabilities:

Approaches and Applications

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Chapter 6
Personal Learning Enviroments:
Meeting the Special Needs of Gifted Students

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ABSTRACT

Gifted Students, in spite of their very well known characteristics, have specific education needs in order to achieve their potential. Although they do not present a special educational need in the common meaning, they have very particular learning needs that, if overlooked, may lead to adverse feelings towards school and learning that can result in academic failure. Authors in the field agree that giftedness can and must be developed and providing challenging and facilitative learning environments is the first building block. The PLE, held up by WEB 2.0, for its openness and possibilities it offers to learn autonomously, resorting to exploration, discovery, networking with like-minded peers and experts fits the style and pace of learning of its user and shows to be a tool to fully suite the particular traits of these students. In this chapter a 5 dimension ple is conceptualized that accommodates the cognitive, emotional and education needs of gifted students.

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INTRODUCTION

Giftedness, the potential for exceptional achievement, is normally characterized by high intelligence and creativity. Frequently it is associated with high Intelligence Quotient (IQ) scores, which is a highly limiting approach and excludes a broader and complex dimension that involves other facets of gifted people. Gifted individuals exhibit a complex of cognitive, perceptual, emotional, motivational and social traits. The issue of giftedness has attracted attention and interest over time, creating myths that contributed towards misconceptions about gifted individuals. Usually, when one refers to gifted students we think of someone with outstanding intellectual abilities, with high levels of cognitive interests, fast learning and, therefore, that easily overcome obstacles and do not experience any difficulties in academic life. Seen in this way, there would be no reason to take particular care for the education of these students. It would seem that these students always learn, whatever the circumstances, good or bad, that make up their study environment. In fact, gifted students do have special needs that may cause several problems that can lead even to school dropout. Gifted students underachieve for many reasons and in many different circumstances that range from obstructing disabilities to lack of motivation and interest in school activities.

Several authors agree that we must regard giftedness as something that can and must be developed, stressing the importance of learning environments (Gagné, 1999; Heylighen, 2007; Endepohls-Ulpe, 2009). As Endepohls-Ulpe (2009) correctly states, students with a rapid learning pace, highly effective information processing capacities and memory skills, often associated with high learning motivation and a growing need for knowledge, will suffer from boredom and under-stimulation if their special needs are not met. Lack of challenging experiences and lack of a sense of achievement will, in the long run, decrease or destroy their motivation and affect their intellectual development (Endepohls-Ulpe, 2009). Therefore, their capabilities risk not being developed due to environmental issues or even due to avoidance related with the lack of adjusted responses that may lead to disinterest in school and consequent failure.

As many education professional acknowledge these students experience several difficulties during their education, despite the relevance of their particular qualities (Senos & Diniz, 1998). Steps have been made in order to actively respond to these students' particular needs, however there is still a major lack of educational strategies to support gifted students education. They require services and activities not ordinaryly provided by school in order to fully develop their capabilities (Johnsen, 2004; Renzulli, 2002; Brown, Renzulli, Gubbins, Siegle, & Zhang, 2005). Gifted students demand flexible and differentiated learning strategies that comply to their special educational needs in order to develop their potential. Otherwise we risk not being able to provide meaningful and enjoyable learning experiences that take advantage of what these students can potentially offer. However, even the more willing teacher who strives to be proactive in this respect is faced with constraints to implement individualized teaching and learning that often reveals itself to be hard work in today's classroom that still suffers from the "syndrome" of teaching for the masses.

The implications that computers and the Internet have in providing new and meaningful experiences in education is unavoidable. The use of technology to enhance education is well documented, it being clear the associated motivational load that it triggers in all students, eager to explore it and play and learn with it. It has been observed that technologies and web experience are advantageous in general and special education, acting as innovative learning tools and promoting access and participation for all students (Ribeiro, Moreira & Almeida, 2009). The Web 2.0, the new concept of the Internet, is now a two way process, where users can easily interact, create and share

information, open up new doors that open up new possibilities of knowledge construction. We can now consume and produce contents, trough webware applications that allow to gather and mash-up information, interact and communicate. Web 2.0 based Personal Learning Environments (PLEs) constitute a multidimensional space where it is possible to assemble and tailor different software and webware applications that suite the users learning needs in terms of content consumption and information exchange. PLEs paired with strategies that encourage the pursuit of knowledge through more autonomous learning based on search, discovery, exploration and social interchange present themselves as a component of the open instructional format that seems to be more advantageous for older or more intelligent students (Heller, 2004). Therefore, they seem to be adequate for the particular needs of gifted students that require open and comprehensive learning environments. Educators of gifted students endeavour to provide curricula with complexity and depth, which includes organizing, analyzing, synthesizing, and communicating large amounts of information. Technology can be used effectively in this process (Siegle, 2004a). Such tasks define the nature of a PLE that can be characterized in a simplistic manner as an online space that resourts to WEB 2.0 tools to manage all of them. Not being the all-in-one-solution to the learning of gifted students, PLEs could be an answer to the differentiated learning that these students require.

In this chapter we introduce and explore the potential that PLEs have to offer to support the learning needs of gifted students. It is our belief that PLEs fully fit the particular characteristics of gifted students and thus portray themselves as a tool for individualizing learning at the service of these students.

A PLE can be used with almost any age group. But given the constraints that involve the use of the Internet, supervision is advised and its use should preferably be aimed at young people with an added integrated sense of responsibility and Internet safety. Cautionary measures can be taken with the use of tools similar to those of parental control.

THE GIFTED STUDENT

There is no clear universally agreed definition of gifted students. Overall, the literature consistently reports positive qualities of interpersonal effectiveness, independence, and self-assurance for academically gifted students (Murray, 2008). Although it is not clear, the concept behind Special Educational Needs also comprises the education of students with giftedness traits, an area with several and controversial discussions due to erroneous conceptions, which include those that state that gifted students are equipped with skills that empower them to succeed with no help. However, the gifted individual is not necessarily a brilliant student. It is often found that gifted students may have social and learning issues (Serra, 2004; Senos & Diniz, 1998). Gifted individuals with learning disabilities or other learning problems are a common exception; they often may have extreme ability in one or more areas and need remediation in others (Rimm, 2009; Johnsen, 2004). However, it has been found that it is very rare that a gifted student excels in all areas; rather, they usually have great competences in very restricted areas (Serra, 2004; Senos & Diniz, 1998).

Rather than presenting an extensive list of definitions and discussion on giftedness we would like to expose a brief but comprehensive description of giftedness that may allow the reader to understand the traits that influence the academic path of gifted students.

The concept of giftedness goes beyond high IQ scores, which is a very restrictive definition and many scholars and practitioners argue that it disregards numerous students whose potential for superior performance simply does not show up on intelligence tests (Renzulli, 2002). As Heylighen (2007) correctly states, giftedness is characterized

by a complex of traits extending far beyond aptitude for IQ tests. One of the most cited authors, with whose perspective we agree, is Renzulli, who assembled the works of experts in the area and came up with the following definition (Brown, Renzulli, Gubbins, Siegle, & Zhang, 2005, pp. 69):

"Giftedness consists of an interaction among three basic clusters of human traits these clusters being above-average general abilities, high levels of task commitment, and high levels of creativity. Gifted and talented children are those possessing or capable of developing this composite set of traits and applying them to any potentially valuable area of human performance. Children who manifest or are capable of developing an interaction among the three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs (p. 261)".

This definition captures the essence of giftedness and highlights the need for proper educational responses. Moreover, we concur with Clark (2002 *cited in*Manning, 2006) that the growth of intelligence has a strong dependability on environmental experiences that the individual encounters to develop his/her abilities. Therefore, opportunities must be provided so that a gifted student can raise his/her potential. In a simple and non comprising way, we can say giftedness is the potential for exceptional achievement, high cognitive abilities and creativity. Gifted individuals exhibit a complex of cognitive, perceptual, emotional, motivational and social traits (Heylighen, 2007).

Based on the work of different authors (Gowan & Torrance, 1971; Renzulli, 1978-2007; Tannenbaum, 1983; Tuttle & Becker, 1983; Alencar, 1986; Freeman, 1991; Lombardo, 1997), cit in Oliveira (2007); (Silverman, 2000; Winebrenner, 2001; Clark 2002), *cit in*Manning (2006); (ERIC Clearinghouse on Handicapped and Gifted Children, 1985; Sisk, 1987; Chuska 1989; Landau, 1994; Serra, 2004; Bainbridge, 2010) we can sum up the traits that characterize gifted youngsters (Figure 1).

From some of the traits listed above we can see that gifted individuals have a high learning potential if their cognitive, motivational and creative needs are met. Anticipating the description of some of the most common educational strategies used with gifted students and the introduction of Personal Learning Environments in this chapter, we would like to draw the reader's attention to the intellectual, motivational and work discipline traits that stand up to show the willingness to pursue knowledge in flexible, autonomous, self-regulated and innovative ways. Their abilities and thinking processes indicate that intellectuality gifted students need advanced content and choice in learning activities (Manning, 2006). Cognitive abilities and motivation need to be worked with these students in order to fulfill their needs and not holding back their enormous potential.

Underachievement as a Result of Maladjusted School Environments

Possessing such high intellectual abilities it is easy to conceive that these students encounter no difficulties in their school path. However, the reality can be very harsh and it is reasonably common to find students who show great academic potential not working up to their abilities in school. In fact, educators agree that underachievement among highly capable students is a common phenomenon (Reis & McCoach, 2002; Rimm, 2009).

Underachievement might be defined as a discrepancy between potential (what a student ought to be able to do) and actual performance (what a student is demonstrating). A variety of factors can contribute to the underachievement of gifted students. Whitmore (1989), cit in Smutney (2004), identified three broad causes for underachievement in gifted children:

Figure 1. General characteristics of gifted youngsters

Cognitive and Learning
Close and penetrating observation
Rapid strategic retention and evocation of large amounts of information
Quick and easy assimilation of principles and concepts; ability to see relationships and to generalise knowledge, facts, ideas and solutions, and to apply them in new situations
Excellent skills and different ways of solving problems
Better and earlier reading skills
Comprehension of materials at advanced levels
High levels of language development and verbal ability
Possession of accelerated and flexible thought processes
Capability of seeing unusual relationships among disciplines or objects
Adept at generating original ideas and solutions to problems
Persistent, goal-oriented, and intense attention on topics of interest
Autonomous in forming their own ways of thinking about problems and ideas
Rapid learning with use of various means with less practice and repetition
Need for freedom and individuality in learning situations
High desire to learn and seek out own interests
Questioning and inquiring spirit, willing to examine the unsual and learn new things (tendency for research and knowledge construction)
Well-developed powers of abstraction, reasoning, conceptualization, and synthesis
Effective use of strategies of self-regulated learning
Prefers complex and challenging work
May prefer to work alone
Wildly eclectic and intensely focussed interests
May possess high energy levels and longer attention spans
Independent and autonomous work and ability to concentrate for longer periods
Tackles tasks and problems in a well-organized, goal-oriented and efficient manner
Likes to innovate and find new ways of doing things
Unusual and/or vivid imagination
Good results/knowledge in one or more areas
Social and Emotional
Interested in philosophical and social issues
Very sensitive, emotionally and even physically
Concerned about fairness and injustice
Perfectionistic
Energetic
Well-developed sense of humor
Relates well and prefers the company of older peers and adults
Sense of critical judgement of him/herself and of others
Self-confidence
Sense of responsibility
Spirit of leadership
Motivation
Usually intrinsically motivated, not encouraged by external reinforcements
Tendency to iniate own activities
Demotivation when faced with routine tasks
Persistent in the pursuit of his/her objectives
Persistent in finishing tasks
High curiosity with intrinsic motivation to explore and find out
Unconventional and transcendent concerns
"Obsessive" need from mental engagement
Involvement and enthusiasm in tasks
Competitiveness in his/her area
Diversity of interests and projects
Attention to novelty and interest singularity
Earlier organization of leisure time

i. Lack of motivation to apply themselves in school;
ii. Environments that do not nurture their gifts and that may even discourage high achievement;
iii. Disabilities or other learning deficits that mask their giftedness.

A research review by Reis and McCoach (2002) also points out basic reasons for underachievement related with physical, cognitive and social-emotional reasons, and with a mismatch between student and his or her school environment.

As can be observed, the causes of underachievement are due to intrinsic problems that originate from (i) some type of disability or social-emotional issues, or from (ii) environmental issues related to non-motivating, maladjusted and unchallenging learning environments. The identification of the cause of underachievement is of crucial importance as interventions that do not address the special needs of these students could do more harm than good (Reis & McCoach, 2002).

As the reverse of underachievement due intrinsic problems requires a specific intervention such as counselling, the addressing of maladjustment in educational contexts demans for an adequate instructional approach (Schultz, 2005; Reis & McCoach, 2002).

The inadequacy of educational conditions is probably the most referred issue related to the underachievement of gifted students, often associated with lack of motivation to undertake school activities that do not fulfill the potential of the gifted individual. Monotony, routine, wasting time with irrelevant subjects may contribute to underperform, diluting any interest once held. Inappropriate curriculum, that reveals itself uninteresting, undifferentiated and therefore unengaging often leads to underachievement (Rimm, 2009). The disenchantment and adverse feelings towards school may lead to further reluctance to pursue academic success and even opposing behaviours.

Understanding achievement motivation is relevant to giftedness because it plays an essential role in enabling intellectually gifted students to fulfill the promise of their exceptional abilities and in preventing their underachievement (Rea, 2009). In this matter, motivation, diversity and opportunities to explore and choose different knowledge paths play an important role. A study made by Emerick (1992) with gifted underachievers concluded that the participants were most presumably building up achievement-oriented behaviours when stimulated and given the opportunity to pursue topics of interest to them.

As shown ahead, educational strategies that blend with the style and pace of learning of gifted students have a strong motivational impact that brings back the student to the learning process and promotes better feelings towards school.

Learning Strategies for Gifted Students

For centuries the maxim of "equal education for all" was defended, connected to democracy and equality ideals. Meanwhile, the recognition of human diversity and its various biological rhythms and different cognitive and psychological characteristics increased learning activities focused on the idiosyncrasies of each individual. Therefore, we reinforce the need of being aware of gifted abilities, styles (instructional, reasoning, expressive) and interests, in order to provide them with the required environment for the development and expression of their potential, thus preventing possible episodes of underachievement. General giftedness traits unveil the need of pedagogical intervention proposals that require flexibility and adaptation of curricula and effective differentiation of educational methods and strategies.

Multiple conceptions and definitions of giftedness have led, over time, to the development of different educational approaches. Although not mutual exclusive, we can identified three major

giftedness models of intervention in the literature (Senos & Diniz, 1998; Kirk, 2002):

a. acceleration procedures which include early admission to certain levels of schooling, grade skipping and condensation of academic years;
b. creation of homogeneous gifted student groups, through gifted resource rooms with itinerant teachers, special classes and even special schools;
c. development of enrichment programs in order to create stimulating and attractive procedures for the gifted integrated into the regular education system.

Our aim is not to persist on detailed explanations about each of these models. We will only focus on potential strategies for enrichment, as we believe there is a strong benefit in developing such programs with and trough technology.

Renzulli's Enrichment Triad Model (1977) is one of the most popular learning theories based on enrichment and is structured around three levels:

a. General Exploratory Activities (Type I) - it offers introductory or general exploratory activities to expose students to new topics and ideas;
b. Group Training Activities (Type II) - students are encouraged to develop higher-level thinking and advanced research skills related to a specific area of their interest;
c. Individual and small group investigations of real problems (Type III) - activities that trigger opportunities for students to apply their skills and become 'experts' in a field or topic, engaging in real world activities.

This intervention model is based on special gifted traits and the demand for a shift from a traditional, passive and teacher-centred paradigm, to a more independent, personal and engaging learning one. Some years later Renzulli and his colleagues proclaimed the importance of enrichment programs for all the students and involving the whole school and community. Through the Schoolwide Enrichment Model (SEM) (Renzulli & Reis, 1985), all students should be encouraged with challenging environments but Type III activities were particularly suitable to the gifted. Renzulli's learning approach considered that each student is unique and therefore Type III activities should be developed taking into account the students' interests and learning styles as well as their individual abilities; another important assumption, taking into account the relevance of motivation for effective learning, is that activities should be developed and evaluated considering both pleasure and goals of cognitive growth. Influenced by Discovery Learning methods (John Dewey, 1909), enrichment Type III activities emphasize learning based on the real world, meeting students interests (personalization) and encouraging the use of authentic research methods; finally, this approach gives special emphasis to the individuals' creativity and sharing knowledge with other experts.

Other authors have also addressed strategies suited to gifted. According to Nielsen (2002), curricular interventions are vital to enhance giftedness and some strategies need to be considered:

(a) design a curriculum that recognizes and enhances different or multiple intelligences and learning styles; (b) emphasize critical and creative thinking; (c) allow students to self-select projects; (d) allow students opportunities to conduct in-depth exploration within interest areas; (e) modify assignments and products so that students' gifts and abilities can be demonstrated.

Along with curricular adaptation, "excellence" in the gifted is also dependent on the learning environment. In this manner, a study by Emerick (1992) found that a class that (i) provides opportunities for intellectual challenge and advanced studies, (ii) supplies independent study in areas of interests, (iii) promotes students discussion, (iv) offers "real" contexts and challenges and

(v) empowers feedback, have positive influence on the academic achievement of gifted students.

Having identified the benefits of enrichment strategies for approaching the performance of students within their actual abilities, we will now focus on the potential of emerging technologies for the implementation and dissemination of those enrichment strategies that can enhance the education of these students with particular traits.

WEB 2.0: AN OPEN DOOR TO KNOWLEDGE AND INTERACTION

Technology is changing daily and with it Education. The last decade gave us mobile phones, social media, laptops and the access to online applications where and when we want. As Renzulli (2005) accurately states, virtually all of the world's knowledge is accessible to any student that can use a computer with an Internet connection. Learners are seeing new and attractive ways of getting information without constrains of any kind. It is easy to create and generate information, it is easy to upload it online; it is easy to have an opinion and broadcast it worldwide.

Technological development brought us the Internet, the largest knowledge store currently available. It is also a communication highway that demolishes distances and time. Via its features everyone can stay in touch trough synchronous and asynchronous communication. Finding information sources and experts has become increasingly easier. Communicating with science specialists can be just a click away.

The World Wide Web provides an environment in which the gathering, analysis, and sharing of information are prominent. Learning is currently based on knowledge construction by collecting information, processing it in meaningfull ways, and presenting it to others (Siegle, 2005a).

The evolution of web 2.0 trends, usually related with web applications that promote users' easy content production and information sharing, interoperability and user-centred design applications, facilitates the democratisation of online content production, therefore promoting a different web, more focused on socialization and equality. These new trends are giving everyone the power of being someone (Casanova, Huet & Holmes, 2009). This new paradigm brings with it a big change in terms of constructing, producing and managing knowledge. Kress and Pachler (2007) point out that we are experiencing a transition from a stable, settled world of knowledge produced by authority/authors, to a reality where knowledge is changing and produced by individuals everywhere.

As far as education is concerned, the Web 2.0 gives learners new opportunities, allowing them to form learning networks and communities, giving them the faculty of freely producing content and jump outside classroom walls. Social networks as Facebook, Twitter, NING, Blogging and Wikis are giving learners new opportunities to communicate, produce, share and assimilate knowledge in new places, using new formats and new environments. Students are used to work with these tools to communicate and socialize and feel comfortable interacting with each other, sharing information, resources and opinions. Teachers, however, still experience some difficulties in taking full advantage of these students' new habits and using them for enhancing learning. While social networks have altered much of society, in teaching and learning the change has been minimal (Siemens, 2008). Different authors (Oliver, 2006; Riley, 2007) emphasise the lack of teaching strategies aligned with these new trends and changes, mainly as to curriculum design, monitoring students' improvements, absence of feedback in students' work and new forms of assessment. Attwell (2008) sustains that either education embraces technology "enabling learning and knowledge for all" or, if it does not, technology and the Internet will minimize education with potentially disastrous results. It seems crucial to respond to the generation gap that we are facing, allowing students the opportunity to

produce information and the task of participating in the production of knowledge. Theories like Constructivism, Communal Constructivism (Holmes, Tangney, FitzGibbon, Savage, & Mehan, 2001) and Connectivism (Siemens, 2005) give context to the shift that we are facing nowadays from the instructor- or institution-controlled teaching to a greater learner-controlled teaching. Educators should not limit students' hunger for information and knowledge; they have to adapt their teaching processes and habits in a way that allows students to feel they are part of the process of building knowledge and embrace them as members of a community (Holmes et al, 2001).

From the teacher's point of view, these new trends emerging in schools and in education in general do not limit his/her performance as instructor and responsible for knowledge management, nor does it give him/her less power in the process of facilitating knowledge. These new teaching strategies, if well used, can take full advantage of ICT and Internet capabilities and induce new learning experiences, motivation and willingness to seek new knowledge. It can also promote personal learning environments and the sense of ownership, a greater sense of independence and the possibility of promoting the emergence of individual learning paths.

Information flow as grown at the same velocity as the users' willingness to produce content. We are living in a context where users have the opportunity of producing content everywhere, anytime and for everyone, originating a large amount of information that is made available to all users. This growing amount of information brings with it difficulties to all opinion makers and to those who have the responsibility to select learning materials, information and content from all the repositories available online. This reality allows these agents to promote new strategies decentralizing the process of browsing information and using learners to seek knowledge.

Tee Web 2.0 is an open and fast pathway for information and knowledge exchange. It provides several educational opportunities that are even at hand if you know how to take advantage of its high potential. These opportunities are extremely important for gifted students given their thirst for knowledge that is not included in the regular curriculum. The Web 2.0 is still evolving, but as it is, it adequately fits the needs of more autonomous learners and knowledge seekers as gifted students can be. We might say that gifted students are definitely a population that can capitalize on the features that the Web 2.0 makes available.

The establishment of knowledge networks allows them to group up with learners with similar interests and traits and to contact with experts outside school, letting them overcome the boundaries imposed by the school budget, bureaucracies and physical distance. The diversity of gifted students interests and skills demands the availability of advance training that is frequently beyond the confines of their schools and communities (Siegle, 2005a).

We conclusively agree with Ng and Nicholas (2007) that in an era where technology is advancing at an accelerated pace, and where information is effortlessly accessible on the Internet, educators should be capitalizing on these resources for gifted students. Online resources and technologies promote the exploration of new concepts and sharing of new learning with a group of motivated and "like-minded" peers.

Learning trough Web 2.0 resources presents itself as an opportunity to enhance student autonomy and to create a self-paced, expert-directed, time/place independent environment for learning (Skyba, 2009).

The Web 2.0 generates an immense amount of resources and information exchange, rendering its management as what could be described as Herculean. A vast amount of information and resources can be found at institutional applications, such as schools' Learning Management System (LMS) or independent applications such as Blogs, Wikis, Social Networks, Online Newspapers and other information resources. In these

information resources there are new contents and learning materials that are uploaded daily, which makes it difficult for educational agents to follow all the information flow. There is, therefore, the need to have applications that comfortably and conveniently assemble all the relevant information and that aggregate different resources in just one place, allowing customization and personalization of the environment.

PERSONAL LEARNING ENVIRONMENTS: CUSTOMIZED LEARNING

Customizable and editable web-based systems have been promoted as support for the future of teaching and learning (Atwell, 2007) because it they allow customisation of educational environments and promote autonomous learning. Related to these concepts there emerges the Personal Learning Environments (PLE) that stand for a new approach of information and communication technologies, influenced by web 2.0, that gives students and teachers control of their learning environment by allowing them to choose and customize their learning materials from centralised repositories.

Van Harmelen (2006) refers to PLE as being essentially a multidimensional space where the user can manage the content and applications that will facilitate the interaction between all the participants (teachers, students and other educational agents) in the process of building knowledge. Siemens (2007) refers the importance of promoting autonomous learning but he also mentions the importance for these environments to be open and their ability to interact with other environments and users, allowing the producing and sharing of knowledge. Atwell (2008) highlights the importance of PLEs as individual environments in which users can communicate and interact with the main objective of learning and contributing for collaborative knowledge construction.

As mentioned before, PLE characteristics allow learners to take control of their learning processes and adapt learning to their needs and rhythms. The learners can plan the way to achieve their learning outcomes taking therefore the responsibility for achieving their learning goals. In this new reality, the role of the teacher is far removed from the traditional style of transmitting knowledge.

PLEs can also change the nature of assessment. These tools should have features that allow teachers to monitor students' participation in group communications (synchronously and asynchronously), in the production of quality content, in sharing this content with other learners, and in interactions with each other.

How to Technically Support a PLE

Tools that support PLEs should allow users to foster their creativity giving them the opportunity to customize their own learning environments with new information modules, resources and specific layout. With these purposes in mind this tools have to allow:

i. the production of content (blog posts, forum threads, posts on Facebook or on Twitter)
ii. the aggregation of different sources of information using web syndication (web syndication allows to receive all the fresh content from different types of Web resources)
iii. the linking-up of new personal or customized widgets and modules (widgets are visual blocks which combine in one application different kinds of data from one or more websites, mashing-up information and content while respecting content authority and copyright; this can be made using software like Widgetize, Widgetbox, Econetvibes or Wahoo Pipes)
iv. the availability of synchronous communication tools such as messenger or skype (that allow teachers and students to communicate synchronously, even outside the classroom)

v. the possibility of formatting/customizing their own layout, choosing their own images, colors and layouts.

What is needed is a desktop that operates on the Web and that has the ability to communicate with other desktops and websites. This web desktop or webtop uses web applications, web services and application servers often using Ajax technology due to its flexibility. Examples of webtops can be found in iGoogle, Netvibes or Pageflakes.

CONCEPTUALIZING THE USE OF PLES TO SUPPORT GIFTED STUDENTS' LEARNING NEEDS

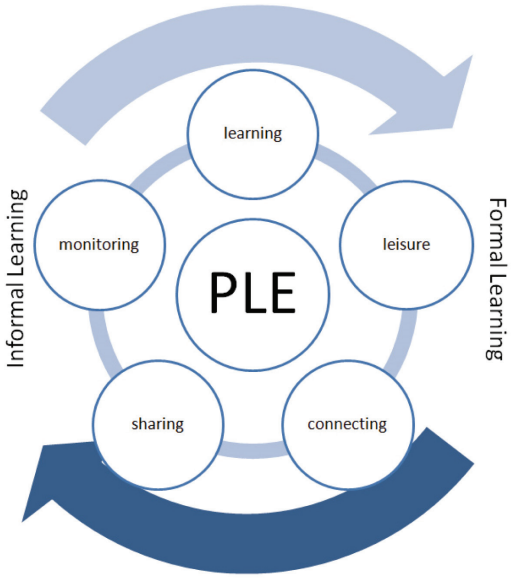
When it comes to the education of gifted students, the mismatch between the learning materials and learning contexts and the specific learning characteristics of each specific student is often highlighted. The inadequacy of educational environments will certainly result in lack of motivation and indifference to learning outcomes which can induce school underachievement. Gifted students need environments that foster creativity, interest and motivation that lead to the personalization of the learning process but that also concede the possibility of sharing and interacting with other gifted students in learning communities.

At this stage we must note that special education programs for gifted students are not often available and geography can pose an important problem. Online learning trough the use of a PLE based on the above mentioned Web 2.0 toolsd and principles, becomes a reliable alternative to underserved students. Gifted learners like to take command of their own learning, master more things in shorter periods of time, and do not rely on being taught but rarther like to take the initiative. From this perspective, such advantages of online instruction as flexibility of time and place of learning, more learner control, exposure to innovations and optimization of learning rate make web based learning appealing to gifted learners (Skyba, 2009). PLEs by their inherent web properties aggregate these requirements and constitute a viable option for gifted students that appreciate interaction with web technologies to complement their education.

Thus it is important to promote learning with the interaction of other dimensions that motivate the student. We idealize this PLE (Figure 2) based on 5 dimensions that we take as crucial in the conception of a PLE for gifted students:

i. **Learning:** The first dimension of this PLE is the one that relates to its primary function, to learn and to produce new information and knowledge, seek new information from different online resources and transform it in meaningful information;
ii. **Sharing:** After the production of meaningful information, share this information with other gifted students, the community of teachers and other users such as friends and family;

Figure 2. Dimensions integrated on a PLE to support the education of gifted students



iii. **Connecting:** Connect with others, communicating, interacting and socializing. Collaborate on the production of knowledge, sharing input and accepting suggestions;
iv. **Leisure:** Even though this is a learning environment it should also have an important dimension for leisure and recreation. Virtual games, music and television can promote new learning stimulus even if they are not directly connected to school curriculum content;
v. **Evaluation and monitoring:** Formal evaluation is very important. Like with ordinary students, the gifted students learning process also has to be monitored and guided. The PLE has to have the feature of allowing the tutor to monitor his/her students and if needed to guide them onto the right path.

These dimensions represent the way learners' should interact with the teacher and with each other, promoting contexts for formal and informal learning experiences that complement and augment multidimensional knowledge construction.

As mentioned earlier gifted students can be a very heterogeneous population. However, there are traits that stand out: the will to explore and learn beyond what schools can usually provide; a need to pursue topics of study in greater depth and breadth (Eckstein, 2008; Siegle, 2005b) and to persist independently; and, at least in part, to generate new understandings independently (Ng and Nicholas, 2007). Learning with rich full online tools, covering the above dimensions, that are condensed on a customized space, constructed by learner with little or no help, seems to be in line with the particular interests of these special learners.

FUNCTIONS FOR THE PLE

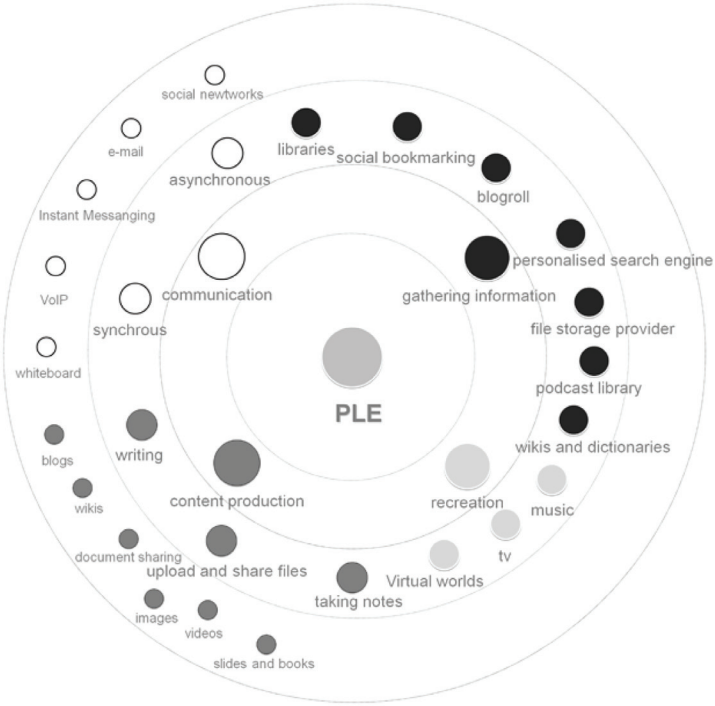
Each PLE is unique. The primary characteristic of a PLE is precisely the fact that it is an environment with features that allow ideosyncratic customisation. Therefore, the features available in each PLE should be consonant and coherent with the interests of each owner. However, it is possible to highlight some functions (Figure 3) that we think are relevant for giftedness education. We conceive our PLE concept for gifted students in five fundamental pillars: (i) communication, (ii) content production, (iii) tasks and goals setting. (iv) information gathering and, (v) using free time (leisure).

(i) Communication

One of the most important functions in the PLE is the communication feature. Due to their independent learning nature it may not seem that gifted students really need to communicate. Face-to-face communication is sometimes hard for these students owing to their interests not being alike those of their peer. They need support in their affective and growth needs, they need to socialize with other like-minded students, and share and discuss topics of their interest. Online communication in its many features can cover a wide range of communication needs, including the possibility to exchange information with other gifted students and go directly to the source of information, asking experts to clarify their doubts.

It is possible to communicate synchronously and asynchronously using freeware web based tools, from VoIP (Voice over Internet Protocol) to social networking. Online communication has different characteristics from communication in class. First of all this communication can be synchronous and asynchronous, which means that, depending on the context, teacher and student can wait to give a specific answer to a question, promote a more reasoned discussion and take part of multiple virtual communities of interests and be actively present in all of them. On the other hand, if communication is synchronous all the most urgent doubts and questions can be answered by the teacher in seconds, using text,

Figure 3. An example of functions available on a PLE to support the learning of gifted students



sound or even video. Besides the temporal issue, online communication eradicates geographical constrains allowing students to interact with the teacher while in different places, therefore making virtual and informal learning easier. Finally, and because we are addressing gifted education, virtual communication allows gifted students to integrate better in communities without being misadjusted vis-à-vis other students. In social networks users that participate in communities producing high quality content play a key role in those communities and are followed by other users.

Asynchronous communication:

- **Social Networks:** generally built upon users with the same interests. They are important resources for finding answers, sharing and confronting findings or to meet people with the same interests. Opinion makers emerge according to the impact and quality of produced content. There are online social networks for almost all existing topics so it is easy to find one to suite learner needs. Some examples of social networking tools are Ning, Facebook, Twitter, Google Buzz and LinkedIn. Academic-based online social networking provides an avenue to connect gifted students with intellectual peers and learn the skills of social networking in a safe environment (Ecstein, 2009).
- **E-mail:** one of the most used means of communication. It can be used for question-answer issues but it is also important for the development of digital identity which is crucial for online learning because the majority of the web applications require a digital identity. Some examples of e-mail providers are Gmail, yahoo and live.
- **Brainstorming tools:** these tools allow several users to interact and discuss ideas

with text (synchronous and asynchronous), diagrams, images or even video. Teachers can create a brainstorming session with their students and with their colleagues trying to promote collaborative thinking. Some examples of brainstorming applications are Mindomo, Writeboard and Mindmeister.

Synchrous Communication

- **Instant messaging:** it is a form of real-time direct text-based communication between two or more people. It is a process similar to chat but it has a feature of lists of contacts/group contacts, which allows teacher and students to communicate with each other in a private environment or even crate a shared channel for communication between classes. Live Messenger is the most famous IM application but there are others like Yahoo! Messenger, Google Talk, Google Wave or Skype.
- **VoIP:** it is a voice based real-time way of communication that allows conversation between two or more users. It also has a contact list feature for all users and it works, for each user, as a telephone inside the computer. Skype is the most famous VoIP application because it comprises VoIP, videoconferencing and IM. However, there are other VoIP applications such as Google Talk and Yahoo! Messenger.
- **Whiteboard:** as the name suggests a whiteboard web based application is an application that simulates a teaching board on a computer. Because it is computer-based and online it comprises an on-screen shared notebook, a place to chat, draw and upload files like videos, sound and multimedia applications. There are interesting applications for whitebording such as WiZiQ, Twiddla and Scriblink.

Research by Michelle Eckstein (2008) refers that academically gifted students learn better with their intellectual peers who also have unique social and emotional needs. Internet communication provides opportunities to address their particular needs in new and diverse ways.

(ii) Content Production

Content production relates to all the input that a student places in his/her PLE. Due to its learning-based conception, a PLE has to allow content production. Learners produce content when they communicate, when they comment a blog post, when they interact with other learners or when they write text, draw and/or upload files. The most relevant characteristic of Web 2.0 is the ability of harnessing the power of the people, giving the user the power of putting content online where, when and how s/he wants. Nowadays each user, each student, has the power of being heard and this can create new challenging opportunities because s/he can be heard by a larger audience. Comments will be read, videos will be seen, speeches will be listened to, feedback and comments will be more active, which means each voice will be heard more often. This can induce more motivation in the student given the fact that s/he knows that feedback of his/her work will be richer and more constant.

Collaborative documents enable students to interact and work together without being physically present.

- **Writing texts:** it is very easy to post an idea or a message in a blogging application. For educational purposes a Blog can be used as a portfolio, for a classroom assignment or for a group work report. It is also possible to comment other blogs and interact with other users in the blogosphere. Wordpress, Blogspot and Livejournal are three of the vast Blog providers available on the web. For assign-

ments it is also possible to use wikis and upload the work on this kind of webpage or even write articles on Wikipedia. Wikis foster creativity and collaboration and are commonly used for group work (wikispaces, PBworks, Wetpaint). Other good tools for collaborative work are document-sharing applications such as Google Docs, Zoho or Etherpad. All of these tools allow exporting in most common formats after the collaborative writing process finishes.

- **File upload and sharing:** there are also applications that allow the upload of different types of files and sharing these files with the web community receiving feedback and comments about them. These files can be based on images (Flickr, Picasa and DevianART), videos (Youtube, Vimeo and Teachertube) or slides and books (Slideshare, Scribd).
- **Note-taking:** even though this is a content production resource it is also an important tool for browsing the web and associating content to this PLE. Unlike the other two features, taking notes does not promote sharing. It is a very important working tool to collect, sort, tag and annotate notes and resources selected from the web.

(iii) Management of Personal Goals and Tasks

Gifted students, even more as regular students, feel the urge of having a feature for setting their own goals and tasks on their own learning environment. They need to know where they are going and see the steps to be taken to attain their objectives. As Ng and Nicholas (2007) mention it is essential to structure gifted students learning based on goals to help them direct towards what they want to achieve. Therefore, managing objectives and tasks is essential to keep on track. Despite their abilities of self-motivation, self-centred learning and eagerness for knowledge, it is easy to get dispersed in the immense sea of information. Moreover, no student, even the most gifted one, can accomplish his/her own relevant learning without the supervision of teachers or of older gifted peers as they risk to stray way from what is really necessary for the scaffolding of learning. Therefore, it is important that the teacher monitors closely the student's progress.

We assume in this PLE that it is possible for students and teacher to share the list of personal learning tasks and goals. Sharing this list allows the teacher to define what the learning outcome required for each student is, and also to endow each student with the self-determination of defining their personal goals and tasks, thus fostering the personal need for informal learning that resides outside his/her teaching duties. Assessing the process and stage of learning is possible trough a PLE based partnership between teacher and student. Google calendar and Google notebook allow synchronizing a calendar and a to-do-list and sharing this list or one of its items with other users such as students and the teacher. For personal goals and tasks each student can use a goal-setting community, such as "43 things" (www.43things.com), in order to help choose informal learning goals. Such tools help find other users' experiences in achieving a specific goal.

(iv) Gathering Information

No matter the field, there is such an amount of new information being published that it is a full time job just to keep up with subject matter. The web adds more and more content and Google reported that there is more than 1 trillion (1,000,000,000,000) unique URLs on the web. It is impossible to select the best information available because it is disperse in too many resources to make it possible to keep up with. Syndication facilitates this task because it allows the updating of further resources and webpages. Users can add to their blogrolls all the blogs they want to follow, podcast providers with the categories that

interest them and feeds for all bookmarks with the tags they want to receive. Everything is uploaded automatically in their PLEs without any manual work. They just have to set what they consider to be important and wait for the information to appear on their learning environments.

- **Blogroll:** these are important resources. Several proeminent thinkers in each scientific area interact with the web community using their own blogs and it is possible to retrieve important information and fresh content when we follow these people. On the other hand blogs are also massively used in education, for group work and assignments. To follow blog users one can use feed readers (Google Reader, Bloglines, Wasabi), e-mail clients (Thunderbird) or Web browsers (Firefox or Flock). To search for relevant blogs each student can search on Technorati or Edublogs which are real-time search providers for blogs.
- **Libraries:** Libraries are always important resources for finding information. Besides the physical library almost every school has, there are some schools with online libraries or document repositories in their own Learning Management Systems (LMS). Outside schools there are also some online libraries such as The Free Library, Project Guttenberg, Read Print and Google Books.
- **Social Bookmarking:** As already mentioned it is very difficult to keep up with all the interesting information produced online. Following some key players' bookmarks or some bookmarks tagged with relevant words can be a good method for retrieving quality content. Social bookmarking tools such as Delicious, Diigo or Stumbleupon can be very important resources in order to filter/suggest new content and resources. In the case of Diigo and Trailfire it is possible to establish a path of relevant websites, record, comment and share them among a community of learners.
- **Personalised search engine:** Google offers an important feature (Google Custom Search) of customising a search engine. Basically the student just has to add the webpages that s/he wants Google to search (for instance the blogs, wikis and social networks s/he follows) and Google will just search information pertinent to these resources. Other metasearch engines can be customized by areas of interest.
- **Wikis and Dictionaries:** Wikis are important resources for finding information. Even though they are still regarded by the education community with some wary they can be a starting point for the student. It is possible, however, to find well-documented Wikis signed by experts and key actors. Besides Wikipedia, good examples can be found in Student Room, Wikimedia Commons and Wiktionary. It is also important to have a dictionary and thesaurus feature associated to the PLE to help write text in the mother language but also in foreign languages. Reference.com and The Free Dictionary services have a Dictionary, Thesaurus and a Translator all in one. For the Encyclopedia feature both Britannica and Encyclopedia are also great resources.
- **Podcast library:** these are specific libraries that give access to audio and video files allowing users to download them to their computers, MP3 players or smart phones. This would allow each student to listen/see audio/video classes and other resources while jogging or commuting. Podcast Alley, iTunes and Podomatic are some available podcast libraries. The majority of online Radio and TV channels have their own podcasts available as well as national and community libraries and University libraries.

- **File storage providers:** teachers can share e-books, articles and presentations using storage providers and sharing them with their students and colleagues. From his/her PLE each student will have access to all the class information that the teacher uploads to the storage provider, and also do the reverse. Box and Dropbox are two good examples for storing and sharing files.

(v) Using Free Time

Recreation, leisure and free time activities are important for a PLE because they help students recreate and use spare time also promoting informal learning activities. Listen to music, watching television, playing online games can also promote new competences and knowledge even when these do not have a formal pedagogical intention. Virtual reality, for instance, can help students get acquainted with historical places like Ancient Rome or Ancient Athens and, at the same time, visit the Frank Lloyd Wright Virtual Museum, going to a theater to see a play or listen to a classic concert and one minute later accompany a heart surgery procedure at the Postgraduate Medical School in the Imperial College of London. All of this can be done in Second Life or in Active Worlds. In the PLE it is also possible to play educational games that are available depending on the students' age and interest.

Gifted students suffer with the high expectations of people surrounding them; they also don't identify with the most of their age-group peers creating stress. They find relief contacting with older peers, other gifted students and adults. Different Social networks can provide possibilities to freely socialize, share, learn and teach with other individuals that have similar views and perspectives.

CONCLUSION

One of the main objectives of educational systems is to promote excellence and maximum development of human potential. According to the definition of giftedness put forward by Renzulli et al (2005), there are three important clusters that distinguish gifted from regular students: (i) above-average general abilities, (ii) high levels of task commitment, and (iii) high levels of creativity. Therefore, gifted students' education requires a set of guiding principles in order to support those above-average general abilities and promote exceptional achievement, not only to ensure individuals exponential development, but also to avoid problems of maladjustment and subsequently prevent underachievement.

First of all, it is crucial to identify gifted students' learning styles, characteristics and interests, not as an attempt to create labels but aiming to plan and conceive an atmosphere suitable to their needs. Curricular flexibility and adaptation as well as challenging and supportive environments, both well stocked with enrichment strategies, are important issues to considerer when educators face students with traits such as those mentioned in this chapter.

Although many factors contribute for the underachievement of high ability students, several research findings (Reis & McCoach, 2002; Murray, 2008; Endepohls-Ulpe, 2009) unveil that one of the reasons for the discrepancy between gifted students' potential and real performance is linked with the lack of challenging opportunities and the prevalence of environments that do not nurture their gifts. According to Emerick's research conclusions (1992), when appropriate educational opportunities are present, gifted underachievers can respond positively.

A closer look at gifted traits and benefits of technology enhanced learning led to our consideration of web 2.0 trends, namely Personal Learning Environments (PLEs) as a viable "tool" to address enrichment strategies and activities, as well as af-

fective support for this special educational needs population. The Internet and technological tools are generally seen as precious assets for students whose needs are not met in a regular classroom, but who are highly motivated to meet their educational goals (Skyba, 2009).

The benefits of the web 2.0 for gifted students has already been highlighted in Eckstein's Enrichement 2.0 project (Eckstein, 2009a), which is an adaptation of Renzulli's Enrichment Clusters model using web technologies (Renzulli, 1977). However, our intention is to demonstrate the potential role of PLEs for the gifted students' learning process, since their features and functions can give more freedom and control to the student over the learning environment, empowering personalization, connectivity, self-publication and creativity. Literature on effective practices towards gifted students (Renzulli, 1977; Emerick, 1992; Nielsen, 2002) shows that it is extremely important to respect student's learning rhythms given the speed of assimilation that characterize them. The potential of technology in special education is recognized specifically by facilitating different rates of learning, enabling the exploitation of resources and content according to the speed of each student and their own interests, at the same time avoiding excessive repetitions on familiar topics. PLEs, by creating a space where gifted students can gather and manage contents, resources and communication seem to fit the learning needs and rhythms of these students, empowering autonomy, individuality and control over their own learning processes.

Self-oriented learning focuses on the interests of youngsters, becoming a pillar for motivation and increased levels of task commitment for these students. Therefore, by allowing them to build and manage their own PLE according to their interests, giving opportunity for high quality research and autonomous learning with online resources suitable for advanced levels of thinking, educators are indeed supporting gifted individuality and satisfying their need from mental engagement.

Task management by teachers and learners is of crucial importance to ensure the achievement of relevant learning. Therefore, the role of the teachers doesn't fade into nothing; rather, it evolves from transmission of knowledge to facilitating its construction, requiring a shared space where task management can occur in order to monitor progress and assess strengths and areas where extra work is required. Such space can easily be created on a PLE through Web 2.0 tools for production, collaboration, and time and task management .

PLEs, on the other hand, by connecting online learning communities, provide these students with the opportunity to increase their knowledge, through the sharing of information and exchange of ideas with experts or members of network communities who share their personal interests. The opportunity to interact online breaks physical and bureaucratic barriers, simultaneously bringing about benefits in terms of speed and quality of feedback, i.e., online interaction with experts in a particular subject of interest allows gifted students to get answers more quickly and with higher quality than when s/he is limited to the school walls or to the teacher, a non-specialist in some specific topics. Through on-line communication it is also possible to create supportive network communities for the gifted to share their feelings with peers with similar abilities. Hard to reach gifted individuals (in rural areas, for example) are also a click away from all this vast array of knowledge and challenging contributions.

The numerous Web 2.0 tools available also allow youngsters to develop presentation skills, drawing on a range of techniques, encouraging both innovation and creativity. Because PLEs are also a publishing platform, sharing their own productions, texts and points of view through blogging, wikis or by uploading other media resources (photos, videos, podcast), is of major relevance as they enjoy and feel motivated when their work is recognized. Furthermore, while this sort of "talent" dissemination does not usually occur in face-to-face classroom contexts, it can act

as a source of stimulation and encouragement for those gifted students that normally conceal their opinions or ideas in front of their "not-gifted" colleagues, for fear of peer retaliation or social exclusion – the so-called deliberate underachievement phenomenon (Murray, 2008).

Although this may look ambiguous, teachers must heighten their awareness of issues related to gifted students, namely their skill and will to pursue knowledge both autonomously and cooperatively, extending the span of interests and establishing their own learning pace, connecting to knowledge through specially oriented social networks where information exchange can occur with peers.

It is also very important to be aware of safety and ethics when dealing with Internet browsing. Individuals must be critical consumers and virtuous citizens. Even though the majority of gifted students possess a sense of responsibility and critical judgement of him/herself and of others, in a world where media inputs became clearly superior to our capacity to assimilate information, it is important to alert them for the need of questioning available information by measuring levels of authority, accuracy, objectivity, currency and coverage of webpages (Johnson, 2008).

It is common sense that learning can happen in many contexts (formal, informal and non-formal), therefore a leisure dimension cannot be overlooked in a PLE as it may eradicate opportunities to further enhance their knowledge.

It is our belief that PLEs are not the panacea for gifted education issues but rather an innovative strategy, especially because they allow for the establishment of a "least restrictive environment" that enables the development of gifted individuals' abilities through formal and informal learning.

We must keep in mind that online learning is not suited to every gifted student; individuals with self-regulation problems and poor time management skills will find it difficult to cope with (Siegle, 2004b). Therefore, in such cases the teacher's role is even more determining, filtering which student's profile is more adequate to the type of learning strategies illustrated here.

In the meantime, the concept presented depends on field implementation with practitioners that are fully aware of the potential of PLEs and able to put in practice this innovative tool to ascertain its value as a sound strategy that integrates and interconnects the most well known traits of gifted students.

We would like to add, as a matter of curiosity, that the preparation of this chapter was optimized through the use of available collaboration and communication Web 2.0 tools that were worked upon resorting to the authors' own Personal Learning Environments.

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