

Teaching and learning sustainably with Web 2.0 Technologies Benefits, Barriers and Best Practices

Aoued Boukelif, Hasnia Merzoug And Fatiha Faty Aiboud

University of Sidi Bel Abbas, Algeria, University of Algiers, France, Mohamed Boudiaf University of
Science and Technology of Oran, Algeria
aboukelif@yahoo.fr , merzougsim@yahoo.fr

Abstract: A whole new range of web-based tools and services now provides learners with the opportunity to create their own digital learning materials, personal learning environments, and social networks. These tools provide an opportunity for new design models for education and training that will better prepare citizens and workers for a knowledge-based society. provided insightful guidelines and tips for teaching with Web 2.0 technologies. In recent years, IT's have fascinated many teachers and learners but did they really bring advantages for the learning process?. To what extent are they used? To reach what objectives? What are the new roles for teachers?. This paper deals with the innovative usages of IT's in teaching and addresses the many issues. The purpose of this paper is to explore best practices in teaching with Web 2.0 technologies as well as the benefits and barriers associated with the use of Web 2.0. The major benefits of using Web 2.0 technologies in teaching include interaction, communication and collaboration, knowledge creation, ease of use and flexibility, and writing and technology skills. The major barriers university instructors encounter in teaching with Web 2.0 technologies include uneasiness with openness, technical problems, and time. The paper is organized as follows : First ,current and emerging usages of IT's and multimedia in university teaching and learning are dealt with, then two innovative teaching techniques are introduced, namely active pedagogy and problem based learning . The paper concludes with the issue of Integrating IT's in university teaching.

Key words: IT's, teaching, learning, tools, pedagogy, digital workspace, assessment.

1. Introduction

Emphasizing a participatory culture, Web 2.0 technologies encourage and enable teachers and learners to share ideas and collaborate in innovative ways. They also force educators to rethink the way we teach and learn and to transform our education practices so that we can support more active and meaningful learning that involves “learning to be” as well as “learning about.”

Thus, Web 2.0 technologies has the ability to “support active and social learning, provide opportunities and venues for student publication, provide opportunities to provide effective and efficient feedback to learners, and provide opportunities to scaffold learning in the student’s Zone of Proximal Development”

In addition, Web 2.0 provides numerous opportunities for social interactions and collaboration

among students, teachers, subject matter experts, professionals in different fields, as well as a host of others with related interests.

Web 2.0 technologies – such as blogs, wikis, podcasting, social bookmarking, and social networking sites – have allowed users to easily publish content online and to connect and network with other people from all over the world who have similar interests. In a nutshell, Web 2.0 could be characterized by openness, user participation, knowledge sharing, social networking and collaboration, user-created content, and folksonomy .

To determine how education and training policy can adequately prepare learners for life in the future society, there is a need to envisage what competences will be relevant and how these will be acquired in the future. This paper identifies key factors for change that emerge as a vision of the future of learning .In a second step, it discusses future solutions to pending challenges for Education and Training systems

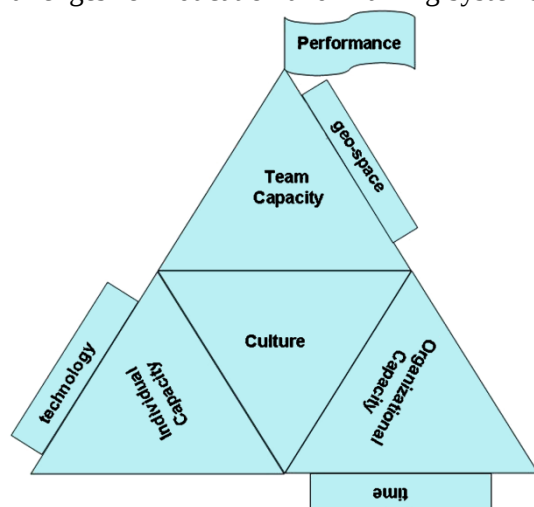


Fig. 1- The tetrahedral model of teaching and learning

3. The digital workspace

3.1. Definitions and evolution of the Digital Workspace concept

Numerous terms are used to define the same entity or a range of entities: Virtual learning Environment, Virtual Education Space, Virtual Learning Space, Digital Learning Space, Educational Environment, Internet based distance-learning environments, Computer Environment for Human learning, Computer based learning environment or extranet... So

and outlines policy options. “The teacher is not there for the sake of the student; both teacher and student are there for the sake of learning.

A. von Humboldt, 1810

“The aim of teaching is simple: it is to make student learning possible.”

“True learning is based on discovery guided by mentoring rather than the transmission of knowledge.” John Dewey

“Learning ... is about changing the ways in which learners understand, or experience, or conceptualize the world around them.”

“Learning is a qualitative change in a person’s view of reality.”

2. The teaching-learning process

The teaching-learning process consists in 3 actors : the teacher , the learner , the group and the knowledge . The relationships between them are depicted in fig. 1.

how, and on what conceptual, theoretical and educational basis, can one define the Digital Workspace?

3.2. The computer-based learning environment, the electronic schoolbag and the Digital Workspace?

In 1998, Josiane Basque and Sylvie Doré shed consider that the ‘environment’ concept refers to both the socio-constructivist theories and to the systems theory (the environment being a place that plays host to one or more systems). They take up the idea presented by Wilson

(1996), suggesting that an environment is a “a place where people can draw upon resources to make a sense out of things and construct meaningful solutions to problems”.

According to Wilson, the term “learning communities” would be even more suitable than the term “environment”, in order to highlight the collaboration between individuals. On the basis of this interpretation, such collaboration would be principally educational. The definitions vary according to the population segment and the different perceptions: for example, the term extranet is used to emphasize the services offered in terms of communication between users, whereas the ‘environment’ concept is used to emphasize the educational sphere evoking the learning communities.

3.3. The Electronic schoolbag (or e-schoolbag) and the Digital Workspace

The electronic schoolbag was initially designed as a services portal for pupils, teachers, the administration and families. The objective of the Digital Workspace is to “favor the implementing of genuine digital workspaces or "virtual offices", consisting of a uniform range of digital services: collaborative work, school and student life, availability and management of digital resources, etc”. In light of all these definitions, it would seem that a Digital Workspace is both a virtual office and an electronic schoolbag.

In addition to the terminological aspects, there are other dimensions that make these definitions even more opaque, and, notably, the projects’ ideological dimension. A Digital Workspace is a meeting place that is able to serve as an educational community and is no longer just a learning community, according to the Wilson interpretation (1992). This meeting point is a virtual space and also a range of tools.

To summarize, it seems difficult to provide a precise definition of the Digital Workspace for various reasons, one of which is the fact that these systems are themselves very diverse. They are systems designed to facilitate communication between the administration and

pupils’ families, teachers and pupils, information systems designed for use between teachers and establishments, and training and learning systems based on educational approaches that vary hugely from one teacher to the next and from one establishment to the next.

4. The digital workspace ou ent (“espace numerique de travail”) in the school environment

Information and Communication Technologies (ICT) offer a whole multitude of options for the rapid circulation of information on a worldwide scale. These new information and communication modes now play a key role in the economic, social and educational sectors, and the school environment cannot afford to ignore them; to do so would risk isolation. The implementation of “e-education” applications offers a significant lever for circulating, appropriating and generalizing the usage of ICT. It is also an important strategic platform for the definition of regional digital development policies.

The French abbreviation ENT (“Espace Numérique de Travail”) and “environnement” (environment) have been translated as Digital Workspace. There is no direct equivalent in English, but the following terms all refer to this concept:

- Virtual learning Environment;
- Virtual Education Space;
- Virtual Learning Space;
- Digital Learning Space/virtual;
- Educational Environment;
- Collaborative workspaces;
- Internet based distance-learning environments;
- Computer Environment for Human learning;
- Computer based learning environment;
- Learning Spaces;

What is required is a modernization of the educational proposal, better communication between the players involved (teachers, pupils, administrations, families etc), greater autonomy for the pupils, personalization of the teaching content and development of group work.

5. Psychopedagogy

Socioconstructivism

Behaviorism
Sociocultural learning (Vygotsky, 1978;
Bruner, 1996)
Connectivism

6. Active pedagogy

Personalization, collaboration and informal learning will be at the core of learning in the future. The increased pace of change will bring new skills and competences to the fore, in particular generic, transversal and

cross-cutting skills. With the evolution of ICT, personalized learning and individual mentoring will become a reality and teachers/trainers will need to be trained to exploit the available resources and tools to support tailor-made learning pathways and experiences which are motivating and engaging, but also efficient, relevant and challenging.

7. Teacher education

7.1 . Research-based teacher training

In Finland, the decentralization of school management is one aspect of an overarching policy that aims to bring decision-making as close as possible to the place of application; schools are thus able to determine their own curriculum.

In the field of teacher education, this means that teaching practice must start as early as possible for trainee teachers. Periods of teaching practice have therefore been included in each year of study, and each period of teaching practice is combined with theoretical and scientific studies relating to the subject of the “practice” period. The program culminates (after two years) in the completion of a research thesis, the theme of which is taken, as far as possible, from students' personal experiences of teaching practice.

Students thus learn to discuss and argue with constant reference to research, rather than citing “mystical” arguments “magicked” out of thin air. In contrast to the traditional image of the teacher-centred on the teaching process and individual day-to-day organization- the contemporary Finnish image of the teacher's

role is expanded to include determining the curriculum and group decisions. However, the authors acknowledge that determining the curriculum at local level seems to represent a real problem for Finnish schools. It is felt to be a supplementary task that does not form part of teachers' “normal” work.

This method is founded on the following principles: alternation, consistency between theory and practice, interdisciplinary training, teamwork, learning through action, active trainee participation and project work. From the authors' point of view, the benefits lie in the research-based training process between teachers and training staff that is able to occur thanks to the use of an investigative approach that conceptualizes the teaching experience.

7.2. The portfolio: the best teacher training tool

There are different forms of final thesis that exist in teacher education using four models: the scientific literature study, the portfolio, action research and, finally, the didactic box. The dominance of theory-oriented work – particularly common in the literature review model – cannot meet the training needs of new teachers today. The portfolio, on the other hand, was judged the most appropriate model, as it covers several periods of practical training in a variety of contexts – putting it at an advantage over action research, for example. Moreover, as it explicitly includes a dimension of reflection and justification regarding one's own teaching practices, it satisfies training objectives more effectively than the didactic box. We should note here the definition that the authors give of the portfolio: an extensive curriculum vitae in which the students demonstrate their teaching and learning skills by showing the results of their teaching activities and considering their performance. Portfolios should not be used for summative accountability purposes.

7.3. Aims, competences and professional identity

Research literature into teacher's work (in compulsory education) focuses by and large on curriculum reforms, massive decentralization of the education system and sometimes-

contradictory orders issued to those involved in education, especially teachers. They are asked, at one and the same time, to be more autonomous and to work more together, while continuing to respect well-defined core competences. In addition, the aim of the teaching profession is not only to instruct (the action of communicating a set of theoretical or practical knowledge related to teaching or studies), but also “to educate” (the art of training someone, especially a child, by developing his/her physical, intellectual and moral qualities so as to enable him/her to tackle the personal and social dimensions of life with a sufficiently fulfilled personality).

7.4. Changes in teachers' work

The context in which teachers work has changed. This change has arisen through an accumulation of reforms, the latest of which have taken on a marked trend, and by transformations in society and in culture. In their introduction to “La profession d’enseignant aujourd’hui” M. Tardif and C. Lessard (2005) list all the components of this change: a degradation in quality (work has become more complex and more intense) without any corresponding gain in quantitative terms (organization of time and pay); systems decentralized with performance indicators set up that turn the education system into a commodity; new constraints relating to the professionalization of teaching, to the use of ITCs inside and outside school and to the dispersion of knowledge; damage done to professional ethics in the face of social inequalities and the distress that they lead to.

7.5. The teacher's competences

These competences involve:

- The cultural approach to teaching: defining fundamental benchmarks and the lines along which the knowledge contained in his/her discipline will become intelligible for the pupil, stepping back and taking a critical look at the discipline being taught, establishing relationships between the second culture element prescribed and the pupils' first culture; transforming the classroom into an open forum for culture; taking a critical look at one's own origins, cultural practices and social role;
- Command of the language of teaching (use, communicate, respect, correct, argue);

- Designing and test-driving learning situations appropriate for the pupils and the competences being developed: reviewing the teachers' relationships to academic knowledge, the contents of the disciplines, the pupils' knowledge; choosing appropriate learning strategies, including cooperative work;
- Assessing progress: reports, evaluation tools, communication with pupils and parents, collaboration with the teaching staff;
- Organizing and running the class as a group: having clear requirements and getting pupils involved in the running of the class.

In a working paper of the Academy for educational development, E. Leu also formulates some “basic skills” for quality learning, another way of classifying universally-expected professional competences: awareness of the young learner, appropriate and varied methodologies, teaching content; understanding of the curriculum and its goals; skill in communicating, enthusiasm in learning, sensitivity to others, skill in working with others, devotion, etc.

To sum up, the teacher must excel in his or her discipline, master it and dominate it, put it into practice and, in a word, love it. He must also be in command of the processes by which knowledge is passed on: teaching and learning. He must know what it means to be a child or young person learning; know how to manage a class, be familiar with the school, the education system and the big issues of education. As a specialist of the discipline or disciplines he teaches, he must be aware of the epistemology and the didactics of these; he must also be a psychologist, a sociologist and a philosopher.

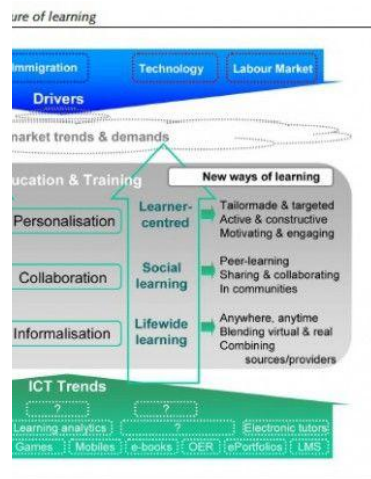


Fig.2- Conceptual map of the future of learning

7.6. Implications for education and training

- Technology enabled lifelong learning (any time anywhere)
- Shift of focus from institutions to individuals: Institutions will need to re-create themselves as resilient systems with flexible, open, and adaptive infrastructures, which engage all citizens and re-connect with society.
- The key is “Constructive Alignment”, a design for teaching which builds our knowledge of how humans learn into the design of teaching. The learning activities needed to achieve the intended outcomes are embedded in both teaching and assessment.

8. Assessment: a central issue for learning

We generally prefer to talk about “assessment for learning”, sometimes also called “formative assessment”, rather than “assessment of learning”. In other words, how does assessment come into play in the course of the very process of learning, to facilitate it, redirect or control it, rather than as a form of disciplinary measure applied on an a posteriori basis.

8.1. Assessment of learning

- assessment that is accompanied by a number or letter grade (summative)
- compares one student’s achievement with standards

- results can be communicated to the student and parents
- occurs at the end of the learning unit

8.2. Evaluation

- judgment made on the basis of a student’s performance

8.3. Diagnostic assessment (now referred to more often as "pre-assessment")

- assessment made to determine what a student does and does not know about a topic
- assessment made to determine a student’s learning style or preferences
- used to determine how well a student can perform a certain set of skills related to a particular subject or group of subjects
- occurs at the beginning of a unit of study
- used to inform instruction:makes up the initial phase of assessment for learning

8.4. Formative assessment

- assessment made to determine a student’s knowledge and skills, including learning gaps as they progress through a unit of study
- used to inform instruction and guide learning
- occurs during the course of a unit of study
- makes up the subsequent phase of assessment for learning

8.5. Summative assessment

- assessment that is made at the end of a unit of study to determine the level of understanding the student has achieved
- includes a mark or grade against an expected standard

E- Key Performance Indicators

A Key Performance Indicator is a measurable value that demonstrates how effectively a company is achieving key business objectives. Organizations use KPIs at multiple levels to evaluate their success at reaching targets. High-level KPIs may focus on the overall performance of the enterprise, while low-level KPIs may focus on processes in departments such as sales, marketing or a call center.

9. Techno Pedagogical innovation, quality approach and best practices in the management of E-Learning Project

INNOVATE to motivate or motivate to INNOVATE?

10. Learning assessment tools

10.1 PDCA (plan-do-check-act or plan-do-check-adjust)

PDCA is an iterative four-step management method used in business for the control and continuous improvement of processes and products. It is also known as the Deming circle/cycle/wheel, Shewhart cycle, control circle/cycle, or plan-do-study-act (PDSA). Another version of this PDCA cycle is OPDCA. The added "O" stands for observation or as some versions say "Grasp the current condition".

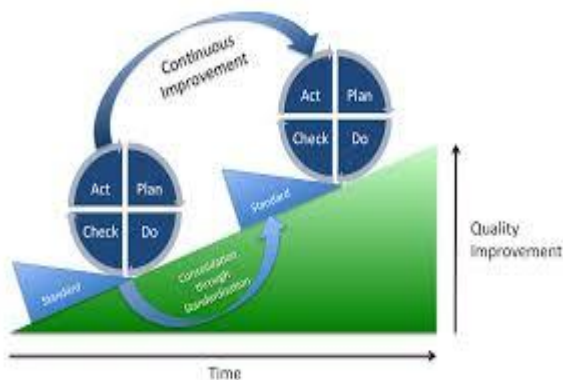


Fig. 3- PDCA (plan-do-check-act or plan-do-check-adjust)

When to Use Plan-Do-Check-Act

- As a model for continuous improvement.
- When starting a new improvement project.
- When developing a new or improved design of a process, product or service.
- When defining a repetitive work process.
- When planning data collection and analysis in order to verify and prioritize problems or root causes.

When implementing any change.

Plan-Do-Check-Act Procedure

- Plan. Recognize an opportunity and plan a change.
- Do. Test the change. Carry out a small-scale study.
- Check. Review the test, analyze the results and identify what you've learned.
- Act. Take action based on what you learned in the study step: If the change did not work, go through the cycle again with a different plan. If you were successful, incorporate what you learned from the test into wider changes. Use what you learned to plan new improvements, beginning the cycle again.

10.2. Five "S"

"5S" is the name of a workplace organization method that uses a list of five Japanese words.

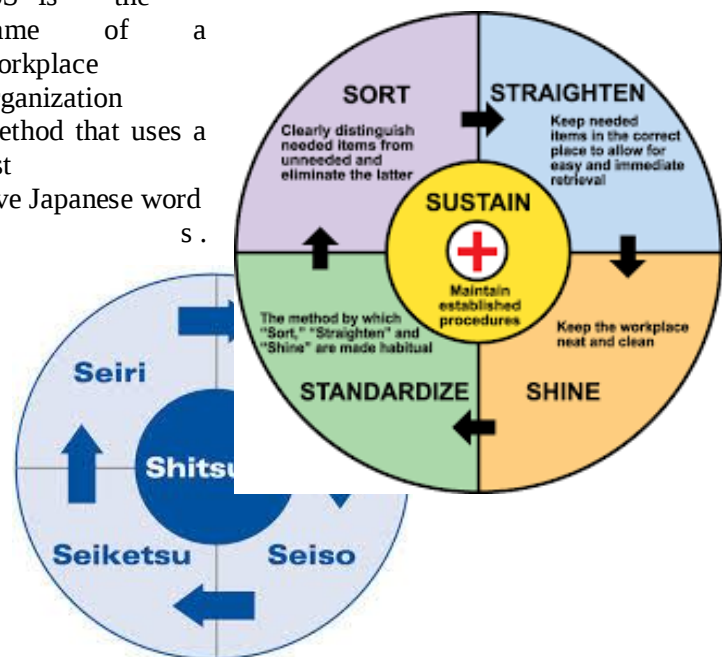


Fig. 4- Five "S" (seiri, seiton, seiso, seiketsu, and shitsuke.) method

: seiri, seiton, seiso, seiketsu, and shitsuke. Translated into English, they all start with the letter "S". The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order. The decision-making process usually comes from a dialogue about standardization, which builds understanding among employees of how they should do the work.

The original 5S principles were stated in Japanese. Because of their proven value, they have been translated and restated in English. The 5S is a mantra of sorts designed to help build a quality work environment, both physically and mentally.

The 5S condition of a work area is critical to the morale of employees and the basis of customers' first impressions. Management's attitude regarding employees is reflected in the 5S condition of the work area.

The 5S philosophy applies in any work area. The elements of 5S are simple to learn and important to implement:

- Sort—Eliminate whatever is not needed
- Straighten—Organize whatever remains
- Shine—Clean the work area
- Standardize—Schedule regular cleaning and maintenance
- Sustain—Make 5S a way of life

Fig.5- Five "S" (Sort-Straighten-Shine-Standardize-Sustain) method

Benefits to be derived from implementing 5S include:

- Improved safety
- Higher equipment availability
- Lower defect rates
- Reduced costs
- Increased production agility and flexibility
- Improved employee morale
- Better asset utilization

Enhanced enterprise image to customers, suppliers, employees, and management

10.3.. Shitsuke ("Sustain")

Shitsuke is the fifth and final step of the 5S method. It means "sustain" or "sustained discipline". It is a Japanese word that carries a wealth of cultural meaning:

- Discipline and training imposed upon a person:
 - Children are taught by their parents to brush their teeth after every meal
- Self-discipline:
 - Children grow into adults who brush their teeth after every meal
- Shared cultural self-discipline:
 - Everyone is expected to brush their teeth after every meal
- Personal discipline to continually practice and improve:
 - Golfers practice putts and drives – they do not simply play a round on the weekend without practicing in between

11. Benefits of using web 2.0 technologies in teaching

The major benefits of using Web 2.0 technologies in teaching include interaction, communication and collaboration, knowledge creation, ease of use and flexibility, and writing and technology skills.

Interaction, communication and collaboration
Using Web 2.0 technologies in teaching helps build a sense of community, increases interaction and communication among the instructor, students, and other people, and promotes collaboration and resource sharing.

Knowledge creation
Web 2.0 technologies enable students to "become creators of knowledge." As one noted, Web 2.0 technologies give students "the opportunity to create content themselves instead of just listening to lectures," and this supports active and student-centered learning in which students take responsibility for their learning. Several participants also noted that Web 2.0 technologies create an environment

where a teacher becomes a facilitator of learning rather than a distributor of knowledge.

Ease of use and flexibility

Web 2.0 tools are easy-to-use and flexible. They noted that while some of the traditional course management systems (CMS) are too static, Web 2.0 tools remove time constraints by providing a more flexible learning environment that is not inhibited to classroom walls.

Writing and technology skills

Web 2.0 technologies help students become more proficient in writing and in the application of technology. In addition to these four major benefits, the participants also mentioned that using Web 2.0 technologies “helps teachers understand a little more about the world of their students,” and “motivates the students.”

Barriers to using web 2.0 technologies in teaching

The major barriers university instructors encounter in teaching with Web 2.0 technologies are uneasiness with openness, technical problems, and time.

Uneasiness with openness

The open nature of Web 2.0 technologies is still new to many students. They reported that some students are very uncomfortable with the openness and are reluctant to participate in class activities that utilize Web 2.0.

Technical problems

Some Web 2.0 tools are “still a little primitive,” having technical glitches and might not work well with current course management systems. Several participants mentioned that universities do not provide enough technical support for faculty who are unfamiliar with Web 2.0 technologies.

Time

It takes time to learn and manage new technologies. Learning new technologies takes time away from learning subject matter content.

Best practices and tips for teaching with web 2.0 technologies

Do NOT introduce too many technologies new to students in one semester.
Do NOT use multiple technologies that do the same thing.
Provide appropriate instruction, tutorials, examples, and frequent feedback
Facilitate collaborative learning
Build a sense of community in your classroom first before trying more public collaboration

References

- [1] Agrawal Manta (2004). « Curricular reform in schools: the importance of evaluation ». Journal of Curriculum Studies, vol. 36, n° 3, p. 361-379.
- [2] Barrett Helen (2004). « Electronic Portfolios as Digital Stories of Deep Learning ». Using Technology to Support Alternative Assessment and Electronic
- [3] Broadfoot Patricia (2007). An Introduction to Assessment. London : Continuum.
- [4] Butler Philippa (2006). A Review Of The Literature On Portfolios And Electronic Portfolios. Palmerston North, New Zealand : Massey University College of Education.
- [5] Centre for Educational Research and Innovation (CERI) (2005). Formative Assessment: Improving Learning in Secondary Classrooms. Paris : OECD.
- [6] Centre for Educational Research and Innovation (CERI) (2007). Understanding the Social Outcomes of Learning. Paris : OECD.
- [7] Challis Diana (2005). « Towards the mature ePortfolio: Some implications for higher education ». Canadian Journal of Learning and Technology, vol. 31, n° 3.
- [8] Crooks Terence J. (1988). « The Impact of Classroom Evaluation Practices on Students ». Review of Educational Research, vol. 58, n° 4, p. 438-481.
- [9] Deakin Crick Ruth (2007). « Learning how to learn: The dynamic assessment of learning power ». The Curriculum Journal, vol. 18, n° 2, p. 135-153.

- [10] Downes Stephen (2008). « My Digital Identity ». In ePortfolio & Identité Numérique 2008, Montréal, 5-7 mai 2008.
- [11] Darling-Hammond et autres. Powerful Learning: What We Know About Teaching for Understanding, San Francisco, CA, Jossey-Bass, 2008, 288 p.
- [12] D. Scott Ridley, Sally Hurwitz, Mary Ruth Davis Hackett, Kari Knutson Miller, "Comparing PDS and Campus-Based Preservice Teacher Preparation. Is PDS-Based Preparation Really Better?", Journal of Teacher Education, vol.56, n°1, 2005
- [12] Gordon George (2005). Responding to Student Needs: Student Evaluation and Feedback Toolkit. Scotland : Quality Assurance Agency for Higher Education (QAA).
- [13] Hargreaves Eleanore (2005). « Assessment for learning? Thinking outside the (black) box ». Cambridge Journal of Education, vol. 35, n° 2, p. 213-224.
- [14] Harvey Lee (2001). Student Feedback: A report to the Higher Education Funding Council for England. Birmingham : University of Central England.
- [15] Hoban Garry & Hastings Geoff (2006). « Developing different forms of student feedback to promote teacher reflection: A 10-year collaboration ». Teaching and Teacher Education, vol. 22, n° 8, p. 1006-1019.
- [16] Hoskins Bryony & Fredriksson Ulf (2008). Learning to Learn: What is it and can it be measured?. Ipsra : Centre for Research on Lifelong Learning (CRELL).
- [17] Hoskins Bryony & Deakin Crick Ruth (2008). Learning to Learn and Civic Competences: Different currencies or two sides of the same coin? Ipsra : Centre for Research on Lifelong Learning (CRELL).
- [18] Houchot Alain & Robine Florence (2007). Les livrets de compétences : Nouveaux outils pour l'évaluation des acquis. Paris : Ministère de l'Éducation nationale, n° 2007-048.
- [19] Klenowski Val (2002). Developing Portfolios for Learning and Assessment: Processes and Principles. London : Routledge.
- [20] Leitch Ruth & Odena Oscar (2007). « Consulting secondary school students on increasing participation in their own assessment in Northern Ireland ». In Annual European Conference on Educational Research, Ghent, septembre 2007.
- [21] Little David (2003). The European Language Portfolio in use: nine examples. Strasbourg : Council of Europe.
- [22] Marylin Cochran-Smith, "Studying Teacher Education. What we know and need to know.", Journal of Teacher Education, vol.56, n°4, 2005
- [22] Maurice Tardif, Ahmed Zourhlal, Aims and difficulties of research into teaching between school and university environments, Les Sciences de l'éducation, Vol. 38, No. 4, 2005.
- [23] Nicol David J. & Macfarlane-Dick Debra (2006). « Formative assessment and self-regulated learning: A model and seven principles of good feedback practice ». Studies in Higher Education, vol. 31, n° 2, p. 199-218.
- [24] Patricia Goldblatt and Deirdre Smith, Illuminating and facilitating professional knowledge through case work in the European Journal of Teacher Education, Vol. 27, No. 3.
- [25] Peter Gilroy, "The commercialization of teacher education: teacher education in the marketplace", Journal of Education for teaching, vol.31, n°4, 2005
- [26] Patricia Goldblatt and Deirdre Smith, Illuminating and facilitating professional knowledge through case work in the European Journal of Teacher Education, Vol. 27, No. 3.
- [27] Sadler D. Royce (1989). « Formative assessment and the design of instructional systems ». Instructional Science, vol. 18, n° 2, p. 119-144.
- [28] Saavala Tapio (2008). Cluster Key Competences - Curriculum Reform: Synthesis Report on Peer Learning Activities in 2007. European Commission, Education and Training 2010, Work Programme.
- [29] Shields, C. M. « Transformative leadership: Working for equity in diverse contexts », Educational Administration Quarterly, vol. 46, no 4, 2010, p. 558-589.
- [30] Taras Maddalena (2005). « Assessment summative and formative: Some theoretical reflections ». British Journal of Educational Studies, vol. 55, n° 4, p. 466-478.
- [31] Weeden Paul & Winter Jan (1999). Learners' Expectations of Assessment for Learning: Report for the Qualifications and Curriculum Authority. University of Bristol.



جامعة السلطان مولاي سليمان
Université Sultan Moulay Slimane

International Arab Conference on Information Technology (ACIT'2016)



[32] White Barbara Y. & Frederiksen John R. (1998). « Inquiry, Modeling, and Metacognition: Making Science Accessible to All Students ». Cognition and Instruction, vol. 16, n° 1, p. 3-118.

[33] Wiliam Dylan (2011). « Changing Classroom Practice ». Educational Leadership, vol. 65, n° 4, p. 36-42.

[34] <http://world-class-manufacturing.com/5S/Shitsuke.html>

[35]<http://www.klipfolio.com/resources/articles/what-is-a-key-performance-indicator>