

Undergraduate Perceptions of the Usefulness of Web 2.0 in Higher Education: Survey Development

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Abstract: Recent research has highlighted how teaching and learning can benefit from the inclusion of Web 2.0 applications like blogs, wikis, and social bookmarking in higher education. However, there is insufficient empirical evidence to support the discipline-specific usefulness of certain new technologies over others. This paper reports on the development of a pilot survey that assesses undergraduates' use and their perceptions of the usefulness of Web 2.0 technologies in higher education. Focus groups were conducted with undergraduates ($n=21$) from different disciplines (Arts, Communication, Education, Mathematics, Engineering, and Sciences) to get digital native input for the proposed survey. The term 'Web 2.0' was deemed by participants as problematic and not commonly understood by undergraduates. They suggested the use of the term 'new technologies' and specific names of applications, e.g. Facebook instead of 'social networking'. Likewise, participants discussed several interpretations of 'Web 2.0 use' in higher education, resulting in more clarity in survey questions and options. The importance of subject-matter or learning goals when teaching with Web 2.0 became clear as participants highlighted the usefulness of certain Web 2.0 applications over others for their respective disciplines. Online discussions or blogs, audio or video podcasts of classroom lectures, and collaborative document sharing (Google Documents) were found to be the most useful technologies across disciplines. Students' prior use of new technologies in on-campus courses greatly influenced their perceptions of their usefulness in higher education. Participants in the focus groups as well as the resulting pilot survey ($n=26$) did not perceive social networking tools to be useful to teaching or learning. Despite the small sample size, both the focus groups and the survey pilot described here provide insight into the digital native perspective for instructors seeking to integrate Web 2.0 tools into their teaching.

Keywords: Web 2.0, undergraduate, new media, higher education, technology use survey

1. Background

The current generation of students entering universities and colleges uses Web 2.0 applications like wikis, blogs, RSS, podcasting, and social networking in their daily lives (Lenhart & Madden 2005, 2007). Educators suggest that Web 2.0 tools should be integrated into higher education because digital natives expect to learn with new technologies and because higher education should prepare students for the workplace of the future (Alexander 2006, Prensky 2001, Roberts, Foehr & Rideout 2005, Strom & Strom 2007). The ubiquity of these technologies is insufficient reason to expect faculty to use these technologies in higher education – it is more important to first assess their potential for improved educational outcomes (Donnison 2004). Emerging research has highlighted the ways in which teaching and learning can benefit from the inclusion of Web 2.0 applications in specific contexts or disciplines, but it is unclear whether certain tools, e.g. wikis, can be used more effectively in one discipline over others. This paper reports on the development of a survey to answer the following questions:

- Which Web 2.0 technologies are currently used by undergraduate students in different disciplines on-campus?
- Which Web 2.0 technologies do undergraduates find most beneficial for learning in their respective disciplines?

The first draft of the survey was developed based on focus groups with 21 undergraduates from different disciplines, following which 26 undergraduates of education completed the survey pilot and provided feedback on the item clarity, scale adequacy, and answer choices. The data collected from the focus groups ($n=21$) is presented in this paper with two aims – first, to report undergraduate perceptions of the usefulness of certain technologies over others in their respective disciplines, and second, to report on its implications for the development of the survey pilot. This research provides insight into the undergraduate perspective to educators seeking to integrate Web 2.0 tools in their teaching in different disciplines, as well as those calling for increased inclusion of new technologies in higher education.

2. Review of prior research

Researchers have identified several benefits of Web 2.0 technologies to learners in higher education (Alexander 2006, Elgort, Smith & Toland 2008, Lamb 2004). Multiple studies have focused on one

particular tool, for example, blogs, within a certain discipline. Ellison and Wu (2008), Farmer, Yue and Brooks (2008), Hall and Davison (2007), Williams and Jacobs (2004) and Xie, Ke and Sharma (2008) reported that blogs encourage students to read and provide peer feedback, and also enhance reflection and higher-order learning skills. Wikis have been found to not only improve students' writing skills but engage students and facilitate collaborative learning in various disciplines (Luce-Kapler 2007, Parker & Chao, 2007). Podcasting has been used successfully institution-wide or in specific disciplines like language learning, chemistry or psychology in higher education (Chinnery 2006, Duke 2006, Miller 2006, Woodward 2007).

No studies were identified that compared the use of any one Web 2.0 technology across disciplines or that identified the benefits of any one Web 2.0 technology over others for a particular discipline. A number of studies provided professor perspective and the measurement of learning outcomes which, albeit valuable, do not provide the undergraduate perspective. The purpose of this study was to identify Web 2.0 technologies that were more suited to certain disciplines over others in on-campus courses from the undergraduate perspective. For this reason, research on Web 2.0 technologies in online courses was omitted from the review and graduate students as well as online students were not included in the sample.

The use of the Internet and mobile technologies by teenagers and students has been surveyed before in the US. In a survey of 4374 students across 13 institutions, Kvavik, Caruso and Morgan (2004) found that respondents used technology mainly for word processing (99.5%), surfing the Internet for pleasure (99.5%) and e-mailing (99.5%). Only 21% had created their own content on the Web. Likewise, in a survey of teenagers, Lenhart and Madden (2007) found that 59% read blogs daily, but only 28% had created their own online journals or blogs. In a study specific to Web 2.0 technologies, Sandars and Schroter (2007) surveyed 3000 medical students' familiarity with and use of Web 2.0 technologies. They found high familiarity but low use of most Web 2.0 technologies except for social networking tools. Despite interest in using Web 2.0 tools for educational purposes, students lacked the experience in using them for learning or teaching. Based on these findings, students' familiarity and prior use of Web 2.0 for teaching and learning were taken into account in this research.

3. Methodology – focus groups

In the absence of a survey used to investigate undergraduate educational use of Web 2.0 in prior research at the time, the initial goal of survey development was to craft survey items that could be understood by undergraduates in various disciplines and that would include a wide range of Web 2.0 technologies. Qualitative research with undergraduates was considered beneficial to the development of survey items and would reduce bias in the technologies to be included in the survey. Focus groups have previously been successfully used to collect qualitative data that informed the development of a survey instrument in educational research (Burstein et al 1995; Nassar-McMillan & Borders 2002). Focus groups with digital natives were thus considered important to explore their perspectives, to make the survey more relevant to the undergraduate context, and to uncover issues and questions that had escaped the researcher.

Sampling was based on the rationale that undergraduates from different disciplines on-campus who participated in the focus groups should be familiar with the educational use of Web 2.0 tools. A Web 2.0 course where Web 2.0 applications were used and critiqued and which enrolled undergraduates from different streams and departments (Arts, Sciences, Communication, Education, Engineering, and Foreign Languages) was chosen for the focus groups. At the end of the semester, all students were invited to participate in focus groups. There was no penalty for non-participation. Participation by 21 of 28 students aged 18-21 resulted in the formation of four groups of four students each and one group of five students according to student availability. Focus groups lasted 30-45 minutes and questions were asked in the following areas:

- Students' prior experiences using Web 2.0 technologies for educational purposes
- Students' perceptions of the usefulness of Web 2.0 tools for teaching and learning in their respective disciplines and areas of possible impact.
- Students viewed a list of technologies and provided input on those most appropriate for inclusion in the survey.

All participating students gave their consent to the focus groups being taped. Data was transcribed and managed using Atlas software. The data was open-coded for themes and a doctoral student

analyzed data from two focus groups. His codes were compared with those of the researcher – there was a difference of one code and terminology of three other codes. Agreement was reached in both areas.

4. Usefulness of Web 2.0 technologies

Although students had worked with Web 2.0 tools in the course they had just completed, the term “Web 2.0” was discussed in all the focus groups and concluded to be problematic and misleading. Students asserted that the term should be left out of the title or the questions in the survey, and that the survey should be about “new technologies,” because a) many undergraduates did not understand the term, and b) there were several new technologies that might not fit the definition of Web 2.0 but that were useful to students. Due to their familiarity with Web 2.0, the focus groups were able to comment on the list presented to them and to express their opinions on the usefulness of those technologies in their respective disciplines. Students asked for “online discussions/online forums” to be included in the list of technologies. This option was formerly missing from the survey as this was not considered a new enough technology. However, it was cited as being the most useful for learning across disciplines and students argued that blogs, Facebook, or wikis also enabled a form of communication that could qualify as online forums. Data across focus groups resulted in the following being included in the survey:

- Online Discussions
- Social Bookmarking (del.icio.us)
- Google Documents
- Blogs
- Wikis
- Podcasts (Audio and Video)
- YouTube
- Social Networking (Facebook)
- Photosharing/tagging

The three new technologies that students found most useful for learning were Online forums or blogs; Class-capture in the form of video-casts, audio podcasts, or SmartBoard capture; and Google Documents.

4.1 Online forums or blogs for discussion

Students enjoyed being able to post comments, generate discussion, read others’ viewpoints or experiences, and get questions answered on an online forum, blog or the “bulletin-board-like” area on a wiki. Three students preferred being able to respond to specific comments within a traditional online forum as opposed to a blog where comments were “linear” and where older comments could get “lost”. On the other hand, students liked being able to receive blog posts by email, which was not possible with online discussions in the course management system. Students who did not visit blogs or online discussions regularly found email notifications were an excellent means of following the discussion. Students insisted that professor participation, whether on a blog or a discussion board, was important. However, a professor’s blog was not considered as useful to student learning as a blog to which students also contributed or posted. The exception was blogs where professors post course-related materials, readings or relevant links. Moreover, the subject being taught was termed critical to the usefulness of the blog. A journalism student provided an example of what she found effective – A professor of journalism had drawn on current news articles in her blog, using them to illustrate certain course topics. Students found her blog both interesting and beneficial to their understanding of course concepts. As opposed to this, students of science as well as engineering had struggled with typing scientific characters or Greek symbols into blog posts for a class. They felt it was difficult to ask questions or problem-solve using a blog due to the special characters involved in mathematics or science.

4.2 Class-capture for content review

Students in almost all the focus groups highlighted the value of audio podcasts, video-casts or Smartboard capture as a “study aide.” As one student put it, “it would be an advantage to students to

be able to go back to the actual lectures and actually hear them again.” Links to existing podcasts on the Internet had been successfully used in foreign language, political science, history, and education courses taken by the participants. Further, students considered audio podcasts of class lectures most useful for history, literature, rhetoric, and foreign language courses. Math and science majors stated that podcasts would have to include a visual component in order to incorporate figures and contribute to their learning. A math major remarked,

I think it would be better with other majors...a podcast of math would be really, really hard because everything is visual. If I can't actually see what the person is doing, it doesn't matter. They can say whatever they want.

Students in that focus group agreed that “in any class where they’re [the professors] writing like crazy on the board, this [an audio podcast] is almost useless.” In another focus group, students discussed learning styles and how visual learners could struggle with audio podcasts. One student shared a positive experience:

...to learn a software that I've never seen for research, and it really helped me to see a video tutorial online by the professor...where it was just so useful to just see all the menus and go here and go there with someone just telling you, rather than trying to read instructions.

Students reasoned that different technologies helped different types of learners – a blog could help a learner who understood better by articulating and writing, and the posting of audio podcasts could help a “listener.” In the third focus group, students concluded that complicated procedures in engineering and nursing required audio-video explanations that should be taped for students to go back and review later. While most students had only heard about class recordings being available online, one student with experience said,

You still have to be in class because there is a class attendance participation grade, but if you ever missed a lecture or you wanted to go back and clarify something, you have the video of the class that you missed online, so you could check it out. I know there was some debate that professors don't want to do that because people won't come to class. But I think it's really useful. Honestly, I think it's important to be in class, so I'm still going to go even if I know it's online. But if I have a doctor's appointment or a job interview, I'd be less likely to try to reschedule if I knew that I could just watch the video online after. So I think that's kind of cool too.

Quality of video was considered to be an important criterion for a class recording, which according to one student, could be resolved with an interactive whiteboard that could record what professors explained in the classroom:

If they [professors] do that with diagrams in a physics class, it will be a lot easier later to look at it and be like oh, so that was what was happening. You have notes, but you may not be able to get everything he [the professor] is writing. Or say he has slides, he goes to the next slide and you haven't seen it but he's drawn a diagram, and if it's online then you can say, oh, so that is what was going on, not what is this? He discussed it, but I don't have a photographic memory.

Students were enthusiastic about the possibility of saving drawings and explanations that professors drew on the tablet PC or the whiteboard online for review. As one student put it, “A lot of the stuff professors write on the board is erased right away, sometimes before you’ve even gotten to it.” Students reiterated that class-capture, whether audio, video, or interactive whiteboard capture, was extremely useful at final exam time, for assignments, and even to revisit content if they had forgotten concepts learned in previous classes.

4.3 GoogledDocuments for collaboration

Three out of five focus groups unanimously stated that Google Docs helped them during collaborative group projects in on-campus courses. Students had busy schedules and were relieved to be able to use Google Docs to complete a larger amount of group work online without coordinating meetings. Students had created joint Powerpoint presentations online and used the tracking feature to monitor which group member had done how much work for a presentation. They liked “the whole cooperative aspect to it where you can just have ten people work on the same document.” Similar to blogs, however, science majors had difficulties with special characters in Google Documents:

We were using Google docs to write up a report and it was all stress-strain equations, so we were using epsilons and sigmas, and I had to write e out the words 'epsilon equals'. Or you have to go into Word insert the symbol and then go to Google Docs.

4.4 Other technologies in undergraduate education

Interestingly, wikis were not among the new technologies that students discussed, except for one student who had read about students creating an online wiki textbook for a course, and thought it would be “pretty cool.” Students mentioned Flickr or phototagging as beneficial in art history or geography courses, but cited ownership and permission problems. 100% of the students stated that they did not find a use for Facebook within courses and would not want to “friend” their professors on Facebook. One student stated “You’ve got to draw that line between work and play. You don’t usually invite them to your parties at your house. You don’t want to have your professors into that part of your life.” Another student had heard of Facebook groups where scientists presented their research and suggested that a Facebook group on a certain topic or a certain course could be useful to communicate effectively, because students already spend most of their online time on Facebook. Other students, however, argued that a blog could serve the purpose just as well.

5. Discussion and implications for pilot survey

5.1 Web 2.0 use by undergraduates

Educators have become so familiar with the term ‘Web 2.0’ that undergraduates’ unfamiliarity with the term or categories therein was an important finding in the focus groups. The term ‘social networking’ for instance, was largely unknown to the participants although all of them had Facebook accounts. The term ‘new technologies’ was substituted for Web 2.0, and the technologies suggested by the students were included in the survey. Questions about ‘educational use’ of new technologies were interpreted in three ways – students’ use of a blog, for instance, included a) students reading the blog of a professor or topic expert, b) students’ contribution to a blog, or c) students’ creation of a blog for a course assignment. Items about students’ use of a tool as a resource versus their creation of a blog or wiki were thus formulated in the current survey.

A second significant finding was that students’ familiarity with new technologies for other purposes does not always translate to their use of those technologies for teaching and learning, as found by Sandars and Schroter (2007). Students welcome or value the use of certain technologies for teaching and learning when they have had prior successful experiences doing so. In this research, students’ familiarity with using certain technologies (e.g. Facebook) outside of education made it possible for them to reflect on whether those could have educational value. The fact that they did not use wikis in their personal lives and had not seen wikis used on-campus led to wikis being omitted from the focus group discussions. In order to add context to the collection and analysis of data in the future survey, a new research question was added to the study - What is the level of Web 2.0 use by undergraduate students for non-educational purposes and for educational purposes? Comparing students’ use of new technologies on-campus and for non-educational purposes could not only shed light on technologies currently being used by professors, but also confirm the hypothesis that the ‘net generation’ uses a number of different Web 2.0 tools in their daily lives.

5.2 Student learning with Web 2.0 technologies

Students from different disciplines highlighted the usefulness of certain Web 2.0 technologies for learning and simultaneously rejected others as not enhancing their learning in that discipline. For example, students found blogs useful for foreign language learning or improving writing skills, which was consistent with the literature reviewed. Communications, arts or education majors found blogs more useful than science or math majors who suggested that they could only use blogs to debate theories and ethical questions. Reflecting their daily use of technology (e.g. mp3 players, downloaded music, YouTube videos), students found it natural that lectures or classes should be recorded so they could be replayed and reviewed. Audio podcasting was found to be useful to review lectures in educational policy, political science, and history courses whereas mathematics and science students stressed the need for visuals to see problems or procedures that professors explained. No distinction had been made earlier between podcasts and ‘video casts’ – this was amended in the survey draft. It also became apparent that asking if a blog or podcast was useful was too simplistic a survey item without asking students to qualify how it was used and why it was or was not useful. Open-ended

questions in those areas were also included. Owing to students' comfort level communicating and interacting virtually, Google Documents was very popular among the students for collaborative projects or assignments. Interestingly, no student mentioned their professors using Google Documents, which suggests that this is an application that has not yet been exploited by faculty for student peer-review or professor feedback on student work.

Corresponding to prior research on student participation when using Web 2.0 tools, students argued for active student engagement and criticized professors' use of new technologies where students were not invited to participate. They preferred online discussions to classroom discussions, confirming Prensky's (2001) statement that the new generation communicates and shares differently as well as Dede's (2005) description of neomillennial learning styles. Dede asserted that neomillennials value active learning that provides opportunities for embedded reflection and that they do not use one "single best source" (p 15.15) but combine and use multiple media to enhanced their learning experiences based on individual needs. Likewise, students in this research were creative and lucid in their description of how several technologies could be combined to benefit different facets of their learning experience. They even debated on whether the survey would not be more appropriate in identifying learning goals (e.g. writing skills, critical thinking, high-order learning, collaboration) within a discipline that are achieved using Web 2.0 technologies instead of the benefits of Web 2.0 technologies for a single discipline.

5.3 Summary of pilot survey findings

The focus group data analysis contributed to the development of the pilot survey which was completed by 26 undergraduates of education (aged 18-24). While 64% of participants had used some form of online discussions in on-campus courses, only 24% had used blogs and 32% had used wikis. Similar to the focus groups, social networking tools were not perceived to be useful to teaching or learning and participation in online discussions was considered most useful. In the open-ended questions, students reported increased interest in their subject-matter or field, and increased engagement with their peers and instructor as the main benefits of using new technologies. The pilot reinforced the conclusion that students' prior experiences with the use of Web 2.0 in learning environments played a large role in the results. On completing the survey, students also commented on the clarity of items and the adequacy of the scale and answer choices. Their feedback has been incorporated on the survey, which will be given to experts to determine construct validity and then rolled out across disciplines in higher education. The data will be analyzed for differences in undergraduates' perceptions of the usefulness of Web 2.0 across disciplines.

6. Conclusion

This research indicates that undergraduates appreciate teaching and learning experiences where new technologies add value to existing practice, enhance the learning process, and gratify different types of learners. They take Web 2.0 for granted as a part of their daily lives, and would like to see it integrated into higher education only if it enriches their learning experience. Their personal use of new media does not automatically lead them to expect those tools to be used in higher education, but this could be attributed to their lack of experience of such technologies in their course work. Faculty can learn from the ways undergraduates' use Web 2.0 for self-study and group projects and leverage those strategies for course activities to help students learn. Further research is needed that studies undergraduates' use of technology for learning in the context of their socio-economic status as well as access to the Internet at home. It is also important to identify and acknowledge differences in subject-matter or learning goals when studying Web 2.0 use for teaching and learning purposes and to compare the benefits of new technologies across disciplines.

Despite the small sample sizes, both the focus groups and the survey pilot described here provide a glimpse of the undergraduate or digital native perspective of the usefulness of new technologies to their learning experience. Instead of educators espousing Web 2.0 benefits, undergraduates in this data not only defined and evaluated 'Web 2.0 use' in higher education in general but also in their specific disciplines. Given the learner-centered and learner-driven nature of Web 2.0 technologies, the learner perspective could inform educators seeking to integrate these tools into teaching and learning in various disciplines. Regular dialog with digital natives on how and where they would like new technologies to be included in higher education, as well as what benefits they perceive when this happens becomes imperative in the context of the debate on whether digital natives are different from earlier generations. While the ubiquity of Web 2.0 technologies is not sufficient reason to integrate

them into higher education, the Net generation's familiarity with new media undoubtedly makes it easier for educators to craft effective learning experiences and to use such tools to engage students.

References

- Alexander, B. (2006) "Web 2.0: A New Wave of Innovation for Teaching and Learning?", *Educause*, Vol 41, no. 2, pp 32-44.
- Burstein, L. McDonnell, L., Van Winkle, J., Ormseth, T., Mirocha, J. and Guiton, G (1995) *Validating national curriculum indicators*. Santa Monica, CA: RAND Corporation.
- Chinnery, G.M. (2006) "Emerging technologies – Going to the MALL: Mobile Assisted Language Learning", *Language Learning and Technology*, Vol10, no. 1, pp 9-16.
- Dede, C. (2005) "Planning for Neomillennial learning styles: implications for investments in technology and faculty", *Educause*. Available: www.educause.edu/educatingthenetgen [March 22 2009].
- Donnison, S. (2004) "Unpacking the Millennials: A cautionary tale for teacher education", *The Australian Journal of Teacher Education*, Vol 32, no. 3.
- Duke University (2006) *Duke Digital Initiative*. Available: <http://www.duke.edu/ddi/> [January 14 2007]
- Elgort, I., Smith, A. G. and Toland, J. (2008) "Is wiki an effective platform for group course work?", *Australasian Journal of Educational Technology*, Vol 24, no. 2, pp 195-210.
- Ellison, N. and Wu, Y. (2008) "Blogging in the Classroom: A Preliminary Exploration of Student Attitudes and Impact on Comprehension", *Journal of Educational Multimedia and Hypermedia*, Vol 17, no. 1, pp 24.
- Farmer, B., Yue, A. and Brooks, C. (2008) "Using blogging for higher order learning in large cohort university teaching: A case study", *Australasian Journal of Educational Technology*, Vol 24, no. 2, pp 123-136.
- Hall, H. and Davison, B. (2007) "Social software as support in hybrid learning environments: the value of the blog as a tool for reflective learning and peer support." *Library and Information Science Research*, Vol 29, no. 2, pp 163-187.
- Kvavik, R.B., Caruso, J.B. and Morgan, G. (2004) *ECAR Study Of Students And Information Technology 2004: Convenience, Connection, and Control*. Boulder, CO: EDUCAUSE Center for Applied Research. Available: <http://www.educause.edu/ir/library/pdf/ers0405/rs/ers0405w.pdf> [March 22, 2007]
- Lamb, B. (2004) "Wide Open Spaces: Wikis, Ready or Not", *EDUCAUSE Review*, Vol 39, no. 5, pp 36-48.
- Lenhart, A. and Madden, M. (2005) "Teen Content Creators and Consumers", *Pew Internet & American Life Project*, Available: http://www.pewinternet.org/pdfs/PIP_Teens_Content_Creation.pdf, [January 16 2008]
- Lenhart, A. and Madden, M. (2007) "Teens and Social Networking", *Pew Internet & American Life Project*, Available: http://www.pewinternet.org/pdfs/PIP_SNS_Data_Memo_Jan_2007.pdf, [January 16 2008]
- Luce-Kapler, R. (2007) "Radical Change and Wikis: Teaching New Literacies", *Journal of Adolescent and Adult Literacy*, Vol 51, no. 3, pp 214-223.
- Miller, D.B. (2006) "Podcasting at the University of Connecticut: Enhancing the educational experience" *Campus Technology*. Available: http://campustechnology.com/news_article.asp?id=19424&typeid=156 [January 14, 2007].
- Nassar-McMillan, S.C. and Borders, L.D. (2002) "Use of focus groups in survey item Development", *The Qualitative Report*, Vol 7 no. 1. Available: <http://www.nova.edu/ssss/QR/QR7-1/nassar.html>, [July 7 2008].
- Parker, K.R. and Chao, J.T. (2007) "Wiki as a Teaching Tool", *Interdisciplinary Journal of Knowledge and Learning Objects*, Vol 3.
- Prensky, M. (2001) "Digital natives, digital immigrants", *On the Horizon*, Vol 9 no. 5 pp1-6.
- Roberts, D.F., Foehr, U.G. and Rideout, V. (2005) *Generation M: Media in the Lives of 8-18 Year-Olds*, Menlo Park, CA: Kaiser Family Foundation.
- Sanders J. and Schroter S. (2007) "Web 2.0 technologies for undergraduate and postgraduate medical education: an online survey", *Postgraduate Medical Journal*, Vol 83 no. 986 pp 759–62.
- Strom, R.D. and Strom, P.S. (2007) *New Directions for Teaching, Learning, and Assessment*, Netherlands: Springer Verlag.
- Williams, J.B. and Jacobs, J. (2004) "Exploring the use of blogs as learning spaces in the higher education sector", *Australasian Journal of Educational Technology*, Vol 20, no. 2, pp 232-247.
- Woodward, J. (2007) *Podcasts to support workshops in Chemistry*, Available: <https://breeze.le.ac.uk/lfconimpalajonny/> [March 22, 2007]
- Xie, Y., Ke, F. and Sharma, P. (2008) "The effect of peer feedback for blogging on college students' reflective learning processes", *The Internet and Higher Education*, Vol 11., no. 1, pp 18-25.