

Taking Advantage of Web 2.0 in Organized Education (A Survey)

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Key words: *Web 2.0, Teaching, Learning, Blog, Wiki, Social Bookmarking, Tagging, Podcasting*

Abstract:

Reports on using Web 2.0 and Social web technology and tools in education appear lately with increasing frequency year after year. Applications of blogging, wikis, social bookmarking and tagging, online communities, podcasting and more were reported. The benefits observed in connection with these new methods include: improved motivation, and quality of learning, development of analytical thinking, collaboration, teamwork, and communication skills. The second part of this work draws conclusions on methodological issues. Blogs seem to be best suited for subjective organization and reflection upon the acquired knowledge. Wikis seem to be well suited for collaborative organization of knowledge. Social bookmarking was used with success for organization of resources of various kinds. The blended learning approach seems to be the most effective way to include these activities in higher education. These tools bring a particular value into those fields of study where open ended discussion and competing opinions are valued, e.g., social sciences, but this is not a rule. Students' activities with these tools provide valuable source of assessment, however not only content contributed by individual students but also frequency and periodicity should take part in the evaluation.

1 Introduction

Today's young generation, sometimes called media generation [51], net generation [11], or digital natives [41], grew up from early childhood surrounded by digital technologies. This by large affects the way how they process the information and boost development of specific skills, such as multi-dimensional perception and multitasking [52]. Education experts are not unaware of this fact and introduction of digital technology and particularly Internet into teaching and learning is an ongoing process. In this paper we survey existing approaches of exploiting Web 2.0 and so called Social Web¹ technologies and tools in teaching and learning.

Tools and services targeted by this survey include: blogs and blogging, wikis, social networking software, social bookmarking and social tagging services, podcasting and more. While in the current paper, we advocate the stance that these tools should be part of the educational process simply because mastering them is an important skill in the knowledge society of the present times, it was also noted [33] that employing such tools in the process of learning is in favor of modern education approaches such as constructivism [53] and

¹ While Web 2.0 and Social Web are two separate notions, most of the tools and services that this study is centered on are possibly seen as part of both. For sake of simplicity we select the first term and use it throughout this paper.

constructionism [38], it possibly makes the education process more attractive and entertaining [20], and even easier for the students [50].

While many reports of successful application of Web 2.0 technologies and tools in organized education were published, most of them are pilot case studies reporting empirically observed success with some particular course. There are considerably fewer (including [33,12,36,29]) more rigorous works mostly concerned with comparison of these new methods with more traditional ones and rigorous evaluation of the learning outcome. In addition several reports call for caution and for increased pedagogical guidance whenever these new methods are applied [23,56,46,40].

One issue that we found almost completely absent in the accessible literature is the one of developing a methodology for application of Web 2.0 and its tools in organized education. Hence, in the second part of this paper we take first steps towards meeting this goal. Resourcing to the existing research that we surveyed we try to answer questions such as: What goals are possibly addressed by these tools? What benefits these tools possibly bring to the education process? How to easily and effectively start using them? Which educational topics and which audiences are suitable to be supplemented with these tools? How to evaluate students' activity with these tools? How to determine whether the application of these tools was successful and beneficial for the students?

2 Web 2.0 in Teaching and Learning

2.1 *Online Communities*

While other more complex definitions are found in the literature [30,54], a learning community is simply a group of people who share common educational interests and interact together. When the interaction and communication in the community is running via the Internet the community becomes an online community. Computer and Internet supported communication was seen as an effective way to strengthen the existing social connections between students and their collaboration [18]. Formulating ideas into words, and receiving opinion from peers leads to the social construction of knowledge and shapes the students' way of thinking and their views [19].

Online communities are increasingly mentioned in connection to education. Two types of educational online communities were described [5]: a knowledge building community and a technological samba school². The first type focuses on knowledge sharing and collaborative learning through projects, for instance, students all around the world collect and share data about some phenomenon and build their own image of it. In the samba school everybody is teaching and learning at the same time in peer-supported environment.

Using the Web 2.0 tools in the educational process helps to integrate students into existing online communities and it helps to form new ones. Students are forced to be active and to collaborate with the help of these new tools and this binds them more tightly into the community. They are all contributing to each other's learning. When solving a problem in context of the community they often investigate much wider range of information as usual. They become experts to other novices in the community, also being novices to other experts [46].

For instance, forming an online community was reported to boost the coordination among the different operating units of the research group and to improve the information exchange and document sharing [22]. In another report, an online community boosted participation and

² Technological samba school is a term introduced by Papert [37] to describe a process whereby a community of people of all ages engage in a creative project using computers.

collaboration among students [24]. It is conjectured that the process of knowledge formation, development and consolidation was facilitated and improved this way.

2.2 Blogs

Blogging bears remarkable potential in education. As noted by Mosel [33], blogging as an activity is well aligned with the theory of constructionism [44], it encourages subjective organization of knowledge, and due to the possibility of receiving feedback it allows to compare one's view of things with others, thus facilitating consensus and social construction of knowledge. Further opinions stress that blogging encourages critical and analytical thinking and the ability to develop and sustain a clear and confident "voice of one's own" [49,35]. This is due to "writing a blog article forces the author to contemplate how her views might be interpreted and reflected upon by others" [38,35]. Given its current socio-economical significance, it is also possible to view blogging as an important personal skill to develop in students [20].

As a tool for sharing of experience and knowledge, the blogosphere³ covers all the essential features of online collaborative learning system [29]. As such, it is suitable particularly as self directed learning system. Using their blogs, students reflect on their own experience and also to the experience of others. Their contributions go beyond the syllabus and may become a resource for other students [55].

Blogs were employed in many organized curricula [56,49,7]. For instance, a university web design course makes use of blog development and blogging as practical assignments [20]. This was reported as particularly rewarding, as it boosted students' communication, experience exchange, competitiveness and increased students' interest and involvement with the course.

Blogs were used also as an environment for discussion on professional practice in the group of undergraduate physiotherapy students [25]. Participants were divided into two groups, the first group was assigned with blogging and the other was asked to comment on the blog articles done by the first group. The blogging was supervised and combined with peer learning strategies. Students appreciated simplicity, accessibility and informality of this tool as well as the feeling that they were not alone and that they could share and compare their own experiences with others. Thanks to the blogging experience they learned to organize their ideas in a more useful manner, and they have learned to communicate more clearly and understandably. Thus, blogging together with peer coaching proved to be a very valuable way of learning, building confidence, strengthening interest and supporting the integration of theory into practice.

2.3 Wikis

Wiki as a collaborative medium designed for document composition and content sharing provides students with an environment in which they learn to arrange knowledge in co-operation with others. This helps them to develop the sense for shared authority and responsibility for their own knowledge [46]. The collaborative work is carried out as online research, ongoing cooperative page updating, and reflecting on the work done by the others. At this kind of teamwork where everybody is "expert" in some topic and individuals act together rather than in competition, the standard status hierarchy (student – teacher) is disrupted.

There are many examples of using a wiki in the educational process. A wiki was applied in preparing lecture notes [13]. Students are able to annotate the lecture notes, and eventually share their annotations under the teacher's approval, improving the lecture materials for future

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The blogosphere [17] is the space defined as the sum of all blogs accessible in the Internet.

students. In another application of a wiki in learning, students worked in groups in order to prepare a library of algorithmic problems and their solutions in algorithm design course [22].

Another report [46] used a wiki to create a student written, collaboratively edited textbook. This allowed students to keep the information in their textbook up to date. A secondary benefit was in acquiring significant skills in self directed learning.

The present comparative studies showed that the students' involvement, but not necessarily performance on assessment, may be higher when using a wiki to support learning in higher education [34]. As follows from another study [43], the successful use of this tool is probably related to the culture and discipline in the classroom as well as the subject of study (students of English composition demonstrated significant learning benefit, while many students of science, technology, engineering, and mathematics actively resisted cooperation).

2.4 Social Bookmarking and Tagging

The children's programming language Robologo was extended by social tagging features so that children are enabled to tag the commands [14]. Thus the programming language features and its IDE are annotated by children's own words and are connected with real world concepts. This makes learning of programming more effective.

Authors of another study [50] provided students with a social bookmarking tool called H20 playlist instead of full fledged citation management products as a tool for resource tracking academic skill development seminars. The reason for this move was the idea that it is too early to introduce the full fledged citation tracking software to undergraduate students, instead they were provided with a tool that is familiar to them and provides all necessary functionality at the same time. A point of particular interest in this study is that the education process was adapted in order to use tools that are already familiar to most students, and that Web 2.0 tools such as social bookmarking systems can be considered as such.

2.5 Podcasting

Also podcasts have been applied in teaching and learning practice. Podcasting falls under mobile learning. The widely acknowledge is the learners option to download the content onto mobile devices and access these materials at any time and any place. Podcasting is possibly also used to deal with the lack of educators in some area. Such application was reported in context of a medical nursing course [31].

Contrasting results were reported regarding the students acceptance of this technology in their learning. These range from students being receptive to use of podcasting [28] to uncertainty and refusal by significant portion of students [23].

However, it was demonstrated how podcasting may contribute to development of key competences of the student. Collaborative development of audio learning objects for a podcasting exercise stimulates student's conceptualization of the subject matter, both individual and collective learning and social knowledge creation [27].

In another study [56] learners were given the assignment to produce a written press-release and a short video interview, suitable for an Internet podcast or a television news interview. These podcasts were created by the learners themselves. In addition podcasts were created and made available to students by the tutor, where the key elements of the software used by the students were discussed between the tutor and selected students.

2.6 Beyond Web 2.0

While tools and services associated with Web 2.0 typically allow people to share and discuss knowledge using written text, sound or video and thus they enable social knowledge construction and formation of conceptualization shared with others, the conceptualization itself may be made explicit using tools such as Semantic Wiki or MoKi [14]. Such tools fall into the field of semantic technologies which also bring its contribution to education.

Methodologies such as ontology maturing [3] and social semantic bookmarking [4] were developed.

While a formal conceptualization exercise certainly is mandatory in knowledge engineering courses, in the context of higher education they might be rewarding also in any other field in which students are to manipulate and master excessive terminology (e.g., medicine, law, etc.). In addition, the use of socially enhanced semantic tools such as SOBOLEO [3] allows students to comment and discuss on the terminology, thus potentially improving their adherence to these terms and the consensus on their proper usage.

3 Towards more methodical application of Web 2.0 in organized curricula

3.1 *What are the overall goals and benefits of including the Web 2.0 tools in the organized education*

In multiple reports, various Web 2.0 tools were found beneficial for teaching and learning and for organization of the educational process. In association with organized curricula particularly the following goals and benefits were pointed out:

- *Developing the skill to use the Web 2.0 tools and other Internet services for personal publication and professional communication.* While often overlooked in the didactic literature, given the current popularity and given the socio-economical significance of these tools, blogs and wikis above all, this goal is equally important as any other listed below [35,49,25].
- *Motivation.* One of the crucial goals is to rise the students' interest in learning. Use of these non-traditional educational methods introduces an entertaining form of learning, encourages students' curiosity and subsequently also their interest in the subject matter. The particular potential of the Web 2.0 tools lies in two facts: because they are already familiar to most students and because these tools and services are often part of their free time activities. In addition, it was reported that giving the students a space to present and discuss their practical assignments boosts competitiveness, and hence increases motivation [20,46].
- *Community building.* As argued above [13,24,45], online learning community creates an environment of cooperation in which participants actively learn via discussion which is possibly beneficial for the learning outcome. Web 2.0 tools were successfully applied in order to facilitate this goal.
- *Knowledge organization and reflection.* In this respect, some of the Web 2.0 tools have the potential to supplement or to even replace more traditional tools that are usually employed, such as personal notes taken during the lectures and even lecture notes, traditionally provided by the lecturer [13,46]. The advantage of these new techniques and methods is in their social and collaborative nature. They boost group interaction instead of solely individual performance which helps to develop competence of collaborative work – one of the most important competences in teamwork practice. By comparing one's subjective view of the learned knowledge with the other members of the learning community, constructivist learning and social knowledge construction is boosted, thus resulting in increased learning outcome [33].
- *Familiarity.* Web 2.0 tools are familiar to most young people today [51,11,52]. Hence they are able to use these tools intuitively and with ease, which saves more of their time and mental capacity for the actual learning. We already discussed an example

where a social bookmarking tool replaced a more traditional citation tracking system [50].

3.2 How to easily and effectively start with employing the Web 2.0 tools in the organized educational process

Technically this is not an issue. Many of the Web 2.0 tools are available in form of open-source software, ready to be installed and used for what ever purpose. There are also online services such as blogger.com, wikia.com, etc. which are possibly employed with little technical administration. In addition, popular open-source courseware systems such as Moodle [8] already allow such features either natively or in form of plug-ins.

The point here is of course the didactic one. The literature [45] points to the blended learning approach. While more traditional teaching methods such as lectures, labs and seminars constitute the main activity, ICT and hence possibly Web 2.0 tools are introduced for sake of community building, tracking, organizing and reflecting upon the learned knowledge, and discussion.

While as every new technology also this one has to be introduced cautiously and with pedagogical guidance, in order to get the most out of the Web 2.0 tools, they ought to be applied in a sufficient extent. In many of the existing implementations of Web and the associated ICT technologies in teaching and/or learning, the on-line environment is employed only for sake of content delivery and support. However, in light of the survey presented in the previous section, we conclude that blogs, wikis and other Web 2.0 services are powerful tools which allow us to *shift the focus from bare presentation of information to collaborative construction of knowledge*. Therefore the educational activities should be adjusted for this goal and give the students the opportunity to play an active rôle in “coming to know”.

Another aspect to be mentioned is that these tools and services should not be considered just as devices designed for individual acquisition of information. They offer much more to the students: they offer the development of the skill of collaboration. So the curricula employing these tools ought to push the students to use exercise this skill relying on particular collaborative features of the Web 2.0 tools in use. The work of the students should be both individual and collaborative and through the cross-linking and comments to work of others they have to follow what others are doing and produce a collective outcome rather than solely compete with each other.

3.3 Which educational topics and which audiences are more suitable for application of the Web 2.0 tools and which are less suitable

While these tools are possibly applied in connection of wide range of topics, as proved by the literature [20,36,25,54,1,34,43,28,31], the areas that could particularly benefit from these new methods are those where there indeed is a lot to discuss, and where there are many competing scientific opinions and stances per single subject of study. This simple claim suggests that these tools should be more successful in social sciences in contrast to precise natural and technical disciplines [34]. Blogs are particularly favoured in creative writing courses [43]. However there are notable exceptions and hence each particular application should be considered and justified. For instance, blogging was successfully applied in a technical discipline of web design [20]. The justification in this case id clear: in this field there are many competing technologies and many competing opinions on how to properly use them.

Another very important consideration to be made is whether and to which extent is the targeted audience ready to accept these tools in the educational activity. While there are studies that claim that current young generation are true digital natives and they all accept and use digital technology intuitively and with ease [41,42,51,11,52], others are more cautious in this respect. A 2006 study [23] surveyed 2010 first year students of the University of

Melbourne to report that while almost all of them were familiar with core digital technology such as PC, word processing, mobile phones, searching information on the Web, many of the students were less familiar with more specific technologies such as wikis or RSS. As also pointed out by this study, even great familiarity and acceptance of some particular technology in their everyday life does not guarantee students' willingness to accept these technologies as supportive tools for study and learning. These results call for caution, surveying the audience and its needs, if possible, and above all, pedagogical guidance and support whenever these technologies are applied in organized education.

3.4 Which of the tools and services is particularly suitable for which purpose

Each technology has its advantages and disadvantages and it is important to select the most suitable one for each particular application. The following application scenarios seem to be the most viable combinations of technology and purpose, according to the literature:

- *Blogs* seem to be most suitable for personal reflection and subjective organization of the acquired knowledge.
- *Wikis*, in contrast, are more suitable for collaborative writing and collaborative organization of knowledge. Collaborative lecture notes authored or coauthored by students are the most typical example.
- *Social bookmarking and tagging* are tools most suitable for organization of resources of some kind. Examples found in literature range from organizing bibliographic records, study materials, but even tagging the commands of a programming language.
- While *social networking software* seems to be the most suited for community building, it must be noted that social networking features are commonly built in almost any Web 2.0 environment, and as noted above, even in the current courseware, and hence all these environments are readily used, usually in connection with other tools built in within the environment.

3.5 How to evaluate students' activity with Web 2.0 tools

The problem how to evaluate students' activity with the supportive Web 2.0 tools and services provided to them is by large still an open issue. Among all, the most problematic remains the question how to assess an outcome that is the result of collaborative work of several students.

It has been noted, that it is important to take into account both quality and quantity of their contributions [56]. In addition we argue that also frequency and periodicity of students' involvement with these activities should be considered. Several authors recommend an ongoing evaluation approach [25,40] that was found motivating for the students as well as beneficial in the sense of reduction of the assessment pressure.

As showed in one course that employed blogging [56], if the blogging assignment is optional, the quality of students' contribution may be very low. From this point of view, a mandatory involvement of these tools in the learning process was proved to be more fruitful [46].

3.6 Implications on the teaching and learning process

Within online learning communities, students often assume untraditional rôles in the learning process. They actively discuss the subject matter among themselves and thus they possibly assume the rôle of educators to some limited extent. Such interaction is indeed often part of more traditional education, however within online learning communities it is further boosted by the fact that the discussion is recorded and it is readily available for the rest of the community once present and thus its impact is significantly increased [20,24]. Even more interesting, it has been suggested that in wiki based environments, but in fact in every other situation where students are able to provide feedback on other students' work, such feedback

may possibly be included in evaluation [13,16]. Thus students partially assume the rôle of evaluator. Given this, a shift of authority naturally occurs, and it should be understood and accepted by the educators. The traditional view of teacher as an expert who leads discussion is shifted towards the one of a moderator, or a coach, who supervises the teaching activity [1].

Another issue is that students may become dependent on the others. If one individual does not contribute to the community this is a disadvantage for the others. If this happens on larger scale, even the most active students may be held behind simply by the fact that there is not anyone to discuss with [5]. This has to be understood and taken into account by the lecturers and the evaluators. Surely it is of high importance to create a learning environment and evaluation conditions that are fair for each students and also perceived as fair by the students themselves, otherwise we risk frustration and demotivation. We suggest that a community development strategy may improve the outcome if incorporated into courses.

One study [6] reported, that in online forums that have been used in pre-service teachers training the pieces of information contributed by students became so scattered, that they decided to summarize the learning outcome in more traditional face-to-face sessions with the students. The participating teachers are involved in many activities that are new also to them. This suggests that not only students require pedagogical guidance but possibly also a need for special training of the teachers occurs.

Two separate studies reported problems with students ignorance of copyright issues [49,20]. Many students freely copied copyrighted material from the Web and presented this on their blogs as their own work. This example calls for, first, educating beforehand all students that participate in these activities and, in addition, addressing plagiarism in the evaluation scheme (e.g., a system of penalties for plagiarism, once detected, turned to be fruitful [20]).

3.7 Quality assessment

Besides for numerous studies reporting empirical evidence of improved quality of learning, a more rigorous investigation of this issue is still very sparse. Comprehensive evaluation method for a course administrated approximately 5000 students that relied on mixed media to deliver the course content including paper, broadcast television and Web-oriented environment was developed by Taylor et al. [48]. This method involves traditional paper-based questionnaires, online questionnaires, student observation and interviews, and analysis of the content produced by the students. This method, sometimes called *multi-level* or dynamic evaluation was since repeatedly applied [39,10] in different scales.

Another attempt in this line of research is the so called Classroom Community Scale (CCS) developed by Rovari [44,49]. It is a method for evaluating the sense of community within a group of learners. Relying on this method, it was reported that students of a blended learning course reached a stronger level of the sense of community than those participating in a more traditionally shaped course [44]. In another report [45] that employed the very same method, a significant increase of the sense of community was observed in a group of students that were supplemented in their traditional course with a web based material (including lecture notes, assignment briefings, discussion pages, etc., i.e. a system with Web 2.0 features).

We suggest that the research community should go further in this effort and we propose to focus on the following issues:

- In what particular aspects should Web 2.0 technology improve the teaching and learning process?
- How is it possible to rigorously evaluate these aspects?
- How are these aspects supported by each of the diverse Web 2.0 tools and services?
- In a given particular study, how much is each of these aspects improved under the current application scenario?

4 Conclusion

In the recent years, a number of approaches to employ Web 2.0 tools and services in education emerged. Blogs, wikis, social networking tools, social bookmarking and tagging, podcasts, and even more tools were applied, particularly in higher education, in courses with various subjects and at various levels. While many reports of successful application of these tools were published, with few exceptions they are mostly experimental case studies reporting empirical results. Based on these reports, it is clear that there is a significant potential in these tools for learning and for organized education. The following benefits were reported: making the education process more attractive for the students, building motivation, increased quality of learning, practicing skills such as critical and analytical thinking, collaboration, teamwork, professional presentation and communication.

On the other hand, as every other new tool also Web 2.0 has to be applied with caution and pedagogical guidance. While it is widely acknowledged that a typical first year student today is highly skilled in digital technology [41,42,51,11,52], it was proved by more rigorous research [23] that this is not universally true for every single individual and also the familiarity of students with different technologies varies – it is very high for core technologies but decreases with more specific ones. In addition, the sole fact that students are skilled with any particular technology and they daily use it does not warrant their acceptance of it as an educational tool.

In the second part of this paper we move towards a more methodical approach of applying Web 2.0 in education. Recollecting all the results found in the literature we take first steps in order to develop methodological guidelines for applying Web 2.0 in organized education. We summarize our findings as follows:

- Blog and wiki publishing, online communication, tagging and social bookmarking are important activities that should be practiced in school, in order rise students that are successful in the knowledge society.
- If properly applied, these tools reinforce constructivist learning and social knowledge construction, and help to develop analytical thinking, collaboration, teamwork, and professional communication skills.
- As these tools are already familiar to most students, they have the potential to build motivation and to make education more attractive and more accessible for today's students.
- It cannot be, however, assumed that all students are equally familiar with every Web 2.0 tool and hence understanding the needs of the audience, caution and pedagogical guidance are very important [23].
- The blended learning approach [45] seems to be the most viable and the most effective one in order to start with these tools within university curricula. Blogs are suitable for subjective knowledge organization and reflection, wikis are favourable for collaborative tasks such as building lecture notes in collaboration, etc., and social bookmarking tools are most suitable for organizing of resources of any kind.
- Teaching topics where discussion and comparison of various opinions such as social sciences, philosophy, creative writing, etc., seem to be the most suitable for application of these tools, however this is no way a strict rule and successful application was reported in many different fields.
- Students' activity with these tools are a possible source of assessment for sake of grading, however it is still very open how to evaluate these activities. It has been suggested that the content that students produce, frequency of contribution and as well periodicity should be taken into account. Failing to include these activities into evaluation may result in student's ignorance of the assignment.

- Evaluation of the level of success of a particular application of Web 2.0 tools in education is highly non-trivial. Complex multi-level evaluation [48,10] was suggested.

As the very final remark, it has to be stressed that these guidelines are not to be considered complete or universally applicable. Development of rigorous methodology in this field is still a very open issue of high demand and this work is to be understood just as one of the steps towards meeting this goal.

Acknowledgement

The authors would like to thank to Chiara Ghidini for valuable discussion on the subject of semantics wikis.

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