The Impact of Web 2.0 on Learning at a Technical University - A usage survey

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Abstract: The recent years saw a lot of discussion about technologies and applications labeled "Web 2.0" and its influence on e-learning. "Web 2.0", labeling an idea rather than a concrete technology, lead to the definition of the related concept "E-Learning 2.0" and research on possible use of corresponding online tools and technologies in E-Learning has been published. Yet the actual inclusion of such concepts in everyday learning situations, especially in university settings, remains undetermined. This paper describes the analysis of a survey conducted to verify the influence of "Web 2.0" applications for Learning at the Graz University of Technology. The goal was to investigate the frequency of passive use, work a a developer and use in lectures and learning, as well as the influence of the education level thereon. The survey was released to students of lectures ranging from freshmen to master students.

Introduction

Since the first Web 2.0 conference in 2004 and even more since the well-known article by Tim O'Reilly (O'Reilly, 2005) defining this term there has been a lot of controversy and discussion in the scientific community about this topic. Undoubtedly the last years saw a change in the way the web has been used, from a primarily passive to a largely participative way. Rather than describing certain technologies, "Web 2.0" can be seen as an idea comprising individual production and user generated content, harnessing the power of the crowd, data on an epic scale, architecture of participation, network effects and openness (Anderson, 2007). In the wake of this discussion and the hype in the media a lot of more or less new applications and technologies have been associated with the term Web 2.0. The ensuing paradigm shift largely moves teacher and student to collaborative learning and the application of Web 2.0 related technologies like Blogs, and Wikis in e-learning lead to the concept of "E-Learning 2.0" (Downes, 2005).

In (Raitman & Augar, 2007), for example, the application of Wikis for online collaboration in tertiary education environment is described and a case study was evaluated. Other applications that are proposed for the use in e-learning are blogs and podcasts. Universities like the Graz University of Technology offer such services to their students[1] and several teachers include the use of online tools in their courses. One of these services is the providing of lecture recordings as video podcasts (Ebner et al, 2007).

Yet the question, to what extend this offer is used by the students, remains largely open, although a survey at the University of Oxford is described in (White, 2007), which tries to answer this question. This survey contained questions concerning the types of usage of different online tools which share the "Web 2.0" label. The survey contains little analysis, offering possibilities for the readers to interpret the numbers themselves. This motivated us

[1] http://tugll.tugraz.at

to make a survey at the Graz University of Technology investigating the extent and type of usage of Web 2.0 applications in a university environment.

Technologies of E-Learning 2.0

The applications of Web 2.0 technologies in the E-Learning field (E-Learning 2.0) have been already numerous. For example, (Wageneder & Jadin, 2006) describe applications of wikis, blogs, and Really Simple Sindication (RSS 2.0) technologies for collaborative creation of content by learners independent of their teachers. Another example of using blogs and social software applications to support learning includes TU Graz LearnLand project (Nagler et al., 2007). The project is based on a principle of so-called personal learning environments, which are collections of free, distributed, web-based tools linked together and aggregating content using RSS and simple RSS feeds (Fitzgerald, 2006).

Recently, E-learning projects applying social software techniques such as tagging emerged. Tagging includes describing content in a social software application by users using simple keywords. The keywords might be related to each other which results in a so-called folksonomy, i.e. a collaboratively created conceptualization of a domain (Wu et al., 2006). It is a bottom-up user-created and maintained alternative to taxonomies, which are typically prepared in a top-down approach by experts and lack therefore flexibility and extensibility. In essence, folksonomies provide valuable metadata about the content in a particular domain supporting and improving information retrieval. The project called share.loc recognized the enormous educational potential of using such techniques for improving retrieval of information in large E-Learning repositories and applied it for offering advanced search and navigation possibilities for learners and teachers alike (Dahl & Vossen, 2007).

Obviously these change in paradigm as far as E-Learning is concerned is connected to the propagation of Web 2.0 applications and technologies. This resulted in the design of a survey to discover to what extent students are familiar with these technologies and use them. Furthermore it is desirable to realize to what extent these students already use such technologies and applications in the context of learning at the university.

Web 2.0 Usage Survey

In order to find comparable numbers for the situation at the Graz University of Technology as well as to gain additional insights a survey was designed. The first objective of this survey is to verify the level of usage of different technologies associated with the concept “Web 2.0”. This concerns the passive usage as well as the active development of applications or websites.

The second objective is comparable to the survey described in (Raitman & Augar, 2007). It is to verify the level of usage of different types of Web 2.0 applications. While aforementioned survey discerns the types of usage into socially, for study and for work, we decided to allow separate frequencies for the categories passive use as a consumer, active use as an author or contributor, use in lectures guided by a teacher or use in learning situations of one's own accord.

The survey was designed for the students of three different lectures. The first lecture is for freshmen, while the second one is for students at the end of their bachelor program. The final lecture involved is for students in their master program. The vast majority of the participants of these lectures study Computer Science, Telematics, Software Development-Economics, Technical Mathematics, or Biomedical Engineering.

Beside the basic statistics describing the knowledge and the usage frequency of the participants, it was aimed to verify a number of hypotheses concerning the correlations of some of the survey’s variables (see). The first set of hypotheses concerns the influence of the academic education, presented by the lecture attended, which roughly equals the year in the curriculum. A second set of hypotheses is focused on two derived variables. *Familiarity* summarizes the frequencies of the passive usage of the observed technologies. *Proficiency* summarizes the frequencies of development with these technologies. These hypotheses were tested by calculating the Pearson’s correlation coefficients for the variables concerned and verifying the significance with a Student’s t-test at a confidence level of 0.95

H_1	Advanced students, know more about technologies associated with Web 2.0.
H_2	Advanced students, use such technologies more frequently.
H_3	Advanced students, develop applications with such technologies more frequently.
H_4	Advanced students, know more about applications associated with Web 2.0.
H_5	Advanced students, use such applications more frequently.

H_6	Advanced students, provide content in such applications more frequently.
H_7	Advanced students, have used such applications in courses more frequently
H_8	Advanced students, use such applications in learning more frequently.
H_9	Advanced students, have gained a higher familiarity with Web 2.0 technologies.
H_{10}	Advanced students, have gained a higher proficiency with Web 2.0 technologies.
H_{11}	Students, who have higher familiarity rating, know more about applications associated with Web 2.0.
H_{12}	Students who have higher familiarity rating, use such applications more frequently.
H_{13}	Students, who have higher familiarity rating, provide content in such applications more frequently.
H_{14}	Students, who have higher familiarity rating, use such applications in learning mire frequently.
H_{15}	Students, who have higher proficiency rating, know more about applications associated with Web 2.0.
H_{16}	Students who have higher proficiency rating, use such applications more frequently.
H_{17}	Students, who have higher proficiency rating, provide content in such applications more frequently.
H_{18}	Students, who have higher proficiency rating, use such applications in learning mire frequently.

Table 1: Hypotheses

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Detailed Survey Setup

Matching the objectives of the survey it was split into three parts. The first part covered demographic information about the participants. The second part covered a list of technologies associated with the term Web 2.0. Finally the third part covered applications associated with Web 2.0. Only the most basic questions in the demographic part were compulsory to be answered.

The demographic part of the survey covered the gender and the age as basic information. Age groups Moreover details to the participants' studies were requested; being the type of curriculum, the year in curriculum, and which of the three lectures had been visited.

The target of the technologies section is to measure the level of proficiency the students have in a number of web technologies. To that end, after checking the basic knowledge about these technologies, two levels of proficiency are of interest. The first level is whether the participant uses the technology passively as a user. The second one is whether he uses it actively as a developer. For both of these levels the frequency of use is asked for, from ever to daily. The technologies covered are Really Simple Syndication (RSS) feeds, Asynchronous JavaScript and XML (AJAX), Service Oriented Architecture Protocol (SOAP), Representational State Transfer (REST), Podcasts, Wiki Software, and Weblog Software.

The final part of the survey is designed to learn about the usage of several of those applications which are summarized to the term Web 2.0 and are interesting in the context of E-Learning. After checking basic knowledge about these applications, the frequency of usage in four different levels is asked for. These four levels are passive usage like reading, active usage meaning the providing of content, guided usage as part of a university lecture, and individual usage during learning. Finally the participants are asked to sort the applications by their importance for collaborative respectively individual learning and are asked to name examples for the application types which they use. A first group of applications, which represents applications used in the course of E-Learning activities at the Graz University of Technology, consists of Weblogs, Wikis, Audio-Podcasts, and Video-Podcasts. A second group consists of other Web 2.0 applications, being Mashups, Social Bookmarking, Social Networks, Media Sharing, and Virtual Realities.

Results

183 of the 831 participants of the three lectures involved completed the survey, resulting in a rate of return of 22%. 90.71% of these were male, matching the gender distribution of the involved course programs. The majority of 69.95% of the participants are aged between 21 and 25 years. 42.62% of the participants study Telematics, and 34.98% Software Development-Economy, while the remaining students are spread over the other possible course programs. 68.31% of the participants were students of the first-year lecture, 21.31% attended the lecture at the end of the bachelor programs, and 16.94% the master program lecture

Technologies

The basic analysis of the answers in the technology part of the survey yielded the result that Wikis, Weblogs, Podcasts and RSS Feeds are best known, as shown in **Table 2**. The other technologies in question are far less known amongst the participants. While this was presumed for SOAP and REST, the fact that the concepts of AJAX and Tag Clouds are only known to a small number of students came as a surprise.

Subsequently the figures were investigated depending on the lecture visited by the participants. This showed that while the technologies AJAX, SOAP, REST and Tag Clouds are less well known by the first year students, they were better known by the master level students, as shown in **Table 3**. This difference is especially outstanding for AJAX, which is known by only 29.57% of the first year students but by 90.32% of the master level students.

The analysis of the passive and active use frequencies of these technologies yielded the result that only Wikis are used very often. Weblogs and RSS are used at quite often, with 51% respectively 40% of the participants using them at least on a weekly basis. More than 50% of the participants stated that they never use AJAX, SOAP, REST and Tag Clouds. **Figure 1** shows the complete distribution auf the frequencies of use.

The statistic for the frequency of development for the eight technologies resembles these trends. Wikis, Weblogs and RSS are used most often, while the other technologies are almost never used. **Figure 2** details this distribution.

	RSS	AJAX	SOAP	REST	Podcast	Wiki	Weblog	Tag Cloud
Known	136	77	39	8	134	174	148	34
Unknown	22	66	111	138	14	4	14	112
Not Sure	20	29	22	18	27	4	17	22
No Answer	5	11	11	19	8	1	4	15

Table 2: Knowledge about Technologies

	RSS	AJAX	SOAP	REST	Podcast	Wiki	Weblog	Tag Cloud
First year	69,17%	29,57%	13,68%	1,77%	72,03%	93,55%	76,03%	9,73%
Bachelor	87,18%	52,63%	24,32%	6,25%	84,62%	100,00%	94,87%	34,29%
Master	87,10%	90,32%	53,33%	16,67%	83,33%	100,00%	96,77%	41,94%

Table 3: Distribution of “Technology Known”

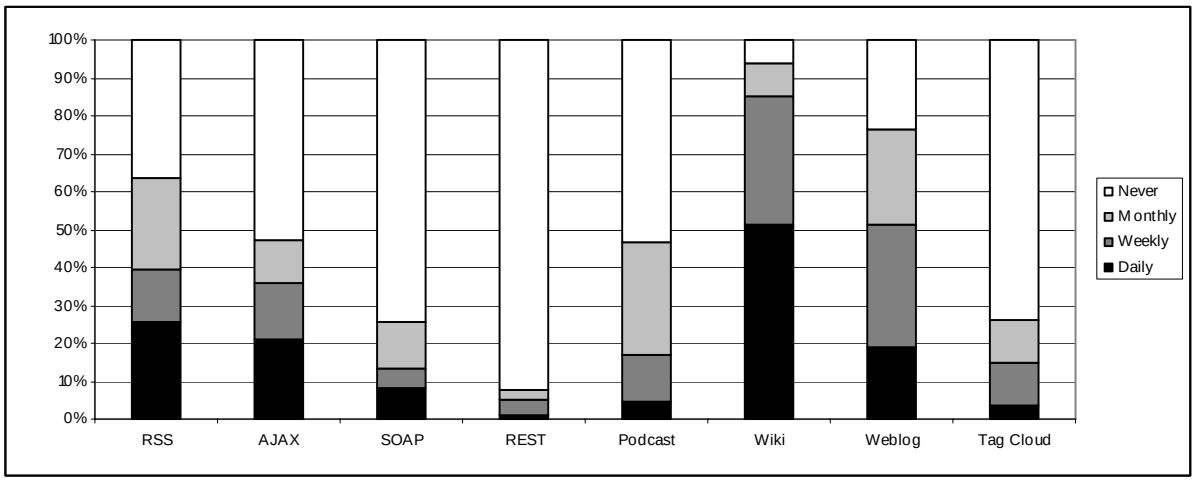

Figure 1: Use Frequency of Technologies

Investigating the correlations of advance in curriculum and knowledge about the eight technologies yielded significant correlations of 0.19 for RSS, 0.46 for AJAX, 0.37 for SOAP, 0.34 for REST, 0.26 for Weblogs and 0.32 for Tag Clouds. For these technologies, H_1 can be confirmed, there is only a high correlation for AJAX, and a medium correlation for SOAP, REST and Tag Clouds.

As far as the use frequency is concerned, significant correlations could be found for RSS, AJAX, SOAP, Wikis, Weblogs and Tag Clouds. All of these correlations are between 0.23 and 0.27, being rather low. For these technologies, H_2 can be confirmed, although there is a low connection The correlation of advance in the curriculum and the derived variable *familiarity* is also significant, at a medium 0.36. H_9 can be confirmed.

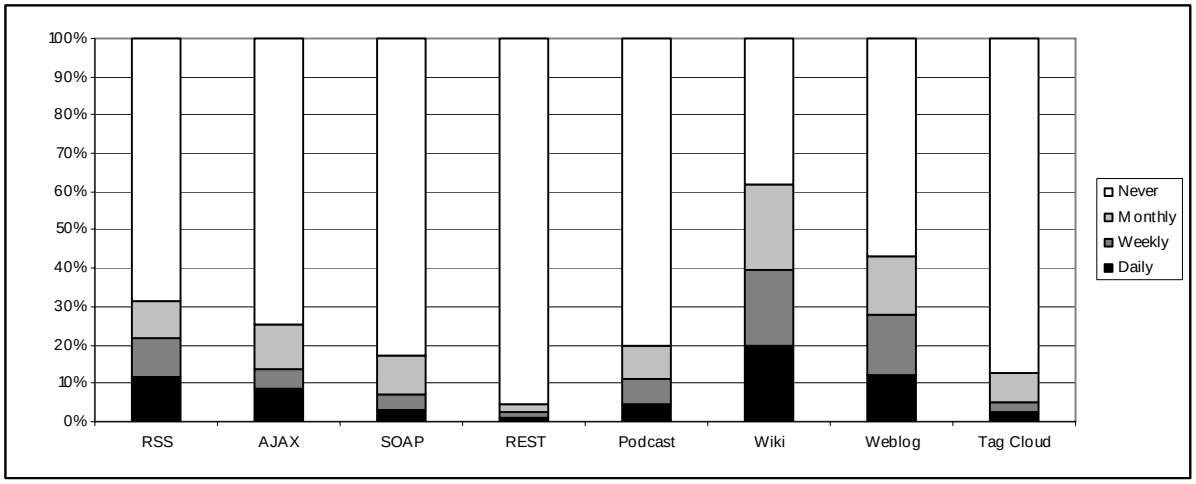

Figure 2: Development Frequency of Technologies

The investigation of the correlation with development frequency yielded significant results for RSS, AJAX, SOAP, Wikis and Tag Clouds. Again the correlation is rather low to medium, ranging from 0.18 to 0.30. For these five technologies, H_3 can be confirmed. The correlation for the derived variable *proficiency* is also significant and at 0.29. H_{10} also can be confirmed.

Applications

Table 4 shows the results of the basic analysis of knowledge about the Web 2.0 applications. Both types of Podcasts and Media Sharing Platforms are known by most participants. More than 60% of the participants know about Mashups. Only about 40% of the participants know about Social Bookmarking and Social Networks.

	Audio-Podcasts	Video-Podcasts	Mashups	Social Bookmarking	Social Networks	Media Sharing
Known	150	143	115	66	75	168
Unknown	10	10	32	70	58	2
Not Sure	14	23	29	30	30	6
No Answer	9	7	7	17	20	7

Table 4: Knowledge of Applications

As far as the passive use of these applications is concerned, only Media Sharing Platforms show high rates, with 70% using them at least weekly. As **Figure 3** shows all other applications are used on an at least weekly basis only by less than 30% of the participants. This frequency is even less for active use providing content, as **Figure 4** shows. Media Sharing and Social Networks are used on an at least weekly basis only by 30% of the participants, while all other types of applications are used even less often.

The investigation on the use in lectures (guided use) or the use in learning (individual use) of these 6 applications, as well as Wikis, Weblogs and Virtual Worlds showed that only Wikis and Weblogs are used regularly by a significant number of the participants. Wikis are used in the course of lectures by 60% on an at least weekly basis, for individual learning even by 84%. Weblogs are used at least weekly by 20% in lectures and 30% while learning. As **Figure 5** shows, all other applications are rarely used in the course of, with Virtual World not being used by 99% of the participants. **Figure 6** shows that these applications are also rarely used in individual learning.

This trend was also reflected in the ranking of applications the participants were asked to do. When ranking the nine applications by the importance for collaborative learning 84.7% of the participants replied that Wikis are most important. As second most important application, Weblogs were chosen by 38.8%. As far as the importance for individual learning is concerned, 88.52% chose Wikis as the most important application and 44.26% Weblogs as the second most important.

The investigation of the influence of advance in the curriculum on knowledge and the frequency of use of these applications yielded almost no significant results. The only significant correlation is between the advance in

curriculum and the knowledge of Social Bookmarks, being a medium 0.40. In all other cases, H_4, H_5, H_6, H_7 and H_8 have got to be abandoned.

The derived variable *familiarity* has a significant correlation of 0.54 and 0.52 with the knowledge of Social Bookmarks and Social Networks. H_{11} can be confirmed for these two applications. As far as the use frequency is concerned, familiarity has a significant correlation of 0.40 with Audio Podcasts and Video Podcasts, 0.39 with Mashups, 0.54 with Social Bookmarks, 0.47 with Social Networks and 0.39 with Media Sharing Platforms. H_{12} can be confirmed for all applications. As far as the active use is concerned, there again is only a significant correlation for Social Bookmarks and Social Networks, being 0.48 and 0.37 respectively. H_{13} can be confirmed for these two applications. There are no significant correlations for familiarity with the frequency of use in lectures of learning. H_{13} and H_{14} must be abandoned.

Proficiency as the summary of development frequency has no significant correlation with the knowledge of any application. H_{15} must be abandoned. There is a significant correlation to the use frequency of Audio Podcasts with 0.37, Video Podcasts with 0.41 and Social Bookmarks with 0.41. H_{16} can be confirmed for these three applications. As far as the providing of content is concerned, there is a significant correlation of proficiency with Audio Podcasts (0.46), Video Podcasts (0.45), Mashups (0.45), Social Bookmarks (0.48), and Media Sharing (0.46). This means H_{17} must be abandoned only for Social Networks. H_{18} can be confirmed for Weblogs, Social Bookmarks, and Social Networks, due to significant correlations of 0.42, 0.49 and 0.36. Finally, due to the lack of significant correlations, H_{19} must be abandoned.

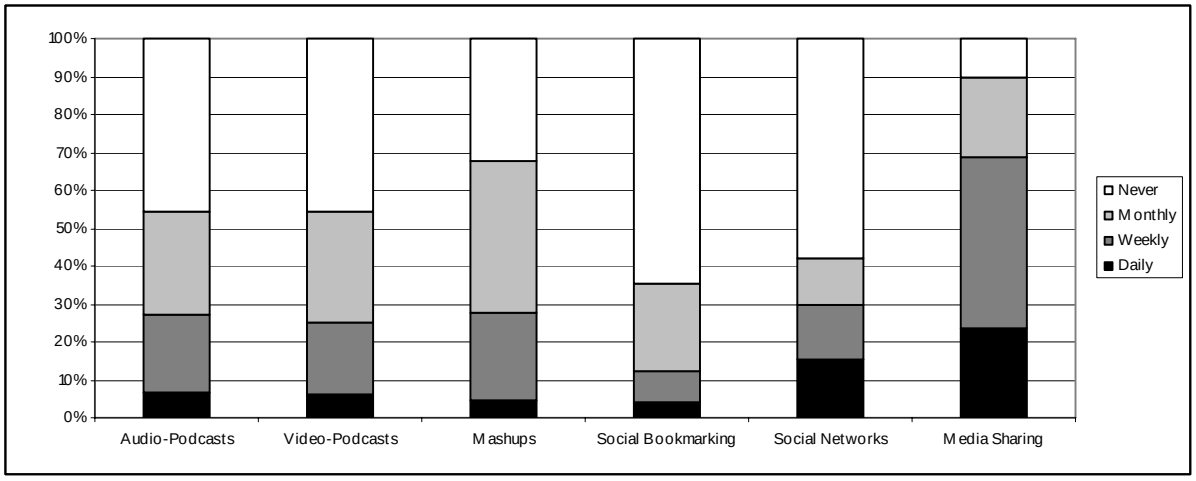

Figure 3: Use frequency for applications

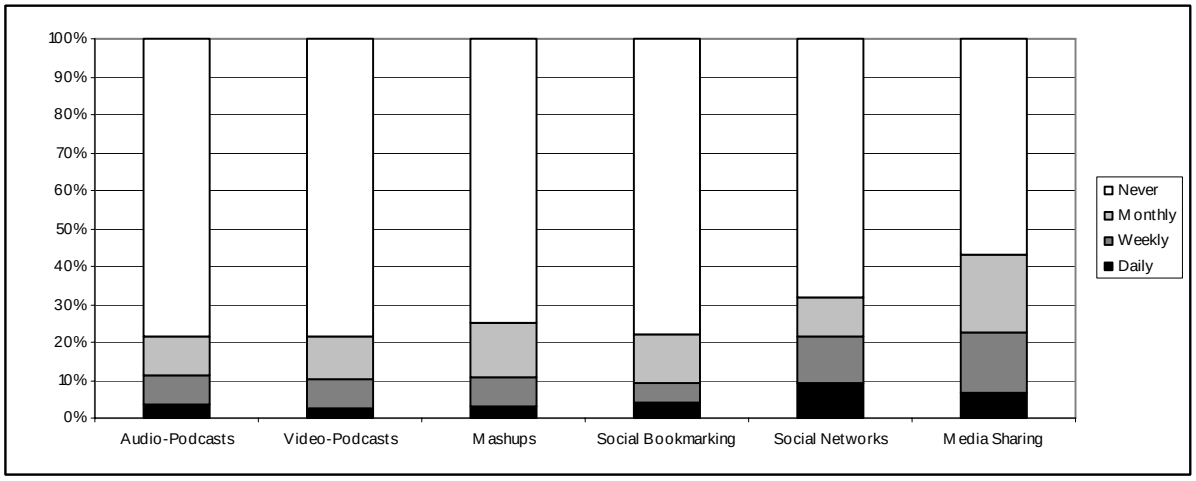

Figure 4: Content providing frequency for applications

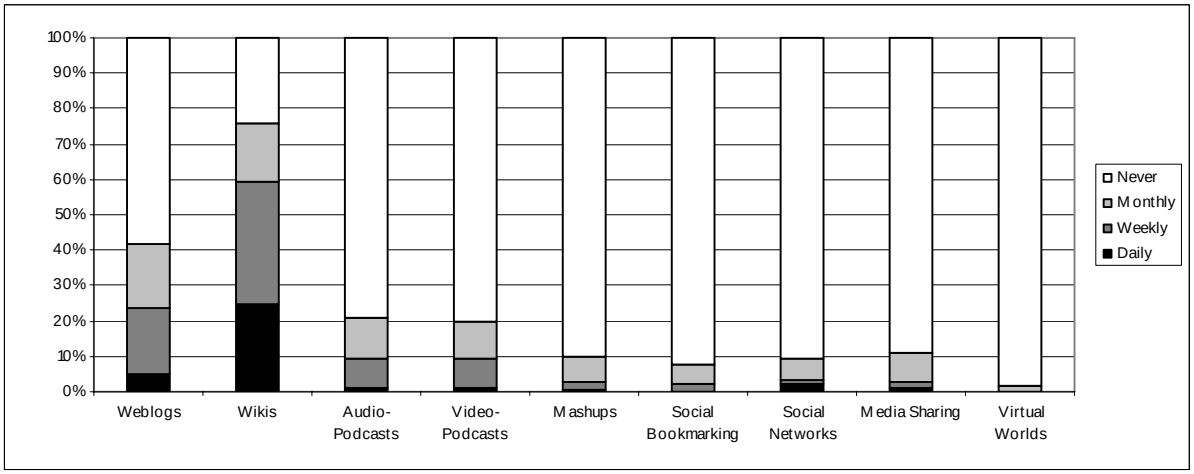

Figure 5: Lecture use frequency for applications

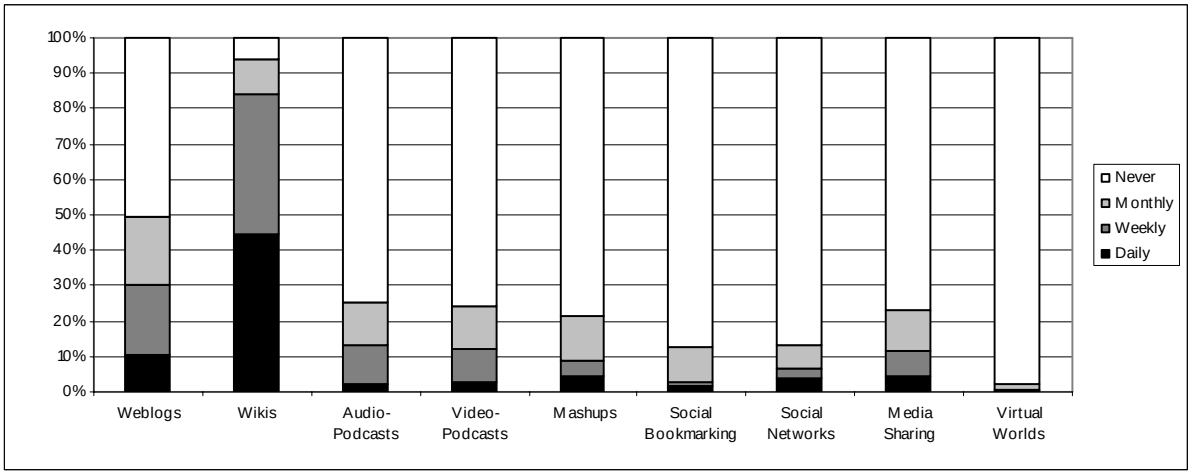

Figure 6: Learning use frequency for applications

Conclusions and Future Work

Web 2.0, its technologies and applications have become emerging topics within the last years which have been frequently discussed in mass media and addressed in scores of conferences. Moreover, many information service providers and major vendors in information technology have at least announced Web 2.0 support, and even major industry analyst firms have put their interest on this topic. Despite this hype, our study shows some unexpected results about the knowledge of Web 2.0 technologies and the usage of Web 2.0 applications: (1) Computer science students have surprisingly little knowledge about the basic technologies, such as AJAX, SOAP and REST, and consequently they also apply these techniques very seldomly in their development projects. (2) The subjects' interest in Web 2.0 applications given by frequent passive usage and active content contributions is also surprisingly low. Only media sharing and mashup applications seem to be well established by our subject group. Given the fact, that Web 2.0 is not another bubble in the new economy, curricula need to be adapted in order to educate students accordingly to industry's needs.

E-Learning 2.0 praises interesting and promising concepts by applying Web 2.0 technologies, Web 2.0 applications and their collaborative aspects. This enthusiasm is contrasted by the sobering results of our study. Most of Web 2.0 applications are scarcely used in courses and in self-organized learning activities. Only Weblogs and Wikis are frequently used Web 2.0 applications in learning processes. The study results reflect that the broad spectrum of Web 2.0 applications is yet not well adopted by teachers at Graz University of Technology, and thus not

well presented in courses. Similarly, students seem not to be adopted Web 2.0 applications for their daily communication and knowledge work, and thus it is not well presented in their self-organized learning activities. In this context the question raises why most of technologies and applications are not more frequently used.

This survey is the subjected to two limitations. Firstly the survey was conducted with an only survey tool, at which only 22% of the potential participants replied. Secondly the participants were limited to the specific setting of Graz University of Technology. Similar studies with a broader set of participants would be advisable in order to compare them to this setting.

Although the survey presented offered us some valuable insights we plan to conduct a follow-up survey in order gain further information. That survey will be split into three parts and accompany first year students from the start of the academic year in October 2007 to its end in June 2008. It is aimed to verify the students' development in the personal use of collaborative tools and other e-learning 2.0 applications. Further surveys with the same students in the coming years are to provide more insight in the long-term development.

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