Comparative analysis of the use of video lectures and web 2.0 applications in a hybrid university course environment: a case study

Goran Bubaš[1], Antonela Čižmešija[2], Andreja Kovačić[3]

[1] University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, 42000 Varaždin, Croatia, goran.bubas@foi.hr
[2] University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, 42000 Varaždin, Croatia, antonela.cizmesija@foi.hr
[3] University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, 42000 Varaždin, Croatia, andreja.kovacic@foi.hr

Keywords
E-learning, hybrid learning, web 2.0 tools, video lecturing.

1. ABSTRACT

Use of online video and audio lecturing is an effective means to deliver asynchronous teaching resources to students in a hybrid academic learning environment. The lecture that was delivered by the teacher in the classroom can be recorded and placed on a video sharing network like YouTube and/or in a learning management system (LMS) to be available to students for later viewing and preparation for assessment. Also, the audio recording of a lecture can be easily created with the PowerPoint Slide Show recording functionality or by using screen capture or screen recording software like Camtasia and also placed in the course LMS to be used by students for learning. In most previous studies the students' evaluation of such video or audio lecturing resources has indicated their potential contribution to learning, even though their adoption by the students was moderated by their learning styles and preferences.

A better insight into the value of video and audio lecturing can be provided by a *comparative analysis* of the use of video and audio lectures and other types of online learning technologies. Therefore, in our paper we compare the students' perceptions of several aspects of video and audio lecturing and the value of their use for learning with their perceptions of the use of other technologies suitable for online teaching and learning: Diigo social bookmarking and notes-taking tool, Mendeley tool for organization of research documents, Google Documents, Google Slides, Google Forms, YotForm web survey tool, online mind mapping tools (Mindomo/Mindmeister/Bubbl.us), online block-diagram tools (Gliffy/Creately), Netvibes mashup tool, user interface mockup or wireframe tool (MockFlow/Mockingbird), and online presentations (Prezi/Emaze). The results of our comparative analysis of students' evaluations of various types of tools that can be used for teaching and learning tasks indicate that video and audio recordings of lectures are among the highest ranked tools regarding the average evaluation of interestingness, usefulness, potential for knowledge acquisition, better understanding of course content and its long term retention.

2. VIDEO AND AUDIO LECTURES

An increased reliance on technology in higher education, widespread use of the internet and the adoption of smart/mobile devices have changed the teaching practice in the hybrid and fully online educational environment. A decade ago, in a U.S. study conducted among 7,500 undergraduate and graduate students the majority of respondents (82%) expressed their preference for academic courses that combine traditional classes with online lectures over courses that offered only traditional lecture format (Veeramani et al., 2008). However, a series of more detailed scholarly investigations on video and audio recordings of lectures have been performed in the meanwhile. Therefore, in this first section

of our paper a brief overview of more recent research regarding the use of video recordings of lectures is presented.

2.1. Importance of using video lecture recordings in higher education

Online video materials are widely used learning resources and are frequently found in the form of class lecture recordings, YouTube videos and massive open online courses (MOOCs). In terms of pedagogy, as the literature suggests, video-based learning has also proved to be effective in implementing currently popular *flipped classroom* instructional model **(**Yousef et al., 2014). The flipped classroom concept implies a set of pedagogical approaches that "(1) move most information-transmission teaching out of class, (2) use class time for learning activities that are active and social and (3) require students to complete pre- and/or post-class activities to fully benefit from in-class work" (Abeysekera and Dawson, 2015, p. 3). Accordingly, the theories underpinning the flipped classroom approach include constructivism, active learning and peer-assisted learning (Bishop and Verleger, 2013).

In their *review of video-based learning research*, Yousef et al. (2014) established that using video in teaching can be combined with a number of pedagogical methods (collaborative learning, video summarization and hybrid learning, among others), and may lead to: (1) development of learners' knowledge and skills, (2) improved opportunities for interaction among participants, and (3) greater satisfaction with the learning environment, which in turn can have implications on motivation and attention. Yousef et al. (2014) emphasize that *positive outcomes* of video-based learning are largely dependent on the use of *appropriate pedagogical approaches*. Similarly, another *metastudy* on instructional video podcasts implicated that their *successful* implementation may be predominantly related to pedagogy in the use of the available teaching and learning technology, and that the potential benefits of the use of video material are accompanied by almost as many possible shortcomings (see for instance: Kay, 2012). In a Canadian study (Wagner et al., 2013, p. 3) on the use of flipped lectures in Electronic Systems Engineering courses several methodological issues related to the use of video lectures were explored, including: integration of video lectures as a means of better use of class time and "strategically designed in-class activities"; the quality, duration and timeline of video lectures; and balanced workload on students provided by the addition of a flipped out-of-class component.

Progressive technological development enables the use of video recordings across multiple platforms and devices (notebooks, tablets, smartphones etc.). One of the main roles of technology in higher education is the improvement of access to learning material anytime, anywhere and from any device. For instance, the findings of McKnight et al. (2016) demonstrated that in a learner-centered approach in which students used their mobile phones to watch course-related short videos, their understanding of a learning topic was enhanced. It must be noted that video lectures are not only an effective vehicle for content delivery but also make the teaching presence possible in the virtual setting (Scagnoli et al., 2017).

The success of implementing instructional technology can also be associated with learners' individual characteristics. In higher education students are well experienced with the internet and it is common not only to view them as *digital natives* but also to differentiate between students as digital *visitors* and digital *residents* (see: White et al., 2012) when analyzing their practices in the use of technology for education. While digital *visitors* use the internet/web in a more private fashion, try to avoid risks and perform specific useful tasks, digital *residents* appear to be dwellers in this virtual territory where they regularly use social networks to engage with groups of friends or colleagues, tend to live a portion of their life online and lose the distinction between being online and offline. Therefore, *visitors* and *residents* may have a different perception of educational technology – while the *visitors* may be primarily looking for benefits, the *residents* may be immersed in the virtual space of the internet and could be perhaps even embracing online educational technology as a part of their "natural" habitat. One of the important questions regarding the use of video and audio lecturing would therefore be its respective acceptance by digital *visitors* and *residents*. Speaking of digital *visitors*, several studies have shown that, in spite of their favorable evaluation of online video lectures, some university students still prefer conventional face-to-face lecturing (see for instance: Griffin et al., 2009; Luttenberger et al., 2018), so it may be worthwhile to examine various factors that may contribute to students' attitude towards the use of online audio and video recordings of lectures.

2.2. Impacts of video-based learning

Uses of video lecture recordings, perception of their use and viewing behavior

A recent paper by Henderson et al. (2017) revealed that one of the benefits frequently cited by the surveyed students regarding the use of *video and audio recordings of lectures* was "reviewing, replaying and revising of digital learning materials" (with 27.9% positive responses). However, it must be noted that their study also reported even greater percent of beneficial utilizations of other educational technologies: (1) organizing/managing of the study material/activities, for instance, by using the *Moodle learning management system*, (2) flexibility of place and location of learning activities by using *notebooks, library websites and databases*; and (3) saving time by using *online library resources, writing digital notes and word processing, as well as online assignment submission*.

In a study by Leonard (2015), 68% of students reported that videos were included in their classes and as many as 79% of them watched videos voluntarily for the following purposes: to help them in better understanding of class material (teachers' lectures in class are not always sufficient), to see the required steps in performing a certain task (e.g. watch a video tutorial), to view practical examples of concepts, as well as to get another perspective on a subject. His study revealed that in most cases the students looked for videos on YouTube (71.2%), Google search engine (44.8%) or their course web page (43.3%), but it also established that they seldom watched a video for more than 5-20 minutes. Variation in the students' behavior regarding the frequency and patterns of use of video lecture recordings may also be at least partly attributable to their learning achievement. For example, Owston et al. (2011) found that while using video captures in large undergraduate courses, high-achieving students were less likely to view video lectures than low-achieving students, who also tended to repeatedly view the complete recordings, without skipping particular portions of video lectures.

The potential uses of video lectures (and perceived benefits thereof) in the aforementioned studies correspond with those in the *metastudy* by Kay (2012) or a large-scale study by Barker et al. (2014), including revising for assessment or assignment, preparation for class, revision of difficult topics, as well as making the time, place and pace of learning more flexible. It is also notable that in hybrid courses students who use videos of university lectures do not necessarily use them as an alternative to attending classes but actually tend to be present in classes more regularly (Barker et al., 2014). Moreover, the availability of online lectures is not only perceived as beneficial for strictly academic purposes, as students may also find the possibility of access to course material after course completion relevant for their professional development (Veeramani and Bradley, 2008).

When the *effectiveness* of instructional technologies is observed, it is also important to explore various *facets of student perception* of the use of technology, as well as the interrelationship between students' perceptions of different instructional technologies and their academic achievement. For example, in a study by Tang and Austin (2009) the perception of the use of technology was conceptualized through four objectives (enjoyment, learning, motivation and career application). In their research the achievement of those objectives by means of five technologies (i.e. projector, PowerPoint - slides only, video, the internet and face-to-face lectures) was explored among undergraduate business students. The highest correlations between particular objectives and technologies were established between "enjoyment" and video, "learning" and "motivation" and PowerPoint, and "career application" and the internet. On the other hand, the evaluation of technologies was also examined in terms of teaching effectiveness and its connection to students' academic achievement. In that sense, the *predictors of students' perceived effectiveness of instruction* in this study by Tang et Austin were the use of video and the internet for "learning", projector and lecture for "enjoyment", and PowerPoint for "career application" and "motivation". Interestingly, students' self-reported academic achievement measured by self-assessed GPA was still most positively associated with effective (face-to-face) lectures. These findings imply that the use of technologies should not be taken at their face value, as different technologies may also have differentiated implications for various aspects of students' perception and preferences regarding technologically-enhanced learning.

Luttenberger et al. (2018) investigated the use of video lectures in a psychology course in which students were able to choose how to integrate the content presented by means of lecture podcasts, lectures, and additional material into their learning. The comparison between students who focused on video podcasts (68.1% of respondents) and those who made little use of different modes of content presentation, or used it only occasionally, showed that the students in the first group spent more time studying, employed more learning strategies and, consequently, ranked highest in the perception of satisfaction and course achievement. These authors also claim that higher satisfaction gains in the

group using video podcasts can be associated with the flexibility provided by a learning environment which allows students to engage in self-regulated learning. This observation resonates with arguments in favor of the flipped classroom approach, according to which "moving transmission teaching out of the classroom" enables students to better manage cognitive load (Abeysekera and Dawson, 2015, p. 9).

Teacher presence in video lecture recordings

It must be noted that, when it comes to lecture recordings, they can include audio only, video and audio, as well as other media resources such as PowerPoint slides or images. The effectiveness of the use of video lecture recordings can thus also depend on how different modes of presentation content are combined in a particular video lecture type. For example, in a study by Griffin et al. (2009) students in the group which used synchronous PowerPoint and voice lectures performed better in the test than the group in which the educational content was delivered separately via PowerPoint slides and audio recordings of the lecture.

According to Woolfitt (2015, p. 28), video teaching can be defined as "teaching via video in which the lecturer plays an active role, is visible and audible, is recorded, and where the screen presence of the teacher plays an important element in the didactic process." Woolfitt also proposes a distinction between the following three types of video teaching: (1) live lecture capture, (2) screen cast and (3) web lecture, all of which imply the lecturer's presence on the screen.

The results of a recent survey performed by Scagnoli et al. (2017) indicate that the inclusion of video lecturing in university course materials can increase students' engagement with content, better meet different learners' preferences and create a greater perception of teaching presence in online courses. According to the qualitative study by Adams et al. (2014), video lectures in MOOCs could have some of the following benefits for attendees: (1) instructor could be perceived to be "always there" for the student; (2) addressing students as a class could create a feeling of belonging and commitment; (3) instructor videos may contribute to creating a more intimate educational environment. Wang and Antonenko (2017) found that video recordings of the instructor attracted more visual attention and increased perceived students' learning, and also decreased the self-reported mental effort in learning difficult topics. In addition to reducing cognitive load, some studies have shown that the lecturer's presence can also have a positive socio-affective impact on learners (Luttenberger et al., 2018).

Korving et al. (2016) found that the visibility of the lecturer increased attention in web lectures and that the lecture with video and slides could attract more interest than the combination of audio and slides. They also found that the size of the image of the lecturer (large versus small frame) had a positive effect on attention, but that the appeal of the lecturer had no influence on attention. A recent study by van Wermeskerken and van Gog (2017) investigated whether the instructor's face and gaze in video lecturing affected the attention and learning in demonstration videos. They found that the visibility of the instructor's face did positively influence attention but had no effect on learning.

Kizilcec et al. (2014) utilized an eye-tracking methodology to investigate the use of video instruction in form of a frame of the instructor's face alongside slides. Even though participants spent about 41% of time looking at the face and preferred this mode, and also perceived it as more educational, no significant difference was found between the two modes in terms of recall ability. Still, the authors of this study recommend video instruction because of learners' positive affective response.

In our paper we will focus on the difference in the students' perception of the use of online video lecture recordings without slides and audio lectures with slides. The use of those recordings of lectures will be compared to the use of the following (predominantly web 2.0) technologies suitable for online teaching and learning: Diigo social bookmarking and notes-taking tool, Mendeley tool for organization of research documents, Google Documents, Google Slides, Google Forms, YotForm web survey tool, online mind mapping tools (Mindomo/Mindmeister/Bubbl.us), online block-diagram tools (Gliffy/Creately), Netvibes mashup tool, user interface mockup or wireframe tool (MockFlow/Mockingbird), and online presentations (Prezi/Emaze).

3. WEB 2.0 TECHNOLOGIES AND EDUCATION

The educational potential of web 2.0 tools like blogs and wikies was recognized shortly after the web 2.0 concept was introduced by O'Reilly (2005). Duffy (2008) emphasized that the use of web 2.0 technologies can provide students with the opportunity to engage in collaborative content creation, as well as enable creative use of online media by the teachers within a concrete learning context using

an adequate pedagogical strategy and framework. A review by Hew and Cheung (2013) revealed that the use of web 2.0 technologies in combination with appropriate pedagogy can generally have a positive effect on student learning. None of the studies that they had observed indicated an unfavorable influence on learning outcomes. Both aforementioned studies (Duffy, 2008; Hew and Cheung, 2013) listed numerous benefits of specific web 2.0 tools, as well as various pedagogical activities that can be used with a specific tool to enhance teaching and learning.

A fairly comprehensive review by Conole and Alevizou (2010) includes a list of e-learning models and pedagogical frameworks for the use of web 2.0 tools, as well as their typology including the following categories: media sharing, media manipulation and mash-ups, instant messaging, chat and conversational arenas, online games and virtual worlds, social networking, blogging, social bookmarking, recommender systems, wikis and collaborative editing tools, and syndication. One of the recurrent insights made by the authors in this review was that web 2.0 technologies facilitate creation of community, collaboration and content sharing among learners, as well as creativity of the instructors.

In our study various web 2.0 technologies were used within a pedagogical framework based on the following premises: (1) each web 2.0 tool would serve as a part of (micro) teaching/learning strategy suitable for a specific topic of a Computer-Mediated Communication (CMC) course and related technical skill; (2) the use of a specific web 2.0 tool would have a meaningful rationale since it was intended to contribute to the students' overall score and the capability to more successfully complete the final project activity within the course.

Similar to the highlights in the overview of web 2.0 in information systems education by Harris and Rea (2009), our practical application of web 2.0 technologies in a hybrid classroom was aimed to utilize their positive aspects for learning and create a diverse, enriched and inspiring environment. How successfully we attained these goals can be judged by the results of students' evaluation of the web 2.0 tools used in the pedagogical activities that were performed during this CMC course and are presented in the following sections of this paper. We would like to emphasize again that the evaluation of the use of those web 2.0 technologies was primarily included in this study in order to compare them with the evaluation of video and audio recordings of lectures in the same course.

4. METHOD

The research that is presented in this paper is a pilot study in form of a comparative analysis of the effects of various technologies for learning that were applied in a Computer-Mediated Communication (CMC) course within a graduate Software Engineering and Information Systems study. During this hybrid university course the students used various technologies like learning management system, e-portfolio, social bookmarking and notes-taking tool, tool for organization of research documents, Google Drive applications, web survey tool, mind mapping tools, block-diagram tools, mashup tool, user interface mockup or wireframe tool, and online presentations. Before the final exam the students were also provided with video and audio recordings of some lectures that had been delivered during the semester.

An anonymous survey was performed after the final exam regarding students' evaluations of interestingness, usefulness, potential for knowledge acquisition, better understanding of course content and its long term retention in relation to the use of video and audio lectures, as well the use of aforementioned web 2.0 tools.

4.1. Research questions

To address the issue of students' self-reported experience with using audio and video lectures in comparison with several web 2.0 technologies suitable for online teaching and learning in a hybrid university course, we formulated the following research questions to be explored in this study:

1. What are the differences in the students' evaluation of interestingness of using a specific technology for learning?

2. What are the differences in the students' evaluation of usefulness of using a specific technology for learning?

3. What are the differences in the students' evaluation of the potential of each respective technology for learning to enable acquisition of new knowledge and skills?

4. What are the differences in the students' evaluation of the potential of each respective technology for learning to enable better understanding of the course material in comparison to traditional learning from a textbook?

5. What are the differences in the students' evaluation of the potential of each respective technology for learning to enable better and longer retention of the course content in comparison to traditional learning from a textbook?

4.2. Respondents

The respondents in our study were 61 students of a graduate Software Engineering and Information Systems study who attended the elective Computer-Mediated Communication course at a Central European university.

Almost all of the students in our convenience sample were full-time, aged 21-26. Also, 80% of the students were of male gender and 18% of female gender (one student did not respond to the survey question regarding the gender). Because of their field and year of study all of the students were highly skilled in computer and internet use.

4.3. Instruments

A survey was used for the evaluation of students' perceptions of video and audio lectures, as well as of various web 2.0 technologies that had been used for the tasks and activities in the course. The survey questions were related to interestingness, usefulness, potential for knowledge acquisition, better understanding of course content, and long term retention of course content. The responses to the questions were on a five-point Likert type scale ranging from 1 (very little / none) to 5 (very much). Here are two examples of survey questions: (1) "Evaluate how interesting you found the use of various technologies and tools/applications for the activities which you performed during the CMC course, including the use of e-course and video/audio recordings for revising for the first and second midterm exam"; (2) "Evaluate how useful you found the use of various technologies and tools/applications for activities which you performed during the CMC course, including the use of e-course and video/audio recordings for revising for the first and second midterm exam".

4.4. Educational technologies and context of their use

The use of each of the web 2.0 technologies in the Computer-Mediated Communication course was associated with a specific pedagogical activity. These activities are briefly described in the list in *Table 1*. The video and audio recordings of selected lectures were made available to students before the final exam. The video recordings did not contain slides but the students were instructed to open the slides in a separate window/frame and follow them while watching and listening to the video recording. In the audio lectures, the audio recordings were synchronized within the PowerPoint presentation slideshow.

It must be noted that the viewing of the video and audio recordings of lectures were not an obligatory activity, even though the students were asked to view the recordings of both types (video/audio) before attending the final exam. On the other hand, the use of web 2.0 technologies was an activity that was scored for the final course grade, so all students were familiar with at least one web 2.0 tool/application in each listed category (in the first column of Table 1).

4.5. Data analysis

For data analysis the average students' evaluations for each technology were calculate based on their evaluations on a 1-5 Likert type scale which had been used in the survey. The results of the data analysis are presented graphically in *Figures 1-5*.

5. RESULTS AND DISCUSSION

The results of data analyses presented in *Figures 1-5* indicate the average evaluation of each particular pedagogical activity with the use of corresponding web 2.0 tool or mode of lecture recording (video/audio) that are listed in *Table 1*. It should be noted that, in addition to the technology used for its delivery, the course related topic/content itself constituted an important component of the learning activity as well.

Table 1. Learning technologies in the hybrid Computer-Mediated Communication university course and the related pedagogical activities for their use.

WEB 2.0 TECHNOLOGY	PEDAGOGICAL ACTIVITY
Mendeley - reference management	Search for and creation of collections of research papers on a topic of students' interest related to CMC course.
Diigo/Delicious - social bookmarking	Search for and creation of collections of research papers on a topic of students' interest related to CMC course.
Google Docs	Creation of online documents and collaborative writing with document sharing and embedding in e-portfolio.
Google Slides	Creation of online presentations and embedding in e-portfolio.
Google Forms	Creation of online forms for surveys and embedding in e-portfolio.
JotForm - web survey	Creation of online forms for surveys.
Mindomo/Mindmeister/Bubbl.us - mind mapping	Creation of an online mind-map for illustration of a specific theoretical concept.
Gliffy/Creately - flowcharts	Creation of a block-diagram or flowchart to depict a process of use of internet tool/application or selected online communication skill.
Netvibes - mashup	Creation of a mashup of selected web sites according to personal preference.
MockFlow/Mockingbird - wireframe, mockup	Creation of a wireframe/mockup of a personal showcase e-portfolio page or mashup.
Prezi/Emaze - online presentations	Online presentations of a project proposal topic.
CreateDebate - online debate	Online debate on a topic of ethical problems related to the internet.
YouTube video recording of lectures	Video recordings of lectures (without slides) on selected topics from the hybrid CMC course.
PPT slideshow with audio recordings	Audio recordings synchronized with PowerPoint slides ("slideshow") on selected topics from the hybrid CMC course.

According to the results of data analysis in *Figure 1*, the use of most of the web 2.0 technologies listed in *Table 1*, in combination with respective pedagogical activity and course content, received an average rating between 3.0 and 4.0 regarding ***interestingness***, while the video and audio recordings both received a comparatively high rating of 4.03 and 3.75, respectively. This confirms that video recordings of lectures that were used in this study, even though they were not simultaneously accompanied with slides, were able to attract an above-the-average interest from students. It must be emphasized that the average evaluation of *interestingness* of audio recording of lectures with a synchronized slideshow were only slightly less favorably evaluated.

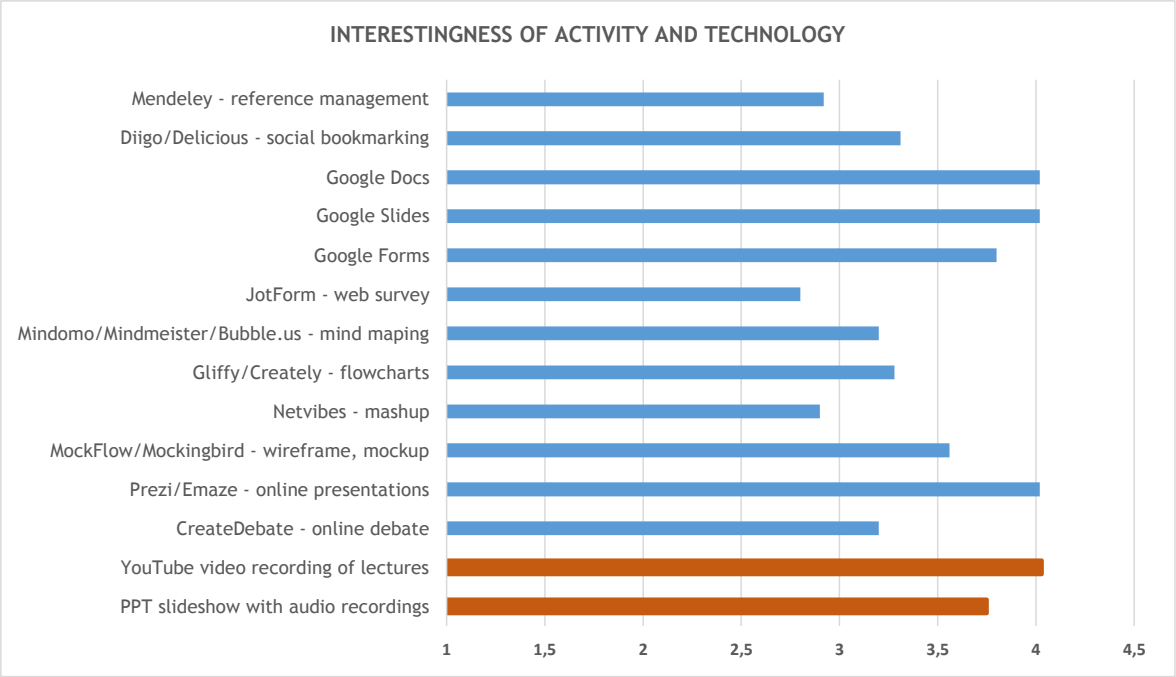

Figure 1. Average responses to the survey question regarding the evaluation (on a 1-5 rating scale) of interestingness of using each respective technology for learning (N=61)

The data presented in *Figure 2* indicate that the average evaluation of the ***usefulness*** of most of the applications of a specific learning technology in the Computer-Mediated Communication course was also between 3.0 and 4.0. As in the previous case, the average evaluations of video recordings and audio recordings regarding their *usefulness* were among the highest-rated technologies, receiving an average rating of 3.90 and 3.69, respectively. It must be noted that, in terms of both interestingness and usefulness, Google Documents and Google Slides also received highest ratings (slightly above 4.0).

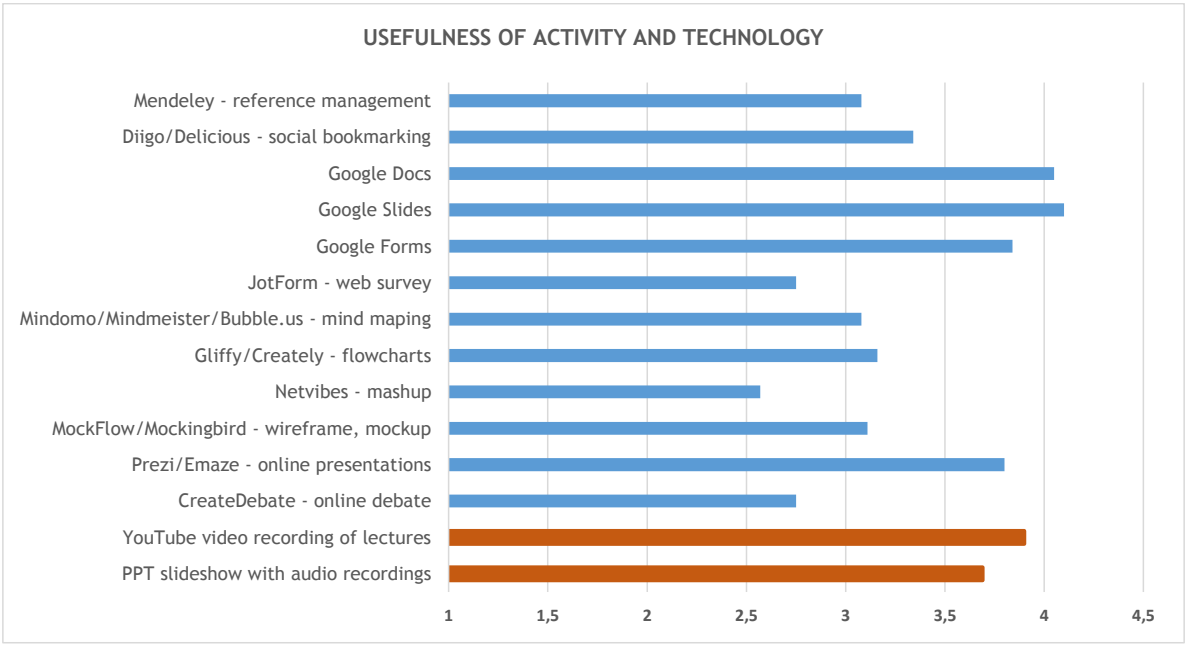

Figure 2. Average responses to the survey question regarding the evaluation (on a 1-5 rating scale) of usefulness of using each respective technology for learning (N=61)

Figure 3 shows the results of the evaluation of the potential of each respective *technology* ***to enable acquisition of new knowledge and skills*** in comparison to *traditional learning from a printed textbook with illustrations*. In this case, most of the average ratings of students were in the range from 3.0 and 3.5, but again the ratings of video recordings of lectures on YouTube and audio recordings with a PowerPoint slideshow were among the highest, with an average rating of 3.48 and 3.49, respectively. It must be noted that the Likert scale rating of "3" represented "the same/equal" level of understanding as that provided by the traditional way of teaching/learning with printed textbooks.

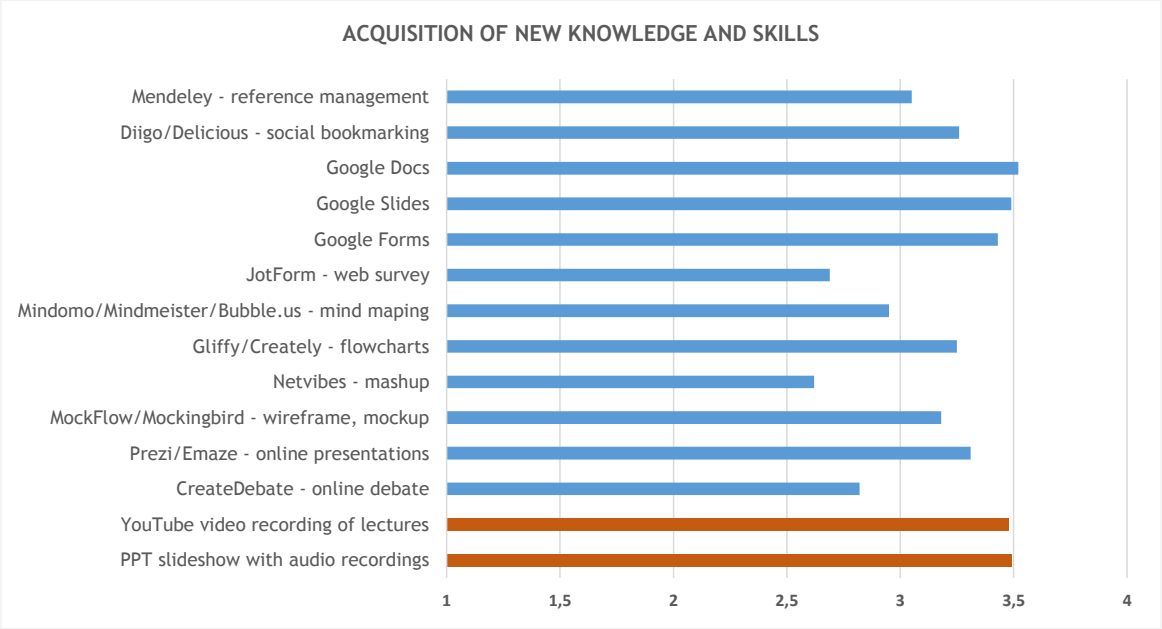

Figure 3. Average responses to the survey question regarding the evaluation (on a 1-5 rating scale) of the potential of each respective technology for learning to enable acquisition of new knowledge and skills (N=61)

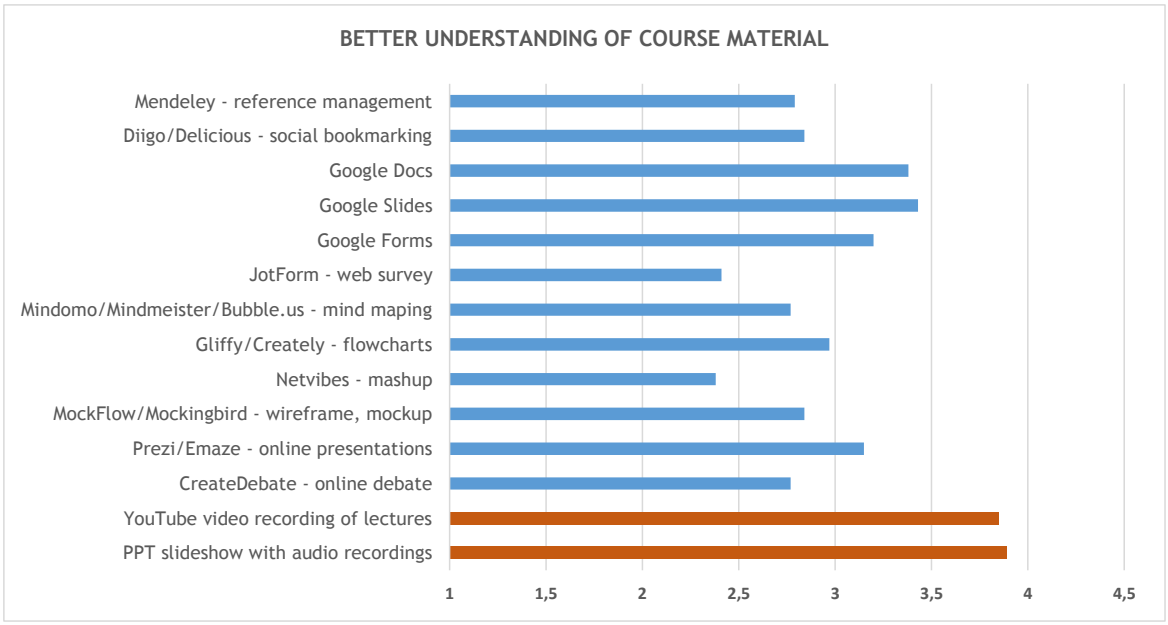

Figure 4. Average responses to the survey question regarding the evaluation (on a 1-5 rating scale) of the potential of each respective technology for learning to enable better understanding of the course material in comparison to traditional learning from a textbook (N=61)

The data presented in *Figure 4* indicate that *video* recordings of lectures and *audio* recordings of lectures with slides received the highest rating concerning their potential to ***enable better understanding of course material***. For most of the web 2.0 technologies the average evaluation was slightly above or below 3.0, which in the Likert scale represented "the same/equal" level of understanding as in the case of the traditional way of teaching/learning with printed textbooks. Moreover, the video recordings of lectures received the average rating of 3.85, while the average rating obtained for the audio recordings was 3.89.

Finally, the data presented in *Figure 5* show that the average evaluation regarding the ***potential to better and for longer time retain the course content*** with the use of a particular learning/teaching web 2.0 technology was also in most cases slightly below or above the average rating of 3.0, which in the Likert scale represented the response "similar/equal level of long term retention" as that obtained when using traditional textbooks. In this case, the evaluations of video and audio recordings received above-the-average ratings of 3.92 and 3.74, respectively, which were also the highest ratings when this survey question is concerned.

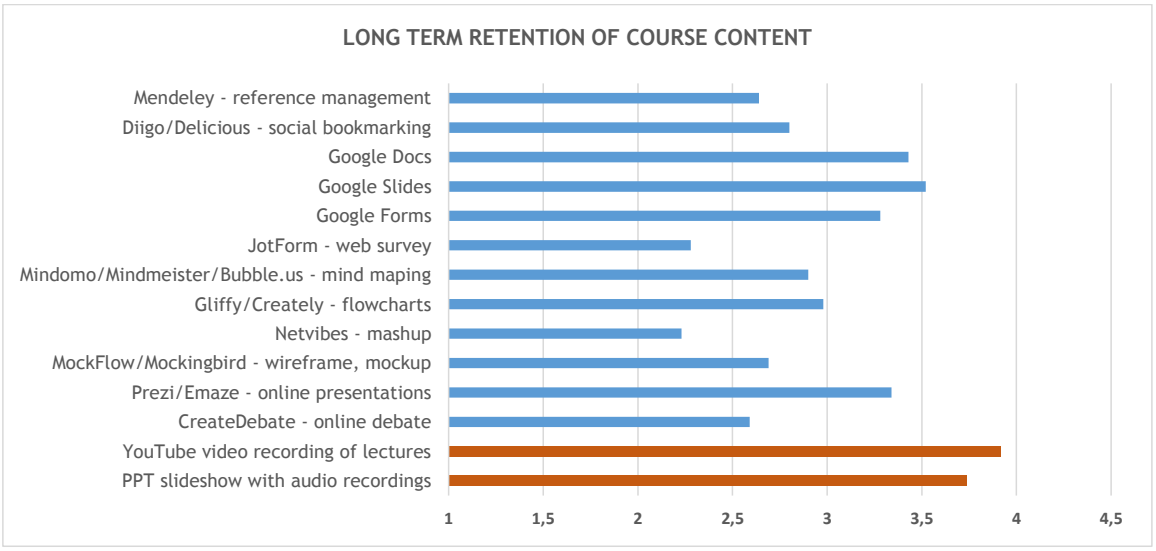

Figure 5. Average responses to the survey question regarding the evaluation (on a 1-5 rating scale) of the potential of each respective technology for learning for better and longer retention of the course content in comparison to traditional learning from a textbook (N=61)

Having in mind the data presented in *Figures 1-5*, it must be emphasized that the average ratings of both video and audio recordings *were above the average in all aspects of students' evaluation* of particular technologies and pedagogical activities performed in the course. Also, both video and audio recordings technologies were among the *highest-rated* when compared to other web 2.0 tools that were used for activities in the Computer-Mediated Communication course.

6. CONCLUSION

In this preliminary study conducted on a convenience sample of 61 graduate students of a Computer-Mediated Communication course the authors investigated the students' ratings of video recordings of lectures and audio recordings of lectures with slides in comparison to the use of various web 2.0 technologies for teaching/learning. The main findings of our study are as follows:

(a) Video recordings of lectures and audio recordings of lectures with slides received similar and above-the-average ratings regarding the evaluation of interestingness, usefulness, potential for knowledge acquisition, better understanding of course content, and long-term content retention (see *Figure 1-5*).

(b) In most cases, the video recordings of lectures and audio recordings of lectures with slides received higher average ratings than most of the web 2.0 technologies that were used for teaching/learning activities in the Computer-Mediated Communication course (see *Figure 1-5*).

(c) When compared to traditional forms of learning with a printed textbook, most of the web 2.0 technologies in general received only an either *slightly* higher or *slightly* lower average rating than traditional forms of learning (see *Figure 4* and *Figure 5*); i.e. they manifested no superiority to the use

of a printed textbook as means of learning regarding the specific context and their respective learning activity in the Computer-Mediated Communication course (see *Table 1*).

(d) When compared to traditional forms of learning with a printed textbook, video recordings of lectures and audio recordings of lectures with slides received similar and above-the-average ratings regarding better understanding of the course material and longer retention of course content (see *Figure 4* and *Figure 5*).

The limitations of our study are related to the use of a convenience sample and only one group of students who attended the Computer-Mediated Communication course. Moreover, one of the objectives of this course was to familiarize students with theoretical aspects of different tools used for computer-mediated communication (CMC) by engaging students in different pedagogical activities in which particular online resources (audio and video lectures and web 2.0 tools) were used for content delivery and practice. In other words, in this pedagogical design, students were able to learn about CMC by using actual CMC tools. Given the specific nature of this course, it would therefore be interesting to verify whether similar results would be obtained in courses in which those tools are used for the delivery of course content not related to CMC. Also, in evaluating the use of various educational technologies in this paper only the students' perception of various aspects of their use and potential benefits for learning was taken into consideration, with no reference to other individual characteristics of students or their course achievement.

7. REFERENCES

Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher Education Research & Development*, 34(1), 1-14.

Adams, C., Yin, Y., Madriz. L.F.V., Mullen, S. (2014). A phenomenology of learning large: the tutorial sphere of xMOOC video lectures. *Distance Education*, 35(2), 202-216.

Barker, L., Hovey, C. L., Subhlok, J., & Tuna, T. (2014, October). Student perceptions of indexed, searchable videos of faculty lectures. In *Frontiers in Education Conference (FIE)*, 2014 IEEE, 1-8. IEEE.

Bishop, J. L., & Verleger, M. A. (2013, June). The flipped classroom: A survey of the research. In *ASEE National Conference Proceedings, Atlanta, GA*, 30(9), 1-18.

Conole, G., & Alevizou, P. (2010). *A Literature Review of the Use of Web 2.0 in Higher Education: A report commissioned by the Higher Education Academy*. The Open University: Walton Hall, Milton Keynes, UK. Retrieved February 10, 2018, from: http://www.heacademy.ac.uk/assets/EvidenceNEt/Conole_Alevizou_2010.pdf.

Duffy, P. (2008). Engaging the YouTube Google-eyed generation: Strategies for using web 2.0 in teaching and learning. *Electronic Journal of e-Learning*, 6(2), 119-130.

Griffin, D. K., Mitchell, D., & Thompson, S. J. (2009). Podcasting by synchronising PowerPoint and voice: What are the pedagogical benefits?. *Computers & Education*, *53*(2), 532-539.Harris, A.L., Rea, A. (2009). Web 2.0 and virtual world technologies: A growing impact on IS education. *Journal of Information Systems Education*, 20(2), 137-144.

Harris, A. L., & Rea, A. (2009). Web 2.0 and virtual world technologies: A growing impact on IS education. *Journal of Information Systems Education*, 20(2), 137-144.

Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of 'useful'digital technology in university teaching and learning. *Studies in Higher Education*, *42*(8), 1567-1579.

Hew, K.F., & Cheung, W.S. (2013). Use of Web 2.0 technologies in K-12 and higher education: The search for evidence-based practice. *Educational Research Review*, 9, 47–64.

Kay, H.A. (2012). Exploring the use of video podcasts in education: A comprehensive review of the literature. *Computers in Human Behavior*, 28, 820–831.

Kizilcec, R.F., Papadopoulos, K., & Sritanyaratana, L. (2014). Showing face in video instruction: Effects on information retention, visual attention, and affect. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. ACM, New York, NY, USA, 2095-2102.

Korving, H., Hernández, M., & De Groot, E. (2016). Look at me and pay attention! A study on the relation between visibility and attention in weblectures. *Computers & Education*, 94, 151-161.

Leonard, E. (2015). Great expectations: Students and video in higher education. Sage white paper. Retrieved February 10, 2018, from: https://studysites.sagepub.com/repository/binaries/pdfs/StudentsandVideo.pdf

Luttenberger, S., Macher, D., Maidl, V., Rominger, C., Aydin, N., & Paechter, M. (2018). Different patterns of university students' integration of lecture podcasts, learning materials, and lecture attendance in a psychology course. *Education and Information Technologies*, *23*(1), 165-178.

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. *Journal of Research on Technology in Education*, 48(3), 194-211.

O'Reilly, T. (2005). *What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software*. Retrieved February 10, 2018, from: http://oreilly.com/web2/archive/what-is-web-20.html

Owston, R., Lupshenyuk, D., & Wideman, H. (2011). Lecture capture in large undergraduate classes: Student perceptions and academic performance. *The Internet and Higher Education*, 14(4), 262-268.

Scagnoli, N. I., Choo, J., & Tian, J. (2017), Students' insights on the use of video lectures in online classes. *British Journal of Educational Technology* [Online]. Retrieved February 10, 2018, from: http://onlinelibrary.wiley.com/doi/10.1111/bjet.12572/full

Tang, T. L. P., & Austin, M. J. (2009). Students' perceptions of teaching technologies, application of technologies, and academic performance. *Computers & Education*, 53(4), 1241-1255.

Veeramani, R., & Bradley, S. (2008). Insights regarding undergraduate preference for lecture capture. *Madison, WI: University of Wisconsin-Madison*, *3*.

Wagner, D., Laforge, P., & Cripps, D. (2013). Lecture material retention: A first trial report on flipped classroom strategies in electronic systems engineering at the University of Regina. *Proceedings of the Canadian Engineering Education Association*.

Wang, J., & Antonenko, P.D. (2017), Instructor presence in instructional video: Effects on visual attention, recall, and perceived learning. *Computers in Human Behavior*, 71, 79-8.

White, D., Connaway, S. L., Lanclos, D., Le Cornu, A., & Hood, E. (2012). Digital Visitors and Residents [Progress Report]. JISC. Retrieved February 10, 2018, from: http://www.jisc.ac.uk/whatwedo/projects/visitorsandresidents.aspx

Wermeskerken, M., & van Gog, T. (2017). Seeing the instructor's face and gaze in demonstration video examples affects attention allocation but not learning. *Computers & Education*, 113, 98-107.

Woolfitt, Z. (2015). The effective use of video in higher education. *Lectoraat Teaching, Learning and Technology*. Inholland University of Applied Sciences, Rotterdam. Retrieved February 10, 2018, from: https://www.inholland.nl/media/10230/the-effective-use-of-video-in-higher-education-woolfitt-october-2015.pdf

Yousef, A. M. F., Chatti, M. A., & Schroeder, U. (2014). Video-based learning: A critical analysis of the research published in 2003-2013 and future visions. In *eLmL 2014, The Sixth International Conference on Mobile, Hybrid, and On-line Learning* (pp. 112-119).

8. AUTHORS' BIOGRAPHIES

Goran Bubaš works as full professor at the University of Zagreb, Faculty of Organization and Informatics in Varaždin, Croatia. He teaches courses in Computer-Mediated Communication, Business Communication, Managerial Communication and Leadership. He has published papers on e-learning, computer-mediated communication, interpersonal communication, e-government etc. He was a team member and a project leader when he won the EUNIS Dørup E-learning Award in 2008 and 2011.

Antonela Čižmešija is a teaching assistant and doctoral student University of Zagreb, Faculty of Organization and Informatics in Varaždin, Croatia. She teaches courses on Computer-Mediated Communication, Business Communication, and Communication in Organization. Her research interest are related to technologies in education, computer-assisted learning, open e-learning, web 2.0 tools, and information literacy of students. She has published several papers on the topics of clicker systems and information search by students.

Andreja Kovačić holds a bachelor's degree in the English and Spanish language and literature from the University of Zagreb. She has worked as a lecturer of English for Information Technology and Business English at the University of Zagreb, Faculty of Organization and Informatics. Her research interests lie in the connection between various psychological variables and CALL, online teaching of grammar and writing instruction in the hybrid English for Specific Purposes context. She has authored and co-authored around two dozen professional and scientific papers and several book chapters. She was a project leader when she won the EUNIS Dørup E-learning Award in 2008.