International Review of Research in Open and Distributed Learning

THE INTERNATIONAL REVIEW
IRRODL OF RESEARCH IN OPEN AND
DISTRIBUTED LEARNING

Blending Crowdvoting in Modern e-Learning Environments

Marija Maletić, Dušan Barać, Tamara Naumović, Zorica Bogdanović and Božidar Radenković

Cite this article

Article abstract

Given that the most students spend considerable time on social networks, many educational institutions use this habit as a basis for educational purposes. Increasing students' active participation in learning activities is one of the main goals of education. The purpose of this research was to investigate to what extent crowdvoting techniques can increase students' participation and interest in the e-learning process. Additionally, we set out to explore social networks as a medium for crowdvoting, contests, and collaboration among students. The research participants included 131 students in the information technologies area of the Faculty of Organizational Sciences, University of Belgrade who participated in contest related to their 3D modeling projects. Voting was performed via Facebook. The students voted for particular projects primarily based on the quality of the project itself. Additionally, the competition was an incentive for students to prove themselves to colleagues, but also to provide an opportunity for teamwork, additional engagement, and acquisition of new skills and knowledge. The research results indicate a generally positive attitude among students towards the competition and rewards.

Blending Crowdvoting in Modern e-Learning Environments

Marija Maletić[1,] Dušan Barać[2], **Tamara Naumović**[2]**, Zorica Bogdanović**[2], and **Božidar Radenković**[2]
[1] *DXC.Technology – Enterprise Services, Serbia, Belgrade,*[2] *Department for e-business, Faculty of organizational Sciences, University of Belgrade, Serbia*

Abstract

Given that the most students spend considerable time on social networks, many educational institutions use this habit as a basis for educational purposes. Increasing students' active participation in learning activities is one of the main goals of education. The purpose of this research was to investigate to what extent crowdvoting techniques can increase students' participation and interest in the e-learning process. Additionally, we set out to explore social networks as a medium for crowdvoting, contests, and collaboration among students. The research participants included 131 students in the information technologies area of the Faculty of Organizational Sciences, University of Belgrade who participated in contest related to their 3D modeling projects. Voting was performed via Facebook. The students voted for particular projects primarily based on the quality of the project itself. Additionally, the competition was an incentive for students to prove themselves to colleagues, but also to provide an opportunity for teamwork, additional engagement, and acquisition of new skills and knowledge. The research results indicate a generally positive attitude among students towards the competition and rewards.

Keywords: crowdvoting, social networks, e-education, crowd wisdom, crowd learning

Introduction

Crowdsourcing is an emerging concept that involves user participation in problem solving. This term implies the process of collecting opinions, ideas, services, or content from a particular group of individuals (so-called *crowd*) usually via an online community (Howe, 2006). It includes a wide range of Internet activities, with crowdvoting included as one of the crowdsourcing categories (Howe, 2009; Starbird, 2012). Crowdvoting is usually used to assess the prominent ideas of the crowd (Standing & Standing, 2017).

Educators and researchers are continually trying to find new ways to increase student interaction and participation in educational activities. Social networks and other modern technologies have become pervasive among youth, and they also allow individuals to contribute to decision-making processes simply by voting. In recent years, the use of social networks has also become popular for stimulating critical thinking skills, collaboration, and knowledge construction (Griesemer, 2014).

In this paper, we investigate whether harnessing crowdvoting techniques and social networks can have a positive impact on the results of student learning and interaction. Further, we set to explore social networks as a medium for crowdvoting, contests, and collaboration among students. Using crowdvoting techniques within courses should help teachers improve many aspects of their teaching.

Theoretical Background

Crowdvoting in Education

As James Surowiecki (2005) stated, crowdsourcing is a combination of crowd and outsourcing that collects the wisdom of crowds, which refers to the superiority of groups over individuals in predicting public opinion.

There are several existing crowdsourcing applications and communities used as online education support tools (Buecheler, Sieg, Füchslin, & Pfeifer, 2010), since they allow Web-enabled tools to produce online learning materials (Recker, Yuan, & Ye, 2014; Skaržauskaite, 2012).

Crowdvoting is a crowdsourcing method for collecting ideas, opinions, and concepts in an intelligent, accurate, and cost-effective way (Dietrich & Amrein, 2016). Crowdvoting increases community participation and awareness of the importance of business decisions (Pedersen, et al., 2013).

When it comes to security and privacy issues, it should be mentioned that crowdvoting systems have certain problems and constraints in terms of misuse, hacking, lobbying, social engineering, and so on. Given that users post information about themselves on a crowdsourcing platform, the data they post is no longer under their control and it can easily become public (Rahim, Ismail, & Samy, 2014; Sarwar & Khan, 2013). As crowdsourcing becomes more popular, the phenomenon of *crowd attacking* becomes more frequent (Hassan & Rahim, 2017).

Despite the issues and constraints when harnessed crowdvoting in an educational context, the role of crowdvoting activities in both our educational system and specific approach studied here was to encourage students to be engaged and more interested in course content.

Crowdvoting is applicable in education in that it enables students to evaluate their colleagues' projects and thus encourage participation in the educational process (Bogdanović, Labus, Simić, Ratković-Živanović, & Milinović, 2015). Al-Jumeily, Hussain, Alghamdi, Dobbins, and Lunn (2015) stated that crowdvoting techniques can effectively be applied to technology-enhanced learning since it can help collect the crowd's view on a certain subject. Wang and Kinuthia (2004) stated the four characteristics of technology-enhanced learning environments: motivation, learning enrichment, learning implementation, and learning assessment and evaluation. Therefore, we can conclude that crowdvoting techniques can be applied to learning purposes through discussions, group projects, feedback, and so on (Keppell, Au, Ma, & Chan, 2006). As well, we should not ignore the influence of peer learning on students' performance, like development of social and leadership skills, and high attendance rates (Stiller-Reeve, et al., 2016). This also includes peer assessment which can be both formal and informal (McLuckie & Topping, 2004). Barker and Bennett (2011) described the process of evaluating projects by using an electronic voting system (EVS). Voters evaluated the quality of the websites made by their fellow students, as well as the quality of the applications within the websites. The research results showed that the voting process was objective and was not based on acquaintance with the candidate.

The Utah Valley University organized a competition with use of digital media that relied on the wisdom of the crowd whose choice influenced the selection of the winner. The winners had the highest number of online votes, and the technologies they used during the competition included mobile and Web applications, video games, 3D animation, film, special effects, and digital audio (Solemon, Ariffin, Din, & Anwar, 2013).

As Kibble (2007) stated, rewards increase students' participation, so it is important to investigate whether the reward concept provides an incentive and has a positive impact on students' learning outcomes. Baranek (1996) stated that grades are the most common type of reward (Seoane & Smink, 1991). Therefore, one of the research questions in this study deals with which type of prize would most encourage students to participate in the competition.

Educational Aspects of Social Networks

The information availability makes individuals feel dependent on social networks, and accordingly, reduces their interest in and focus on studies (Labus, Despotović-Zrakić, Radenković, Bogdanović, & Radenković, 2015; Tariq, Mehboob, Khan, & Ullah, 2012; Yuen & Yuen, 2008). Also, some authors consider social networks as source of "psychological distress (Chen & Lee, 2013), lower quality of life (Bevan, Gomez, & Sparks, 2014), and reduced subjective wellbeing (Kross, et al., 2013)" (Doleck & Lajoie, 2018, p. 437). On the other hand, several studies have proved that many students use social networks to discuss their classes, learning outside of school, and planning for college (Yuen & Yuen, 2008). The open nature of social networks as well as their accessibility, efficiency, and ease of use can help students' learning experiences (Abrahim, Mir, Suhara, & Sato, 2018; Labus, Simić, Vulić, Despotović-Zrakić, & Bogdanović, 2012). However, a few studies could not find scientific proof of a link between use of social networks and academic performance (Doleck & Lajoie, 2018).

Educational institutions should consider use of social media to support the creation of knowledge (Macià & Garcia, 2017; Moskaliuk, Kimmerle, & Cress, 2009). There are numerous groups on social networks that are maintained by universities for the purpose of interacting with students (Selwyn, 2012) and contributing to their persistence and motivation to study (Mason & Rennie, 2007). Cost, accessibility, and flexibility are the advantages for students and educational institutions to engage in online learning (Chau, 2010).

Authors like Junco, Heiberger, and Loken (2011) and Hung and Yuen (2010) stated that social networks have a positive influence on students' grades. Positive aspects of using social networks for educational purposes are:

- Better communication and quick information sharing (e.g., increased productivity and team work) (Waycott, Thompson, Sheard, & Clerehan, 2017).

- Creating and maintaining connections (e.g., developing a career).

- Focus on technology for educational and business purposes (e.g., building skills).

- Getting instant feedback from friends and family (e.g., developing artistic abilities and getting confidence) (Raut & Patil, 2016; Vural, 2015).

Mesipuu (2012) investigated the translation system improvement process of both open (e.g., Facebook) and closed (e.g., Skype) social networks where the user-translators voted for appropriate or inappropriate translations. Traunmueller and Schieck (2013) emphasized that social networks also allow the users to give their opinion using the voting system. Since the participants in this research voted via Facebook, we examined whether social networks are a suitable channel for implementing crowdvoting techniques and the benefits of such channels.

Research Questions

Based on the analyzed literature, the main research questions set during this study are:

RQ1: Does crowdvoting have a positive impact on the students' participation in educational activities? (Al-Jumeily et al., 2015).

RQ2: Are social networks suitable channel for crowdvoting implementation? (Mesipuu, 2012; Traunmueller & Schieck, 2013).

RQ3: Which factors influence the voting choice when it comes to students' projects? (Barker & Bennett, 2011).

RQ4: Does the reward concept provide an incentive and have a positive impact on students' learning outcomes? What type of reward motivates students the most? (Kibble, 2007; Baranek, 1996).

Methodology

Research Design

Figure 1 shows the research methodology. As part of a course in the fourth year of undergraduate studies, at the Faculty of Organizational Sciences, University of Belgrade, students were tasked with creating a 3D model and animation. They worked in teams of three. After creating the projects, students uploaded them on the Moodle learning management system, which is used as an open and distance learning engine. After the projects were analyzed and evaluated by teachers, the best 10 projects were selected and published on the course's official Facebook page. Students could vote for one or more projects; the three projects with the highest number of votes (likes) were declared as winners. Depending on the ranking, winners got prizes. These prizes were (a) additional points within the course that can help students to get a higher grade, (b) promotion and presentation of the animation on the e-Business Department website, or (c) free participation in ELAB summer school and free printed e-Business textbook.

Instruments

A survey was conducted in order to examine student attitudes regarding crowdvoting on the social network, as well as the concept of the competition and prizes. The survey was intended to examine whether the crowdvoting process encouraged students to make creative projects or to promote their work. Since the voting was performed on Facebook, it is important to examine whether students voted based on acquaintance with the candidate or exclusively based on the quality of the project itself, as well as how the rewards influenced their interest to participate in the competition.
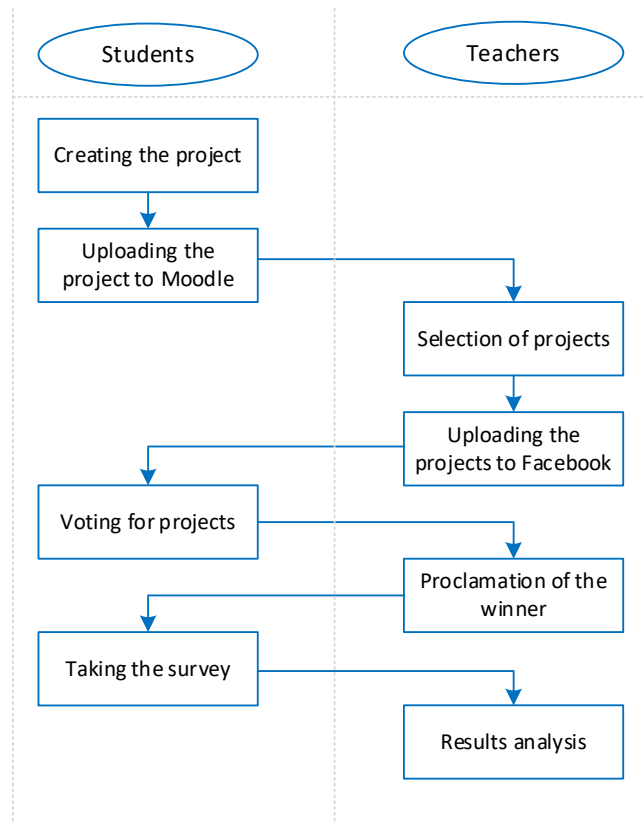
Figure 1. Research methodology.

The questionnaire created for this research consisted of three parts. The first part contained 13 yes/no questions. These questions examined the students' behavior related to the competition. The second part contained one half-open question related to the reason for which the respondent was encouraged to participate in the competition, and three open questions to examine students' opinions on the significance of winning the competition. Here, students could provide suggestions for future prizes and additional comments regarding the course. The third part of the survey contained 15 Likert-type questions for examining students' opinions on the competition and rewards. Table 1 provides an overview of the questions used within the questionnaire.

Table 1

Measurement Items Included in Questionnaire

Model construct	Measurement item
Impact of crowdvoting on the students' participation in educational activities (Al-Jumeily et al., 2015) (RQ1)	• Did you participate in the competition? • You did not participate because you did not create project on time. • You did not participate because you did not want to. • Was your project selected for voting? • Have you looked at the selected projects? • I think the best project has won. • Would you participate again in the ELAB competition? • I think that the candidates were encouraged by teamwork. • I think that the candidates were encouraged by additional engagement and acquiring new skills.
Suitability of social networks as a crowdvoting implementation channel (Mesipuu, 2012; Traunmueller & Schieck, 2013) (RQ2)	• Are you familiar with the ELAB competition? • Did you participate in the voting? • You voted for one project. • You voted for more projects. • I think the competition is useless.
Influencing factors on voting choice (Barker & Bennett, 2011) (RQ3)	• I voted based on my acquaintance with the candidate. • I voted based on the quality and creativity of the project.
Impact of the rewards on students' learning outcomes and their role as an incentive (Kibble, 2007) Rewards with the greatest motivational impact on students (Baranek, 1996) (RQ4)	• What does it mean for you to win this competition? • I think the rewards are appropriate and motivating. • I think the prizes are unnecessary. • I think that the candidates were encouraged by the prizes. • What inspired you to participate in the competition? • Make a proposal for a prize that would encourage you to participate in the competition. • I think that additional points are the most useful reward. • I consider promotion and presentation of animation on the site of the e-Business Department as the most useful prize. • I consider the ELAB summer school course as the most useful prize. • I consider the e-Business textbook as the most useful prize.

In order to examine the consistency and reliability of a data set, the Cronbach's alpha measure was used. The values for research questions RQ1, RQ2, RQ3, and RQ4 are, respectively: 0.758, 0.818, 0.416, and 0.729. Given that Cronbach's alpha for RQ1 is 0.758 we can conclude that the reliability for this research question is respectable, as is RQ4; reliability for RQ2 is very good. However, for RQ3, Cronbach's alpha cannot be appropriately used as the format of questions within RQ3 were mostly yes/no type.

Participants

Participants in this research were undergraduate students in their fourth year at the Faculty of Organizational Sciences, University of Belgrade (born between 1988 and 1995), with average grade during study 8.32. There were 131 students who participated in the survey (59.23% females and 40.77% males).

Results

Participation and Attitude Toward Competition

The results show that almost all respondents were familiar with the competition (only three respondents were not). Most respondents created a project; approximately 28.09% of respondents did not want to participate in the competition. A fairly high number of respondents (74.16%) viewed the selected projects posted on Facebook and almost half of the total number participated in the voting process. Nearly half of the respondents (45.24%) said that their projects were selected for voting. The majority of the respondents found the competition interesting (71.43%). A surprisingly small percentage of respondents (8.91%) were satisfied with the existing prizes. Most of them thought that the competition was an interesting way to encourage students to do the project and thus increase their participation in the educational process. However, there were also those who believed that determining the winner based on the number of votes collected on Facebook was not adequate, because in this way the quality of the project itself was neglected, and increases in the number of votes was affected by the candidates' self-marketing (i.e., collecting votes from friends or family).

Respondents' answers to the questions defined by the Likert-type scale are shown in Table 2. According to the results, the students gave positive answers regarding encouraging both teamwork (mean score = 3.6) and acquiring new skills (mean score = 3.616). In addition, the students did not agree that competition was useless (mean score = 2.1).

Table 2

Likert-Type Questions Related to Participation and Attitude Toward Competition

Research question	Mean	SD
RQ 1: I think that the candidates were encouraged by teamwork.	3.600	1.288
RQ 1: I think that the candidates were encouraged by additional engagement and acquiring new skills.	3.616	1.0983
RQ 2: I think that the competition is useless.	2.121	1.2853
RQ 2: I consider such competitions as useless.	2.064	1.2296

Incentives for Participation and Rewards Types

The analysis found that the teamwork (39.53%), acquiring new skills (31.40%), and rewards (22.09%), respectively, were the biggest incentives for respondents to participate in the competition. The category "Other" includes competitive spirit, grade, obligatory homework, and points (Figure 2).
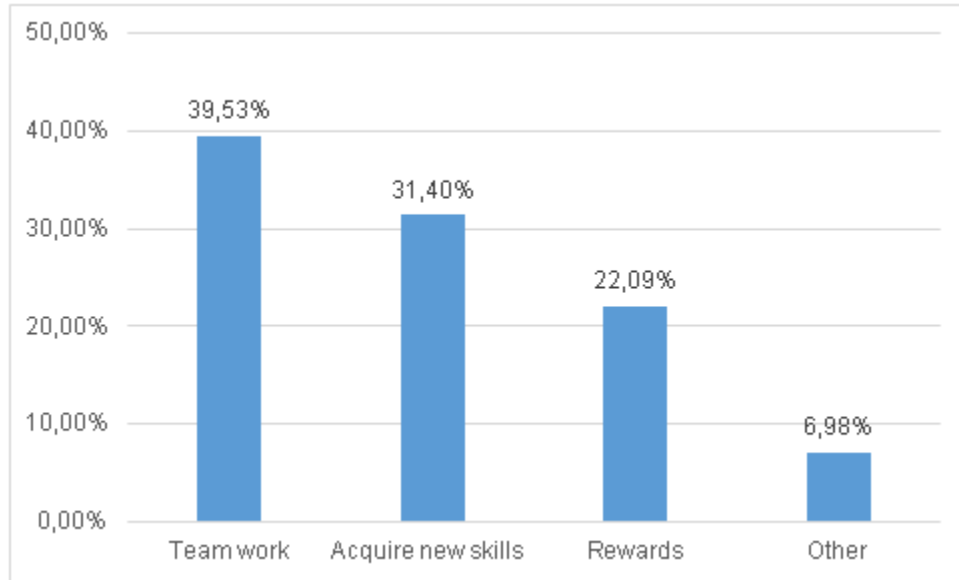

Figure 2. The incentives for participating in the competition.

Figure 3 shows what winning this competition meant to the respondents. Most of them thought that winning in this competition was a kind of effort recognition (34.78%). The category "Other" included personal satisfaction and socializing. The respondents were also asked to propose a reward which would most encourage them to participate in the competition (Figure 4). Grades and points were mostly proposed as rewards (43.48%).
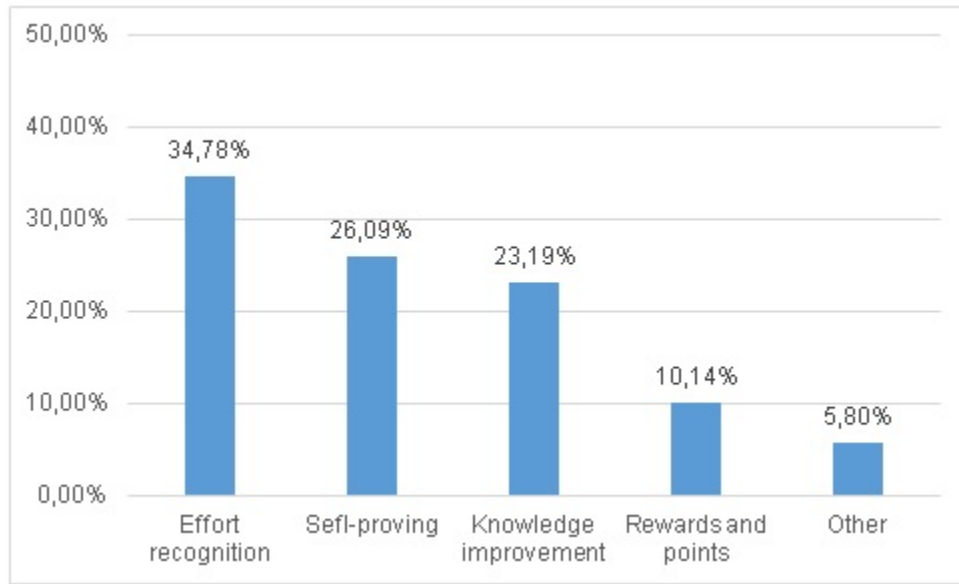
Figure 3. The significance of winning the competition.
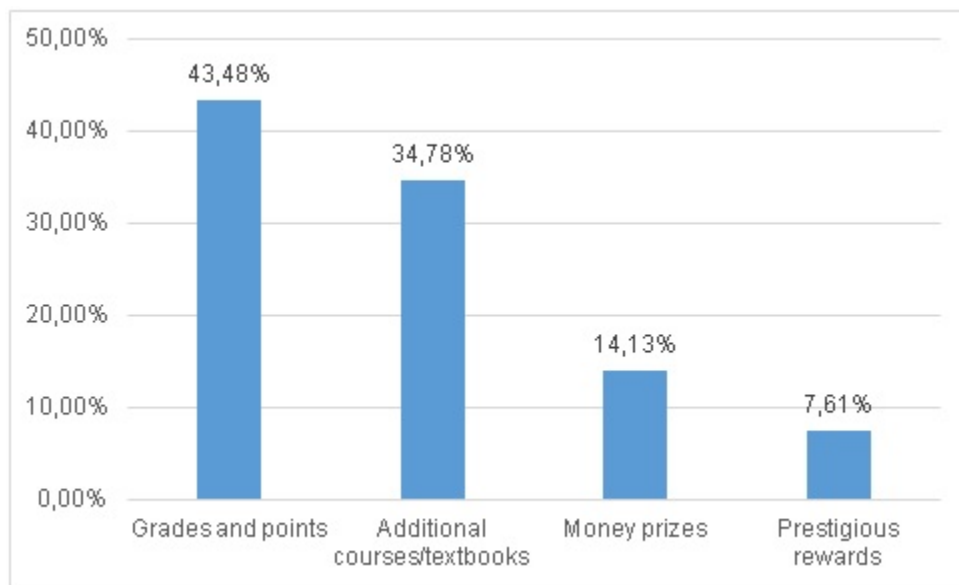

Figure 4. Rewards proposals.

Students' answers for RQ3 and RQ4 are shown in Table 3. The majority of students stated that they voted based on the quality and creativity of the project (mean score = 3.975). The prizes were appropriate and motivating for the students (mean score = 3.72). The ELAB summer school courses prize was considered the most beneficial (mean score = 3.888).

Table 3

Likert-Type Questions Related to Incentives for Participation and Rewards Types

Research question	Mean	SD
RQ3: I voted based on acquaintance with the candidate.	2.758	1.4894
RQ3: I voted based on quality and creativity of the project.	3.975	1.3621
RQ4: I think that the competition is interesting and motivating.	3.823	1.1897
RQ4: I consider such competitions as desirable and interesting.	3.782	1.1157
RQ4: I think that the prizes are unnecessary.	2.064	1.1482
RQ4: I think that the prizes are appropriate and motivating.	3.720	1.0671
RQ4: I think that the candidates were encouraged by rewards.	3.605	1.0956
RQ4: I consider additional points as the most useful prize.	3.488	1.2548
RQ4: I consider promotion and presentation of realized animation on the site of the e-Business Department as the most useful prize.	2.928	1.1858
RQ4: I consider the ELAB summer school course as the most useful prize.	3.888	1.1232
RQ4: I consider the e-Business textbook as the most useful prize.	3.024	1.3528

Correlation Analysis

Correlation analysis identified the links between individual questions, with the goal of determining how consistent the respondents were in their evaluation of prizes and competition. The analysis found that the highest correlations (more than 50%) were observed between the following indicators:

- 68% between questions "I consider these competitions as desirable and interesting" and "I think that the rewards are appropriate and motivating."

- 61% between questions "I think that the candidates were encouraged by teamwork" and "I think that the candidates were encouraged by additional engagement and acquiring new skills."

- 55% between questions "I think the competition is interesting and motivating" and "I think the rewards are appropriate and motivating."

- 54% between the questions "I think the rewards are appropriate and motivating" and "I think that the candidates were encouraged by the prizes."

All of these correlations are statistically significant (1%). The data were analyzed by using the IBM SPSS tool.

In order to determine the consistency of the answers from respondents who participated in the competition, we examined whether they considered that the candidates were encouraged by the rewards, teamwork, or

by additional engagement and acquiring new skills. Also, among the respondents who did not want to participate in the competition, it was important to investigate whether they believed that the competition was useless. During this analysis, the authors of this paper had to take into account the opinions from the respondents who voted for projects based on their quality and creativity and who thought that the best projects had won. It was also important to investigate whether the respondents who participated in the voting process considered that the competition was interesting or useless. Therefore, we created 16 variables for determining the consistency in the respondents' answers. In order to determine the relationships between individual variables, a statistical method of cross tabulation (contingency table) was used, and it was performed by using the χ^2 test. Table 4 shows the naming conventions for the individual variables.

Table 4

Results of the Pearson's χ^2 Coefficient for Examined Variables

	Question combinations	Variables	Pearson's χ^2 coefficient	P level
1.	Did you participate in the competition? * I think that the candidates were encouraged by the prizes.	Competition participant → Prizes encouragement	1.706	0.790
2.	Did you participate in the competition? * I think that the candidates were encouraged by teamwork.	Competition participant → Teamwork encouragement	6.689	0.153
3.	Did you participate in the competition? * I think that the candidates were encouraged by added engagement and acquiring new skills.	Competition participant → Additional engagement / new skills	5.459	0.243
4.	You did not participate because you did not want to. * I think the competition is useless.	Non-participant → Competition uselessness	6.482	0.166
5.	I think that the best project has won. * I voted on the quality and creativity of project.	Best project wins → Quality fulfillment	17.132	0.002**
6.	Did you participate in the voting? * I think the competition is interesting and motivating.	Voter → Interesting competition	1.079	0.898
7.	Did you participate in the voting? * I consider such competitions as desirable and interesting.	Voter → Desirable competition	0.819	0.936

8.	Did you participate in the voting? * I consider such competitions as useless.	Voter → Useless competition	1.950	0.745

Since the value of Pearson's χ^2 coefficient is 1.706 for the 5% significance level, and P level for the first combination of questions (*Competition participant → Prizes encouragement*) is 0.790, we can conclude that there is no relationship between the variables we have chosen. In other words, there are no statistically significant differences in the answers between the students who participated in the competition and those who did not, in relation to their opinion regarding the incentive of the prizes to the candidates.

Table 4 indicates that there is a statistically significant difference for just one of the examined combinations of questions because the Pearson's coefficient is 17.132 and the P level is 0.002 for 5% significance, which means there is a relationship between the answers to the question "I think the best project has won" and "I voted based on quality and creativity of the project."

Given the results of our analysis, we can conclude that the selected variables were independent of each other, except in one case. When we observe these selected combinations separately, we realize that there is no statistically significant difference between those who participated in the competition and those who did not, in relation to their opinions on candidates' incentive regarding prizes, teamwork, and additional engagement. Also, there is no difference in answers from the respondents who did not want to create the project and those who did, in relation to their opinions on the competition's uselessness. Finally, there is no statistically significant difference between the respondents who voted and those who did not, in relation to their opinion on the competition as interesting or as useless.

Discussion and Conclusions

Impact of Crowdvoting on the Students' Participation (RQ1)

The crowdvoting concept itself can have a positive impact on students' learning and on increasing their participation in educational activities. Conclusions from RQ1 testify to this by indicating that more than half of respondents participated in the project creation, and also mastered the use of advanced techniques in the field of 3D modeling and animation. As Al-Jumeily et al. (2015) stated, crowdvoting can help students improve their engagement as well as their learning skills, bearing in mind their learning style preference. The competition shows that teamwork, as well as additional engagement, have had a positive impact on students.

Social Networks as a Crowdvoting Channel (RQ2)

As assumed, results confirm that crowdvoting techniques can be successfully conducted via Facebook, in agreement with Mesipuu (2012) and Taunmueller and Schieck (2013). Therefore, social networks have been showed as a suitable channel for voting. In this research, not only students, but also friends and family of candidates who had access to the Facebook account participated in the voting process.

Factors That Influence Voting Choice (RQ3)

There are pros and cons to using crowdvoting principles on a social network. On the positive side is certainly easier accessibility and transparency. According to RQ3 and influencing factors on voting, the negative aspect is reflected in the fact that in some situations, project quality can be neglected and someone with better self-marketing can be declared a winner. However, the research has shown that the voters who thought the best project won were most probably those who voted based on the project's quality and creativity. It can be said that the acquaintance with the candidate in some cases is not crucial factor in voting process.

Impact of Rewards (RQ4)

It can be concluded that the competition itself encouraged many students to create a project. Rewards were also an incentive for students to do a better project and thus learn more. Although students highlighted free-of-charge participation in ELAB summer school course as the most desirable of the offered prizes, additional points were also a reward that provided students with an incentive to participate in the competition. According to RQ4, a majority of the respondents were satisfied with the provided prizes. Further, that additional points were the most desirable rewards among the students conforms to Baranek (1996). However, there were those for whom further learning and recognition by colleagues were more important.

Findings

This study examined two roles—the project creator and the voter. Project creators, under the influence of the prizes or some other internal urge, tried to create better and more creative projects by using advanced technologies. If their project was selected in the top 10 and published on the course Facebook page, they most likely promoted their project. On the other hand, there were voters who were most probably students who did not want or failed to participate in the competition. They are the ones who decide who will win the competition. Some of the terms from the analyzed literature highlighted in this paper are: crowdvoting techniques, social networks, peer assessment, reward influence. Given that the majority of students were familiar with the competition, and that very few of them did not create a project, it can be said that students were generally interested in participating in the competition. The results certainly point out the fact that the rewards were an incentive for students, as was assumed. However, teamwork has been singled out as the biggest incentive for our respondents.

Based on this research, we can conclude that the concept of rewarding certainly has a positive impact on students and their additional engagement, and consequently on their learning results, as Kibble (2007) stated. Although the prizes of this competition were of a prestigious character, it turned out that for most of the students, winning meant a recognition by their colleagues.

The correlation analysis showed that the creativity and quality of the project were the most important in terms of voting for a particular candidate. In other words, the students who voted for the candidates based on acquaintance with them still considered that they voted based on the quality of the project. This shows that Barker and Bennet's (2011) assumption is correct—students vote for candidates regardless of their acquaintance. Nevertheless, survey results indicate that the quality of the project was a key factor for voting

as well for the respondents who did not know the candidates for whose projects they voted. A topic for some further research may be examining ways to overcome candidates' self-promotion in order to make the quality of a project most prominent.

The contribution of this research is in providing an overview of how crowdvoting principles can be implemented in a social network environment for e-education purposes. The authors of this paper believe that the findings can be used as a framework for other education practitioners, in order to help them adjust learning methods to students' needs and habits. This paper describes an example of how educators can innovate by designing new interesting ways to encourage students to be more involved in such activities and also become more creative. As well, it calls attention to the importance of taking measures to ensure that more teaching activities account for students' opinions and let them participate in the decision-making process. Such approaches can certainly elicit a number of positive reactions from students as well as a greater sense of control. Bearing in mind that social networks are close to students and that they spend time following events on them, it seems logical to integrate teaching activities into social network structures. The primary aim of this research is to make an impact on practice and to provide educators with needed information regarding students' attitude towards crowdvoting implementation in a competition context.

This paper brings new value to e-education, as it encourages lecturers to increase students' participation in an acceptable way and thus positively influence the results of their learning. Our analysis indicates that for most respondents, recognition for their effort is very important, as it can be identified by proving themselves in front of their colleagues. Students should be allowed to express themselves in creative ways and in a familiar environment, such as the social network, and enabled to participate in the decision-making process, such as crowdvoting. All these factors can help students improve their level of engagement as well as their learning skills.

Table 5 provides a list of the main implications and practical recommendations for different interested parties in the educational process.

Table 5

Implications for Teachers, Education Practitioners, and Students

Interested parties	Implications
Teachers	1. Teachers have to continue encouraging students to be more engaged in educational activities as it can definitely increase their knowledge as well as experience (Dougiamas & Taylor, 2003; Reeve, 2009; Skiner & Belmont, 1993). 2. As it is necessary to invest time and effort in e-education in order to achieve positive results, the use of social networks integrated with crowdvoting techniques can make students feel they are important actors in the decision-making process (Cubillo, Sánchez, & Cerviño, 2006). This contributes to their sense of control and desire for additional engagement (Moogan, Baron, & Harris, 1999; Siribunnam, Nuangchalerm,

& Jansawang, 2014). In addition to the feeling of control in the decision-making process, teamwork and additional engagement were of a great importance to the participants.

3. When it comes to rewards, the research indicates that additional points and the possibility of further learning and promotion are very important for the participants in the competition. This should not be neglected and rewards should be chosen carefully. Although prizes are only a part of what encouraged the students to participate in the competition, a reward system must be designed to have a positive impact on students (Sloggett, 1971).

	1. The crowdvoting process on the social network should be organized in a way to highlight the quality of the project itself. Since voting takes place on Facebook, the choice of winner should not be influenced by candidates' self-marketing through collecting votes from friends or family. Voting should be performed within a closed group so voters are not familiar with or able to identify the author of a particular project (Kennedy & Cutts, 2005). For instance, a closed Facebook group could be visible only to the voters, without including the author's name.
Education practitioners	2. Generally, the use of crowdvoting principles on social networks has its advantages (Brady, Holcomb, & Smith, 2010), because of the quick and easy way decisions can be made on a given topic (Wang, Gill, Mohanlal, Zheng, & Zhao, 2013).
	3. The use of social networks does not represent a major investment for educational institutions; therefore, this kind of environment can be easily used for educational purposes (Madge, Meek, Wellens, & Hooley, 2009; Roblyer, McDaniel, Webb, Herman, & Witty, 2010). However, there are some challenges in the use of social networks such as security and unproductive behavior which should not be neglected (Ngonidzashe, 2013).
	1. Due to the use of social networks for educational purposes, students are given the opportunity to invest more effort in the development of their projects, with the possibility of showing their creativity to the broader audience.
Students	2. In addition to the assessment by professors, crowdvoting takes into account the opinions of other evaluators such as peer colleagues. This could encourage students' participation in the educational process and develop their social skills.
	3. Public recognition may have an impact on their future career and provide a reference for further work.

Research has shown that in this case, the use of crowdvoting techniques is possible and has potential but with certain limitations. The main limitation is that the research was conducted solely within the course of 3D modeling and animation. Thus, it is not possible to guarantee that these results are applicable to other

educational contexts. Authors of this paper, however, believe that this kind of competition can be applied to other courses and environments as well. An additional limitation is self-marketing by some candidates which resulted in them getting more likes from friends and family members than from peers. In fact, a method of preventing candidates' self-marketing should be devised. In this way, the voting would have been exclusively based on the quality and creativity of the project (i.e., being acquainted with the candidate would have no effect on the voting results). However, the focus of our research was on increasing student engagement, interest, and participation, not on constraints of crowdvoting.

The possibilities of using crowdvoting/sourcing in education are still on a low level and have to be fueled in future research. Further research should be conducted in order to explore topics such as social engineering, negative marketing, as well as motivation for voting and taking a part in the competition. Taking into account that crowdvoting and other crowdsourcing techniques are rather a philosophy than a well-established concept, it is of great importance to investigate how to implement them in different contexts. Understanding all the challenges in implementation of crowdvoting could be of great interest for both academia and practitioners in order to enhance students' motivation and participation, particularly within millennial generations.

References

Abrahim, S., Mir, B. A., Suhara, H., & Sato, M. (2018). Exploring Academic use of online social networking sites (SNS) for language learning: Japanese students' perceptions and attitudes towards facebook. *Journal of Information Technology & Software Engineering, 8(1)*, 1-5. doi:10.4172/2165-7866.1000223

Al-Jumeily, D., Hussain, A., Alghamdi, M., Dobbins, C., & Lunn, J. (2015). Educational crowdsourcing to support the learning of computer programming. *Research and Practice in Technology Enhanced Learning, 10*(13), 1-15. doi:10.1186/s41039-015-0011-3

Baranek, L. K. (1996). *The effect of rewards and motivation on student achievement.* (Master's Thesis). Grand Valley State University, Allendale, Michigan.

Barker, T., & Bennett, S. (2011). Marking complex assignments using peer assessment with an electronic voting system and an automated feedback tool. *International Journal of e-Assessment, 1*(1), 1-15. Retrieved from https://uhra.herts.ac.uk/bitstream/handle/2299/13346/906796.pdf?sequence=2&isAllowed=y

Bevan, J., Gomez, R., & Sparks, L. (2014). Disclosures about important life events on Facebook: Relationships with stress and quality of life. *Computers in Human Behavior, 39*, 246–253. doi:10.1016/j.chb.2014.07.021

Bogdanović, Z., Labus, A., Simić, K., Ratković-Živanović, V., & Milinović, S. (2015, July). Harnessing crowdvoting to support students' creativity. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *EDULEARN15 Proceedings: 7th International Conference on Education and New Learning Technologies* (pp. 4318-4326). Barcelona, Spain: IATED.

Brady, K. P., Holcomb, L. B., & Smith, B. V. (2010). The use of alternative social networking sites in higher educational settings: A case study of the e-learning benefits of ning in education. *Journal of Interactive Online Learning, 9*(2), 151-170. Retrieved from http://www.ncolr.org/jiol/issues/pdf/9.2.4.pdf

Buecheler, T., Sieg, J., Füchslin, R., & Pfeifer, R. (2010). Crowdsourcing, open innovation and collective intelligence in the scientific method: a research agenda and operational framework. In H. Fellermann, M. Dörr, M. M. Hanczyc, L. L. Laursen, S. E. Maurer, D. Merkle, … S. Rasmussen (Eds.), *Artificial Life XII - Twelfth international conference on the synthesis and simulation of living systems* (pp. 679-686). Cambridge, Massachusetts: MIT Press. Retrieved from https://archive.org/details/ArtificialLifeXII/page/n1

Chau, P. (2010). Online higher education commodity. *Journal of Computing in Higher Education , 22*(3), 177-191. DOI: 10.1007/s12528-010-9039-y

Chen, W., & Lee, K. (2013). Sharing, liking, commenting, and distressed? The pathway between Facebook interaction and psychological distress. *Cyberpsychology, Behavior, and Social Networking, 16*(10), 728–734. doi:10.1089/cyber.2012.0272

Cubillo, J. M., Sánchez, J., & Cerviño, J. (2006). International students' decision-making process. *International Journal of Educational Management, 20*(2), 101-115. DOI: 10.1108/09513540610646091

Dietrich, A., & Amrein, S. (2016). *Crowdfunding monitoring.* Switzerland: Institute of Financial Services Zug IFZ.

Doleck, T., & Lajoie, S. (2018). Social networking and academic performance: A review. *Education and Information Technologies, 23*(1), 435–465. DOI: 10.1007/s10639-017-9612-3

Dougiamas, M., & Taylor, P. C. (2003). Moodle: Using learning communities to create an open source course management system. In *Proceedings of EdMedia + Innovate Learning 2003* (pp. 171–178). Waynesville, NC: Association for the Advancement of Computing in Education (AACE).

Griesemer, J. A. (2014). Using social media to enhance students' learning experiences. *Quality Approaches in Higher Education, 3*(1), 8-11. Retrieved from http://asq.org/edu/2014/03/best-practices/using-social-media-to-enhance-students-learning-experiences.pdf

Hassan, N. H., & Rahim, F. A. (2017). The rise of crowdsourcing using social media platforms: Security and privacy issues. *Pertanika Journal of Science & Technology, 25*, 79-88. Retrieved from http://www.pertanika.upm.edu.my/Pertanika%20PAPERS/JST%20Vol.%2025%20(S)%20Oct.%202017/07%20JST(S)-0403-2017-2ndProof.pdf

Howe, J. (2006). The rise of crowdsourcing. *Wired Magazine, 14(6),* 1-4. Retrieved from https://sistemas-humano-computacionais.wdfiles.com/local--files/capitulo%3Aredes-sociais/Howe_The_Rise_of_Crowdsourcing.pdf

Howe, J. (2009). *Crowdsourcing: How the power of the crowd is driving the future of business.* New York, NY: Random House Books.

Hung, H., & Yuen, S. (2010). Educational use of social networking technology in higher education. *Teaching in Higher Education, 15*(6), 703–714. DOI: 10.1080/13562517.2010.507307

Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning, 27*(2), 119–132. DOI: 10.1111/j.1365-2729.2010.00387.x

Kennedy, G. E., & Cutts, Q. I. (2005). The association between students' use of an electronic voting system and their learning outcomes. *Journal of Computer Assisted learning, 21*, 260–268. DOI: 10.1111/j.1365-2729.2005.00133.x

Keppell, M., Au, E., Ma, A., & Chan, C. (2006). Peer learning and learning-oriented assessment in technology-enhanced environments. *Assessment & Evaluation in Higher Education, 31*(4), 453–464. DOI: 10.1080/02602930600679159

Kibble, J. (2007). Use of unsupervised online quizzes as formative assessment in a medical physiology course: effects of incentives on student participation and performance. *Advances in Physiology Education, 31*, 253-260. DOI: 10.1152/advan.00027.2007

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N. ... Ybarra, O. (2013). Facebook use predicts declines in subjective well-being in young adults. *PloS One, 8*(8). doi:10.1371/journal.pone.0069841

Labus, A., Despotović-Zrakić, M., Radenković, B., Bogdanović, Z., & Radenković, M. (2015). Enhancing formal e-learning with edutainment on social networks. *Journal of Computer Assisted Learning, 31*(6), 592–605. DOI: 10.1111/jcal.12108

Labus, A., Simić, K., Vulić, M., Despotović-Zrakić, M., & Bogdanović, Z. (2012). *An Application of social media in elearning 2.0.* Paper presented at the 25th Bled eConference, eDependability: Reliable and Trustworthy eStructures, eProcesses, eOperations and eServices for the Future, Bled, Slovenia (pp. 557–572). Retrieved from http://aisel.aisnet.org/bled2012/41

Macià, M., & Garcia, I. (2017). Properties of teacher networks in twitter: Are they related to community-based peer production? *International Review of Research in Open and Distributed Learning, 18*(1), 110-140. DOI: 10.19173/irrodl.v18i1.2644

Madge, C., Meek, J., Wellens, J., & Hooley, T. (2009). Facebook, social integration and informal learning at university: 'It is more for socialising and talking to friends about work than for actually doing work'. *Learning, Media and Technology, 34*(2), 141-155. DOI: 10.1080/17439880902923606

Mason, R., & Rennie, F. (2007). Using web 2.0 for learning in the community. *Internet and Higher Education, 10*(3), 196-203. DOI: 10.1016/j.iheduc.2007.06.003

McLuckie, J., & Topping, K. J. (2004). Transferable skills for online peer learning. *Assessment & Evaluation in Higher Education, 29*(5), 563–584. DOI: 10.1080/02602930410001689144

Mesipuu, M. (2012). Translation crowdsourcing and user-translator motivation at Facebook and Skype. *Translation Spaces, 1*(1), 33–53. DOI: 10.1075/ts.1.03mes

Moogan, Y. J., Baron, S., & Harris, K. (1999). Decision-making behaviour of potential higher education students. *Higher Education Quarterly, 53*(3), 211–228 . DOI: 10.1111/1468-2273.00127

Moskaliuk, J., Kimmerle, J., & Cress, U. (2009). Wiki-supported learning and knowledge building. *Journal of Computer Assisted Learning, 25*(6), 549–561. DOI: 10.1111/j.1365-2729.2009.00331.x

Ngonidzashe, Z. (2013). Challenges and perceptions towards use of social media in higher education in Zimbabwe: a learners' perspective. *International Journal of Scientific & Engineering Research, 4*(5), 242-249. Retrieved from https://www.ijser.org/researchpaper/Challenges-and-perceptions-towards-use-of-social-media-in-higher-education-in-Zimbabwe.pdf

Pedersen, J., Kocsis, D., Tripathi, A., Tarrell, A., Weerakoon, A., Tahmasbi, N. ... deVreede, G.-J. (2013). Conceptual foundations of crowdsourcing: A review of IS research. In R. H. Sprague, Jr. (Ed.), *Proceedings of the 46th Annual Hawaii International Conference on System Sciences* (pp. 579 - 588). Wailea, Maui, HI, USA: IEEE. DOI: 10.1109/HICSS.2013.143

Rahim, F. A., Ismail, Z., & Samy, G. N. (2014). Information privacy concerns in the use of social media among healthcare practitioners: A systematic literature review. *Advanced Science Letters, 20*, 2176-2179. doi:10.1166/asl.2014.5659

Raut, V., & Patil, P. (2016). Use of social media in education: Positive and negative impact on the students. *International Journal on Recent and Innovation Trends in Computing and Communication , 4*(1), 281-285. Retrieved from https://lessonnote.net/wp-content/uploads/2019/01/1455261816-12-02-2016.pdf

Recker, M., Yuan, M., & Ye, L. (2014). Crowdteaching: Supporting teaching as designing in collective intelligence communities. *The International Review of Research in Open and Distributed Learning, 15*(4), 138-160. DOI: 10.19173/irrodl.v15i4.1785

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist, 44*(3), 159-175. DOI: 10.1080/00461520903028990

Roblyer, M., McDaniel, M., Webb, M., Herman, J., & Witty, J. V. (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. *Internet and Higher Education, 13*, 134–140. DOI: 10.1016/j.iheduc.2010.03.002

Sarwar, A., & Khan, M. N. (2013). A review of trust aspects in cloud computing security. *International Journal of Cloud Computing and Services Science, 2*(2), 116–122. DOI: 10.11591/closer.v2i2.1840

Selwyn, N. (2012). Social media in higher education. In A. Gladman, (Ed.) *The europa world of learning* (62nd edition; pp. 3-7). London, United Kingdom: Routledge.

Seoane, M., & Smink, J. (1991). *Incentives and education. A series of solutions and starategies (No. 4).* National Dropout Prevention Center, Clemson, SC. Retrieved from https://files.eric.ed.gov/fulltext/ED341920.pdf

Siribunnam, S., Nuangchalerm, P., & Jansawang, N. (2014). Socio-scientific decision making in the science classroom. *International Journal for Cross-Disciplinary Subjects in Education, 5*(4), 1777-1782. DOI: 10.1155/2013/309894

Skaržauskaite, M. (2012). The application of crowd sourcing in educational activities. *Social Technologies, 2*(1), 67–76. Retrieved from https://www3.mruni.eu/ojs/social-technologies/article/view/145

Skiner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the shool year. *Journal of Educational Psychology, 85*(4), 571-581. DOI: 10.1037/0022-0663.85.4.571

Sloggett, B. B. (1971). Use of group activities and team rewards to increase individual classroom productivity. *Teaching Exceptional Children, 3*(2), 54-66. doi:10.1177/004005997100300201

Solemon, B., Ariffin, I., Din, M. M., & Anwar, R. M. (2013). A review of the uses of crowdsourcing in higher education. *International Journal of Asian Social Science, 3*(9), 2066-2073. Retrieved from http://www.aessweb.com/pdf-files/ijass-si-3(9)-2066-2073.pdf

Standing, S., & Standing, C. (2017). The ethical use of crowdsourcing. *Business Ethics: A European Review 2017*, 1-9. DOI: 10.1111/beer.12173

Starbird, K. (2012, April). *What "crowdsourcing" obscures: Exposing the dynamics od connected crowd work during disaster.* Presented at Collective Intelligence conference, Social and Information Networks, Computers and Society. Cambridge, MA. Forthcoming. doi:abs/1204.3342

Stiller-Reeve, M. A., Heuzé, C., Ball, W. T., White, R. H., Messori, G., van der Wiel, K. ... Kumer, V. (2016). Improving together: Better science writing through peer learning. *Hydrology and Earth System Sciences, 20*(7), 2965–2973. DOI: 10.5194/hess-20-2965-2016

Surowiecki, J. (2005). *The wisdom of crowds.* New York, NY: Anchor Books.

Tariq, W., Mehboob, M., Khan, M. A., & Ullah, F. (2012). The impact of social media and social networks on education and students of Pakistan. *IJCSI International Journal of Computer Science, 9*(4), 407-411. Retrieved from https://www.ijcsi.org/papers/IJCSI-9-4-3-407-411.pdf

Traunmueller, M., & Schieck, A. F. (2013). Introducing the space recommender system: How crowd-sourced voting data can enrich Urban Exploration in the digital Era. *Proceedings of the 6th International Conference on Communities and Technologies* (pp. 149-156). New York, NY: ACM. Doi: 10.1145/2482991.2482995

Vural, Ö. F. (2015). Positive and negative aspects of using social networks in higher education: A focus group study. *Educational Research and Reviews, 10*(8), 1147-1166. DOI: 10.5897/ERR2015.2144

Wang, C. X., & Kinuthia, W. (2004). Defining technology enhanced learning environments for pre-service teachers. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber, & D. A. Willis (Eds.), *Proceedings of SITE 2004—Society for Information Technology & Teacher Education International Conference* (pp. 2724–2727). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE). Retrieved from https://www.learntechlib.org/p/13252/

Wang, G., Gill, K., Mohanlal, M., Zheng, H., & Zhao, B. Y. (2013). *Wisdom in the social crowd: An analysis of quora.* Presented at the 22nd International World Wide Web Conference, Rio de Janeiro, Brazil (pp. 1341–1352). DOI: 10.1145/2488388.2488506

Waycott, J., Thompson, C., Sheard, J., & Clerehan, R. (2017). A virtual panopticon in the community of practice: Students' experiences of being visible on social media. *The Internet and Higher Education, 35*, 12-20. DOI: 10.1016/j.iheduc.2017.07.001

Yuen, S. C.-Y., & Yuen, P. K. (2008). Social networks in education. In C. Bonk, M. Lee & T. Reynolds (Eds.), *Proceedings of E-Learn 2008, World Conference* (pp. 1408–1412). Las Vegas, NV: Asscoiation of the Advancement of Computing in Education (AACE).