Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Tech students' perceptions of social media's usefulness during PBL group work

Bjørner, Thomas; Mic, Marius Cristian

Published in:
Educate for the future

Creative Commons License
CC BY-NC-ND 4.0

Publication date:
2020

Document Version
Publisher's PDF, also known as Version of record

Tech students' perceptions of social media's usefulness during PBL group work

Thomas Bjørner

Aalborg University, Department of Architecture, Design & Media Technology, Denmark, *tbj@create.aau.dk*

Marius Cristian Mic

Aalborg University, Denmark, *mariusmic.27@gmail.com*

Abstract

This study explores tech students' perceptions of social media's usefulness during PBL group work. In contrast to much of the previous work, this study is not focused on effects; instead, it is aimed at determining the extent to which students perceived various social media platforms as useful within the context of their PBL group work. This study is based on 15 groups (45 tech students) enrolled at Aalborg University and uses the principles of problem-based learning. The study's procedures included a semi- structured interview guide and a card sorting method. All participants in this study used social media for group coordination. Messenger, Skype, WhatsApp, Snapchat, and Facebook were all used in dynamic, changeable, and different ways within groups for coordination. Moreover, if social media platforms were used for non-academic purposes, they were mostly perceived as not useful and distracting. However, if the social media platforms were perceived as useful, they tended to contain group- and project-relevant content. The various social media platforms were perceived differently and used for different purposes throughout the PBL stages, depending on the individuals, and their use was not persistent or variable due to positive, neutral or negative perceptions. It can also be concluded that real-time synchronous and collaborative platforms are important for facilitating students' group work and projects. In addition, the students perceived that a strongly focused group with good group dynamics benefits more from using social media than does a more unfocused group with an excessively friendly attitude.

Keywords: Social media, PBL group work, Tech students, Card sorting, Friendship pairs.

Type of contribution: PBL research

1   Introduction

It is well-known that students use social media platforms inside and outside the university context (Lau, 2017) and that such platforms are used inside and outside of PBL group work (Fonteijn & Dolmans, 2019; Ryberg, 2019). However, previous studies reported considerably divergent findings regarding the usefulness of social media within the PBL group work context, including positive, neutral and negative effects (Cheston, Flickinger & Chisolm, 2013; Lau, 2017). From a theoretical and methodological perspective, these divergent findings regarding social media use in PBL group work, including the difficulties of evaluating the effects, are quite interesting. Some reasons for the complexity of evaluating social media's effects on PBL group work might be found in the many variables present in the users, contexts, and

technology, as well as the rather complex perceptions, behaviors, and interactions between them. In previous studies, researchers mentioned some of the many variables' limitations (Lau, 2017; Lou et al., 1996; Ryberg, 2019). Some variables that could be considered within the context of evaluating social media's effects on PBL group work include e.g.: country, the university and its location(s), students' ages, gender, semester, cultures, languages, student diversity, study programs, fields of study, and PBL philosophies. Furthermore, the participants' individual motivations, presence, mental state, expectations, social skills, social relations, and involvement all differed in terms of learning and social media use. Given so many variables, it is very difficult to conduct comparative studies and provide generalized findings.

This study's background supplements the numerous previous studies aimed at investigating students' social media use in the PBL group work context. However, this study avoids the complex effect evaluation and instead evaluates the complexity of students' perceptions of various social media platforms' usefulness to their PBL group work. The study's research question is "What are tech students' perceptions of social media's usefulness within the PBL group work context?" In this study, tech students are defined as students enrolled in programs within the Technical Faculty of IT and Design at Aalborg University in Denmark. Almost all study programs at Aalborg University use the principles of the Aalborg PBL model (Barge, 2010; Kolmos, Bøgelund & Spliid, 2019). The tech students must complete group projects every semester in collaborative teams of two to seven students. The projects are assessed and account for half of the students' European Credit Transfer and Accumulation System (ECTS) points. From a philosophical and sociological standpoint, Aalborg University's PBL method also implies that the projects are unique, address real-life problems, involve new and complex tasks or problems, and extend beyond traditional organizations and knowledge (Barge, 2010; Kolmos, Bøgelund & Spliid, 2019).

Perceived usefulness is defined as the degree to which the students believe that utilizing social media platforms will improve their work performance, which is similar to how Davis (1989) defined usefulness within the technology acceptance model (TAM). The TAM approach was previously applied to confirm the acceptance and use of various information systems, including PBL and educational contexts (Bazelais, Doleck & Lemay; Park, 2009). Perceived usefulness is a complex construct, so it might not be possible to measure it directly; instead, researchers must rely mainly on inference. Perceived usefulness comprises affective (feelings), cognitive (beliefs), and behavioral (actual) actions. This is similar to how Baron and Byrne (1984) described attitudes toward specific persons, ideas, objects, or groups.

A social media platform is defined as an interactive software platform that facilitates the creation and exchange of user-generated content and for which users must create service-specific profiles and identities (Kaplan & Haenlein, 2010; Obar & Wildman, 2015). Furthermore, social media platforms are characterized by the development of online social networks by connecting a user's profile with the profiles of other individuals and groups (Obar & Wildman, 2015). This definition of social media encompasses a large suite of software, including messaging, video and photo sharing (e.g., Twitter, Snapchat, Instagram, Slack, Discord, Facebook, WhatsApp, Messenger, YouTube, Skype, and e-mails), forum, discussion board and blogging (e.g., reddit, LinkedIn, and Facebook), and management software (e.g., Trello, Asana, Google Drive, and Overleaf). This definition and typology is also similar to previous studies' approaches of social media (Lau, 2017; Obar & Wildman, 2015; Ryberg 2019).

2   Previous work

In some studies, social media platforms have been found to support interaction and synergy between personal and collective knowledge, including content generation (Ryberg, 2019). Through this supportive facilitation, social media platforms create new knowledge and support innovation within teams and PBL groups (McLoughlin & Lee, 2010; Razmerita & Kirchner, 2014; Ryberg, 2019). A large number of previous studies found that social media can support offline engagement inside and outside the university context

and had positive effects on factors such as integration, extracurricular activities, student retention, university communities, and student groups (Barnes, 2017; Gray, Chang & Kennedy, 2010; Heriberger & Harper 2008; Junco, 2012). Another positive effect of social media is found within PBL resource management, which includes storing, sharing, and annotating references, bookmarks, documents, and pictures (Bacon & Mujkic, 2016; Ryberg, 2019). Within academic and cocurricular discussions, social media has been found to have positive effects on grades and has led to higher levels of engagement (Junco, Heiberger, & Loken, 2011).

Researchers have also found that social media has negative effects, and does not facilitate offline interactions with peers (Berger & Wild, 2016). Furthermore, studies have shown that overinvolvement or hyperbonding through social media has adverse effects on academic performance (Al-Menayes, 2014; Junco & Cotton, 2012). Several studies' (Ravizza, Hambrick & Fenn, 2014; Junco & Cotton, 2012; Lau, 2017) results indicated that social media multitasking for nonacademic purposes while working correlates strongly with negative academic performance. Studies have also highlighted that social media can have highly addictive qualities that can result in non-productive student behaviors such as group absenteeism, sharing old exams and summaries via social media, or off-task behavior, resulting in peer groups that disrupt learning (Fonteijn & Dolmans, 2019). Some studies have also reported neither positive nor negative effects from social media use for academic purposes (Lau, 2017; Sendurur, Sendurur & Yilmaz, 2015).

3   Methods

The sampling method used was convenience sampling within the target group of tech students at Aalborg University's Copenhagen campus. The sampling took place in two rounds: April-May 2019 and November-December 2019. During both periods, students were close to completing their semester projects. This study was based on 45 tech students (38 male and 7 female) enrolled in PBL groups across various bachelor's degree programs. The 45 tech students were sampled from 15 groups of 4-6 students. Using friendship pairs (Bjørner, 2015a), each of the 15 groups selected three students to participate in study. The first data collection period included two groups from the ITCOM program and three from the medialogy program. All groups comprise fourth-semester bachelor's degree students. During the second data collection period, we sampled 10 groups of third- and fifth-semester bachelor's degree students. These included 6 medialogy groups, 2 sustainable biotechnology groups, and two manufacturing and operation engineering groups.

We provided all participants with anonymized ID numbers, and this study required no personal information. We applied special ethical considerations for this study in accordance with the ICC/ESOMAR International Code (ESOMAR, 2016) and used a specific checklist from the university for research-related data processing. Legal access, permission, and consent were made. We applied very special considerations when recruiting students for this study, such as ensuring that recruitment was not performed by a researcher whom the students knew and that the students were not enrolled in one of the researcher's courses. This ensured that they were not unduly pressured to cooperate with the research request. The informed consent form included a description of the study's aim and instructions for completing the study. In addition, it highlighted the right to withdraw at any time, as well as the right to refuse to answer the questions. We were very aware that interviewing students about their social media use within a group work context might bring up sensitive topics and potentially expose their emotions (Dickson-Swift, 2017; Lee, 1993) and PBL group work conflicts. Therefore, we considered it rather important to create a relaxed atmosphere in which the researchers and participants felt at ease (Lee, 1993). We ensured a high level of integrity, respect, and empathy while remaining professional.

3.1   Procedure

The procedure for all 15 groups of 3 students followed a semi-structured interview guide, and all interviews were performed using the friendship pairs method (Bjørner, 2015a). The friendship pairs method is a variation of the in-depth interview in which two to three participants who know each other well (family members are excluded) are interviewed together. Friendship pairs can provide advantages because they enable participants to feel more comfortable, thus facilitating a more open, spontaneous, and deep discussion (Bayley & Nancarrow, 1998). We used this method because it enabled participants to confer with one another and agree or disagree.

The semi-structured interview guide was divided into themes using five overall questions: 1. What do you consider the main strengths of the AAU PBL model? 2. What do you consider the challenges of group work? 3. How do you coordinate work in your group? What happens if not everybody is present? 4. What are the main distractions that emerge? 5. What can you say about the use of social media in your group?

Card sorting was performed using a coordinate system. The vertical axis had extremes labeled "Not Useful" and "Useful," and the horizontal axis has extremes labeled "Not Distracting" and "Distracting." The participants were then presented with cards or Post-it notes on which the researchers had written the names of various common social media platforms. The participants could also write their own social media platforms. The participants were then asked to arrange the various platforms using the coordinate system.

Figure 1: Example of participant arranging various social media platforms using the coordinate system

The card sorting method was used to provide more specific and in-depth interviews about social media by going from a potentially abstract level to more specific use. Within the coordinate system, the card sorting method was also used to identify the tech students' perceptions of the social media platforms' usefulness within the context of their PBL group work. During the card-sorting session, the participants were asked to elaborate on their card arrangements to facilitate further insightful discussion based on their thoughts.

3.2   Data analysis

The interviews were analyzed using traditional coding (Bjørner, 2015b) and content analysis. The interview data analysis followed four steps: organizing, recognizing, coding, and interpretation. The first step was to organize and prepare the data for analysis. The interviews were transcribed verbatim, and the visual materials (sorted cards) were catalogued. The next step was recognizing; transcripts were read several times by two researchers to establish the concepts and themes. This second step provided a general sense of the information and an opportunity to reflect on its overall meaning. The third step was coding, during which the researchers organized and assigned the data to categories and subcategories. The last step was interpretation, which included Creswell's (2014) question "What lessons have we learned?" as well as considerations of how students perceived the usefulness of social media within the PBL group work context

4   Findings

4.1   General perceptions of the PBL model and group work

There were various perceptions of the Aalborg PBL model and group work. However, most participants had positive attitudes and experiences. Some students mentioned the social and work-related aspects of the PBL model. In addition, the PBL model was perceived as helping students both better integrate into the study environment and prepare for future jobs in the labor market. The negative perceptions were mainly related to the specific group work. Several students mentioned that the project work could be very mentally demanding and time consuming and that working in a group of 4-6 people required many social skills and competencies. The majority of students recognized some pressure from the group work project. However, the majority also perceived this pressure as a motivation to study. It is interesting that the students were quite aware of the project's process and synthesis. The participants perceived pressure and an inherent requirement to be less distracted when approaching the project's due date. This also appeared to correlate with their social media use.

> *The distractions from social media go along with the project process. We tend to be much more distracted in the beginning—for example, when finding our problem—and when doing state-of-the-art research. We are more focused closer to deadline... I guess this also has something to do with the group's culture and what is expected and accepted. (ID34, Group 12)….Yes, which actually also caused some major conflict in our groups regarding how much we use social media and become distracted from the real project work, especially toward the end. (ID36, Group 13)*

In general, the students perceived considerable distractions from social media, and they wasted a great deal of time, but it is also interesting that this was considered part of group conflict and work culture management, as expressed by ID34 and ID36. It is also interesting that almost all groups mentioned the correlation of useful and non-distracting social media use with the importance of having a strongly focused group, strong leadership, and good group dynamics. In contrast, most groups also mentioned examples of and experiences with unfocused groups with excessively friendly attitudes, which led to more distracting use of social media.

> *When we don't have such a leader, people are pretty passive… (ID3, Group 1)*

> *Due to good group culture…when we get together, we are also more focused. (ID5 group 2)*

> *Someone in the group needs to set the standard and be the group leader. If this fails, we spend more time on playing games and other things we actually shouldn't do when getting together for group work. (ID22, Group 8)…Yes, I have tried this previously. The problem is also if the group's attitude is too friendly. We should, in general, be more focused when we are here and watch stupid videos or get on Steam when we are at home. (ID24, Group 8)*

> *If we spend less time on crap on social media here in the group room, we can avoid stress in the end. We could actually also go home earlier and get more leisure time….I don't know why we always end up spending so much time on Facebook and especially games.* (ID37, Group 13)

4.2   Social media's perceived usefulness

Based on the card sorting activity (Table 2), the participants arranged various social media platforms using the coordinate system. The numbers indicate how many individual students selected the specific card, and the bubbles' sizes represent these numbers. Students could choose to place the same social media platform in multiple locations using the coordinate system. The placement of the given platforms is a

synthesis of their general placement, which ranged from highly useful to not useful at all on the horizontal axis and from very distracting to not at all distracting on the vertical axis.
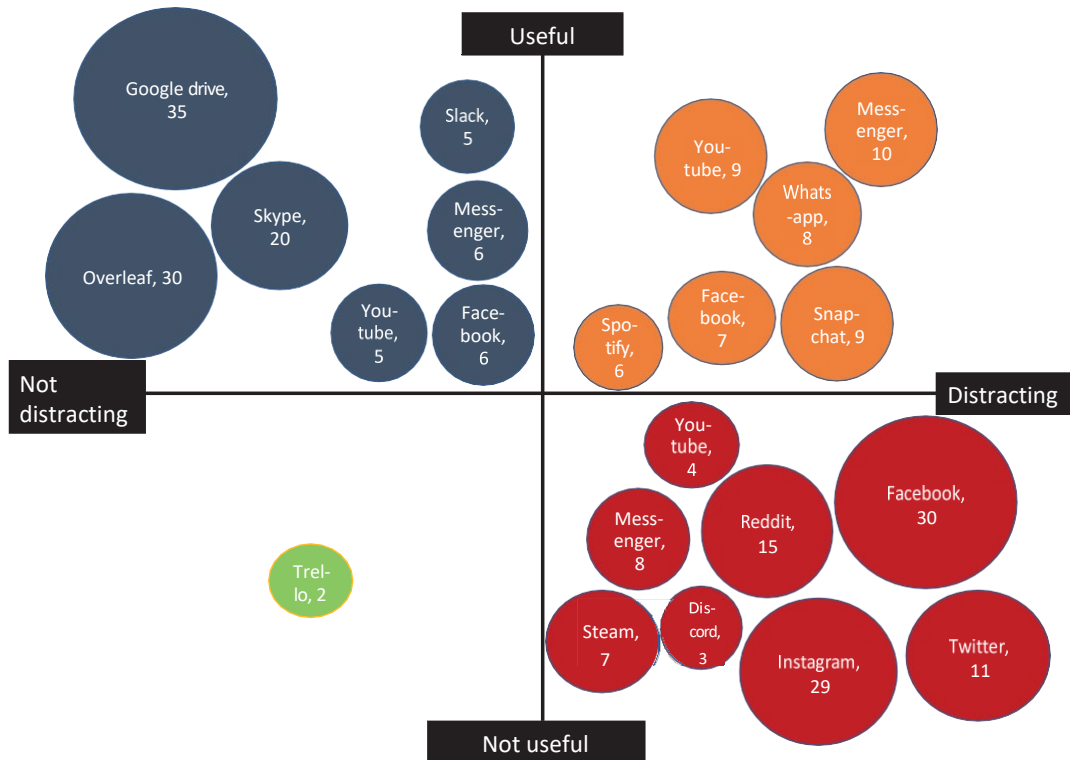

Figure 2: Aggregated social media positions within the coordinate system; n=45.

Most students positioned Google Drive (35 students) and Overleaf (30 students) in the upper left corner because they considered these platforms both useful and not distracting. In the interviews, students perceived these platforms as quite productive when used for group work. Google Drive and Overleaf might not be perceived as the most common or typical social media platforms, but they are interactive software platforms with specific associated profiles that enable students to create and exchange user-generated project content. The participants elaborated that they use Google Drive and Overleaf to leave comments for other group members and share documents, and that these platforms are not distracting because they involve only project-relevant content.

> I think Overleaf is good for giving feedback to each other, to see if something is missing or a reference…then you can leave a comment. (ID5, Group 2)

> Google Drive and Overleaf are good and not distracting, as they only cover project-relevant things. (ID16, Group 6)

> We use Google Drive not only as shared storage space for our various files and work-in-progress papers, but also to produce, use, and comment on files simultaneously (ID29, Group 10)…. In group work, it is pretty smart to access files, write in them, and comment on them at same time. (ID30, Group 10)

Google Drive was perceived more useful than Overleaf. Google Drive offers different features for internal collaboration and is perceived as a good shared folder manager, whereas Overleaf is perceived as a "Power tool that makes the project possible, enables us to print the project" (ID3, Group 1), and "helps us get a

good overview of the project" (ID5, Group 2). It is also interesting that Skype, similar to Google Drive and Overleaf, is perceived as useful and not distracting. Skype is used when holding meetings and coordinating to include students who cannot be physically present. It is also used to share links.

Skype is very useful if you're sick and have to be at the group meeting. (ID6, Group 2)

We use Skype during our group meetings to share and send links, including Google docs links. It's faster than e-mail, and everybody in the group can follow instantly. (ID17, Group 6)

However, some students perceived Overleaf as a bit more difficult to use, less user friendly, and requiring a "programmer's brain" (ID14, Group 5). Some students mentioned that they lacked technical support and better overviews of social media platforms for managing their project work, as well as common standards for project writing, on the platforms they used.

I know that some groups are using Asana as a project management tool, and they have spoken about it very positively. I don't know the details, but in general, we lack a better overview and sometimes also help using Overleaf. (ID33, Group 11)

We are left a bit alone regarding how to use social media platforms in a good, academic way. The supervisors must have some experience from their own projects. (ID22, Group 8)

Thirty students perceived and positioned Facebook as both distracting and not useful. However, they provided mixed elaborations on this position. Seven students considered Facebook useful and distracting, but 6 students labeled it useful and not distracting. Facebook was perceived as the primary group coordination platform by 10 out of 15 groups. There seemed to be some omnipresent coordination habits regarding the use of Facebook, and there were both positive and negative perceptions of Facebook use within the group work context.

Facebook, for us, is used for messaging…it could be substituted, and we could use Slack instead… but because of the network effect, I signed up for Facebook. (ID3, Group 1)

Even though Facebook was the most used platform for group coordination, the participants were also very conscious of the distractions that Facebook might cause because it contains a great deal of non-project-specific content. One participant (ID3, Group 1) had a browser extension that blocked Facebook from his PC. Another regarded Facebook as "an awful time killer that I'm addicted to" (ID1, Group 1).

Facebook works because everybody uses it. (ID40, Group 14)

There are also events at Aalborg University that posted on Facebook. It is the main source for these events. (ID4, Group 2)

The university also uses Facebook for communication. It is distracting because the content is not group- and project-relevant. However, the content is also useful. There is also student-relevant information on Facebook, but of course, there is also lots of other very useless content…. Maybe the university should use Moodle or other channels for communication. (ID26, Group 9)

All 15 groups used social media for group coordination. Messenger, WhatsApp, Snapchat, and Facebook were used in very dynamic and different ways within the groups. All social media platforms were perceived as useful if they contained group- and project-relevant content. However, if the content lay outside the academic context, it was perceived as not useful and distracting. Some students perceived Snapchat as a useful platform for quick communication management and sending reminders to other members. Interestingly, Snapchat was used in some groups to emotionally support group members using emotional snaps. Twitter in general was perceived only as a distracting platform that was not useful, even though Twitter could be used for group coordination and communication like Messenger, WhatsApp, Snapchat, and Facebook. However, among this study's participants, very few used Twitter for academic or group management purposes. Discord, Steam, and Instagram were also perceived as not useful and distracting,

and several participants used the same wording as "there is no project-relevant use" (ID13, ID14, Group 5; ID22, Group 8; ID33, Group 11).

YouTube, like Facebook and Messenger, was perceived differently among the students. Nine students perceived YouTube as useful and distracting, and five students perceived it as useful and not distracting.

> *YouTube is actually a very good platform for ideas, especially for how to do things with statistics, programming, rendering videos, etc. (ID25, Group 9)…True, and it is sometimes also used for TED talks and other relevant stuff. (ID26, Group 9)*

> *YouTube can be good for ideas and introducing some content, but there are also lots of irrelevant videos, which makes YouTube rather distracting as well. (ID41, Group 14)*

Some students used Spotify to focus on work and used headphones to avoid disturbing other group members. However, students also stated that loud volume could sometimes affect others' work performance. Students could choose pre-determined cards and write their own. Steam, Discord, Trello, Slack, and Spotify were listed by the participants. However, it is interesting that others, such as Moodle and Dropbox, were absent.

5 Conclusion

Previous studies identified the benefits of social media within the PBL group work context, the strongest of which include the following: a better perception of group work, support for offline engagement, interaction support, group synergy and content generation support, improved knowledge exchange, and group and resource management facilitation. However, social media platforms were also reported to have negative consequences such as distraction, negative group performance, non-productive student behavior, obsession over one's self image, and negative correlation with academic performance.

All participants in this study used social media platforms for group coordination. Messenger, Skype, WhatsApp, Snapchat, and Facebook were all used in rather dynamic, changeable, and different ways within the groups. As in other studies (Ravizza, Hambrick & Fenn, 2014; Junco & Cotton, 2012; Lau, 2017), we found that if a social media platform was used for non-academic purposes and contains non-project- relevant content, it was perceived as not useful and distracting. However, social media platforms were perceived as useful if they contained group- and project-relevant content. We also found that the students perceived that having a strongly focused group with good group dynamics led to more benefits from using social media than did a more unfocused group with an excessively friendly attitude.

Based on this study's results, various social media platforms are perceived to have different purposes at different PBL stages, depending on individual use, and their use was not persistent or variable due to positive, neutral or negative perceptions. In addition, real-time synchronous and collaborative platforms are important to supporting students' group work and project facilitation. Google Drive, Overleaf, and Skype are perceived as useful and not distracting. They are part of the PBL learning synthesis process and function mainly as project writing and management platforms.

The findings from this study can serve as a reminder that today's students have grown up with social media multitasking. With a balanced facilitation, social media within PBL group work can be adopted to improve group collaboration. Furthermore, our findings also highlight that social media can be used to motivate students to learn and reinforce project materials, including literature and selected content for student supervision. However, for both ethical and didactic reasons, differentiated access is needed, separating students' internal communication and work and the academic teachers' access for e.g. student supervision.

In this study, we find the structured qualitative card sorting is a good method for encouraging participants to talk about the rather abstract topic of the usefulness of social media within the context of their PBL

group work. However, we recognize a limitation of this study is based on our only qualitative approach with participants enrolled in few bachelor's programs. In future studies, researchers can use the card sorting method with more participants for a longer period of time. To increase the validity and provide a more comprehensive data foundation, this study can be supplemented with a quantitative approach to gain knowledge of what and how many types of social media each student has used, as well as their social media time spent within specific PBL tasks. Observations of the actual social media usage during group work may also be of interest. However, within the observational approach there is some additional ethical concerns and potential participant bias that would need to be addressed.

6   References

Al-Menayes, J. 2014. The relationship between mobile media usage and academic performance in university students. *New Media and Mass Communication*, **25**, 23-29.

Bacon, L., & Mujkic, E. 2016. WEB 2.0: How social media applications leverage nonprofit responses during a wildfire crisis. *Computers in Human Behavior*, **54**, 589-596.

Baron, A. & Byrne D. 1984. *Social Psychology: Understanding Human Interaction*, 4th edn. Boston: Allyn and Bacon inc.

Barge, S. 2010. *Principles of problem and project based learning: The Aalborg model*. Aalborg, Denmark: Aalborg University

Bayley, G. & Nancarrow, C. 1998. Impulsive purchasing: a qualitative exploration of the phenomenon. *Qualitative Market Research: An International Journal*, **1**(2), 99-114.

Barnes, N. 2017. Navigating social integration into university on Facebook: Insights from a longitudinal study. *Student Success*, **8**(1), 1-11.

Bazelais, P., Doleck, T., & Lemay, D. J. 2018. Investigating the predictive power of TAM: A case study of CEGEP students' intentions to use online learning technologies. *Education and Information Technologies*, **23**(1), 93-111.

Berger, D., & Wild, C. 2016. Turned on, tuned in, but not dropped out: Enhancing the student experience with popular social media platforms. *European Journal of Law and Technology*, **7**(1), 1-14.

Bjørner, T. 2015a. Data collection. In: Bjørner, T. (Ed.). Qualitative Methods for Consumer Research: The value of the qualitative approach in theory and practice, 57-96. Copenhagen: Hans Reitzel.

Bjørner, T. 2015b. Data analysis and Findings. In: Bjørner, T. (Ed.). Qualitative Methods for Consumer Research: The value of the qualitative approach in theory and practice, 97-106. Copenhagen: Hans Reitzel.

Cheston, C. C., Flickinger, T. E., & Chisolm, M. S. 2013. Social media use in medical education: A systematic review. Academic Medicine: *Journal of the Association of American Medical Colleges*, **88**(6), 893-901.

Creswell, J.W. 2014. *Research design: qualitative, quantitative and mixed methods approaches*. 4th ed. London, UK: Sage Publications

Davis, F.D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, **13**(3), 319-340.

Dickson-Swift, V. 2017. Emotion and sensitive research. In: Liamputtong, P. (Ed). *Handbook of Research Methods in Health Social Sciences*, 1–18. Singapore: Springer

ESOMAR. 2016. ICC/ESOMAR contents international code on market, opinion and social research and data analytics. Retrieved from https://www.esomar.org/what-we-do/code-guidelines

Fonteijn, H. T. H & Dolmans, D. H. J. 2019. Group Work and Group Dynamics in PBL. In: Moallem, M., Hung, W. & Dabbagh, N. (eds.). *The Wiley Handbook of Problem-Based Learning*. Hoboken, NJ, USA: John Wiley & Sons, Inc.

Gray, K., Chang, S., & Kennedy, G. 2010. Use of social web technologies by international and domestic undergraduate students: implications for internationalizing learning and teaching in Australian universities. *Technology Pedagogy and Education*, **19**(1), 31-46.

Heriberger, G., & Harper, R. 2008. Have you Facebooked Astin lately? Using technology to increase student involvement. *New Directions for Student Services*, **2008**(124), 19-35.

Junco, R. 2012. The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. *Computers & Education*, **58**(1), 162-171.

Junco, R., & Cotton, S. R. 2012. The relationship between multitasking and academic performance. *Computers & Education*, **59**(2), 505-514.

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.

Kaplan, A. M., & Haenlein, M. 2010. Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, **53**(1), 59–68.

Kolmos, A., Bøgelund, P. & Spliid, C. M. 2019. Learning and Assessing Problem-Based Learning at Aalborg University: A Case Study. In: Moallem, M., Hung, W. & Dabbagh, N. (eds.). *The Wiley Handbook of Problem-Based Learning*. Hoboken, NJ, USA: John Wiley & Sons, Inc.

Lau, W. W. 2017. Effects of social media usage and social media multitasking on the academic performance of university students. *Computers in human behavior*, **68**, 286-291.

Lee, R. M. 1993. *Doing research on sensitive topics*. London, England: Sage.

Lou, Y., Abrami, P. C., Spence, J. C., et al., 1996. Within-class grouping: A meta-analysis. *Review of educational research*, **66**(4), 423-458.

McLoughlin, C. and M.J.W. Lee. 2010. Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, **26**(1), 28-43.

Obar, J. A. & Wildman, S. 2015. Social media definition and the governance challenge: An introduction to the special issue. *Telecommunications Policy*. **39** (9): 745–750.

Park, S. Y. 2009. An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, **12**(3), 150-162.

Ravizza, S.M., Hambrick, D.Z., & Fenn, K.M. 2014. Non-academic internet use in the classroom is negatively related to classroom learning regardless of intellectual ability. *Computers & Education*, **78**, 109-114.

Razmerita L. & Kirchner K. 2014. Social Media Collaboration in the Classroom: A Study of Group Collaboration. In: Baloian N., Burstein F., Ogata H., Santoro F., Zurita G. (eds). *Collaboration and Technology*. CRIWG 2014. Lecture Notes in Computer Science, 279–286: Springer, Cham.

Sendurur, P., Sendurur, E., & Yilmaz, R. 2015. Examination of the social network sites usage patterns of pre-service teachers. *Computers in Human Behavior*, **51**, 188-194.

Ryberg, T. 2019. PBL and Networked Learning: Potentials and Challenges in the Age of Mass Collaboration and Personalization. In: Moallem, M., Hung, W. & Dabbagh, N. (eds.). *The Wiley Handbook of Problem-Based Learning*. Hoboken, NJ, USA: John Wiley & Sons, Inc.