amee
MedEdPublish

Original article　　　　　　　　　　　　　　　　　　　**Open Access**

Tutors' perceptions of use of tablet computers in PBL sessions

Maria Sundvik[1], Teemu Masalin[2], Heikki Hervonen[3]

Corresponding author: Dr Maria Sundvik teemu.masalin@helsinki.fi
Institution: 1. University of Helsinki, Faculty of Medicine, 2. University of Helsinki, Faculty of Medicine, 3. University of Helsinki, Faculty of Medicine
Categories: Teachers/Trainers, Teaching and Learning, Technology

Abstract

New mobile technologies have reached the classrooms and are opening new possibilities but also setting new demands to the teaching personnel. We studied tutors' attitudes, perceptions and experiences on the use of tablet computers in preclinical problem-based learning (PBL) sessions by using a mixed method with questionnaire and interviews. The main finding was that both the students and the tutors used tablet computers in diverse ways. The basic structure of PBL sessions was not disrupted, but the teachers observed device-induced changes in the group dynamics. Information retrieval and checking was faster than before. Collaboration between the students increased, when digital whiteboard application on the tablet computer was used in brainstorming, and at the same time, the role of secretary was diminished. Adverse incidents were few and mainly technical in nature.
To summarize, the new era with mobile technology is here to stay and both tutors and students embrace it.

Keywords: PBL, tablet computer, communal learning, tutor, mobile technology, learning

Article

Background

Tablet computers and their predecessors, personal digital assistants (PDA), have been used in both clinical practice and medical teaching successfully (Davies et al., 2012; Luanrattana, Win, Fulcher, & Iverson, 2012; Treadwell, 2006). These devices operate in mainly four fields: clinical-log, reference, communication and personal information management (Luanrattana et al., 2012). With the advance of mobile technology and especially the invasion of smartphones and tablet computers during the last decade, many medical schools have incorporated these devices into the medical curriculum (George et al., 2013). This technology offers wireless and flexible access to large amount of medical information worldwide and offer also the possibility to carry around a large amount of information in the form of digital notes, textbooks videos, etc.

Mobile technology in teaching has been assessed earlier from the student's point view, and in general the students find the devices helpful (Davern et al., 2014; Nuss, Hill, Cervero, Gaines, & Middendorf, 2014; Ortega-Rivas, Saorin, de la Torre, & Elsheikha, 2013). Medical Faculty at University of Helsinki launched a tablet computer project in 2013 as a part of its digitalization and mobile learning strategy. All the first year medical and dental students received a personal tablet computer. Also the main textbooks and lecture notes were offered in digital format. We have reported earlier that students have taken the tablet computers readily in use in their studies (Hervonen, Masalin, Selänne, & Viranta-Kovanen, 2013; Pyörälä, Romanov, Masalin, & Hervonen, 2015).

Initially, many of the teachers expressed their worries and doubts about the idea of students using tablet computers during problem-based learning (PBL) sessions (Silenti & Masalin, 2014). Teachers consider PBL as an ambitious method aiming to improve the critical reasoning of students (Neville & Norman, 2007; Scaffa & Wooster, 2004). Tutor's task is to guide the group of students through a process of seven steps (clarifying terms; defining the problem; brainstorming; structuring and hypothesis; learning objectives; searching for Information; synthesis), where the four modern insights into learning materialize: constructive, self-directed, collaborative and contextual (Dolmans, De Grave, Wolfhagen, & van der Vleuten, 2005). There is a clear gap in knowledge when considering how teachers experience the invasion of technology in teaching. Hence, we decided to study the perceptions, experiences and attitudes of the teachers in the new situation when all the students and all the tutors use tablet computers in PBL sessions.

Methods

Tablet computer

A generous grant from Jane and Aatos Erkko foundation (http://www.jaes.fi/en/ visited October 1st 2015) made it possible to provide tablet computers to all the first year medical students and their teachers during 2013 and 2014. Students and teachers also received the main textbooks covering the first year as Inkling books (Inkling Systems, Inc), including the textbook used on the course in this study. An overwhelming majority of medical and educational applications were available for iPad (Apple Inc.) in 2013, than for other tablet computers. This was the main reason to choose iPad as the mobile device in teaching and learning in our faculty.

Students and course

The students were studying on Cell Biology and Basic Tissues course (6,6 credits; 8 PBL-cases). They had studied two previous courses using PBL method and had the experience of 11 PBL cases. The class of 170 students was divided into 18 small-groups for PBL sessions. PBL has been used as teaching method at the Faculty of Medicine at the University of Helsinki for more than 20 years. Immediately after receiving the devices, the students were familiarized with iPad to find the basic functions they already mastered with other devices (Hervonen et al., 2013). During next few weeks, 13 classes were arranged to introduce study applications. This training was organized and offered in addition to the standard Information and Communication Technology Driving License (3,0 credits). In principle, students had total freedom to use tablet computers in PBL sessions. The tutors were, however, instructed that they should give instructions and order limitations, if the key processes of PBL session would be disturbed by excessive or irrelevant use of the devices.

Participants

The teachers (9 in 2013 and 6 in 2014) participating in the study were substance specialists and were

specially trained for PBL tutoring. All tutors studied had at least two years of experience of tutoring PBL sessions in this course. Each tutor guided the same group or groups during the whole course. The roles of students as chairman and secretary rotated from case to case.

All tutors received a personal iPad and all tutors were trained for the basic uses of iPad (including internet, mail, note making, camera). Tutors were also familiarized to using educational applications like Inkling-books and iBook, as well as utilizing wireless data transfer using AirDrop or Airplay connected to AppleTV-monitor system. Altogether 14 separate occasions were arranged for the teachers to gain and develop their tablet computer skills.

Study design and data collection

We used a mixed method to study the perception of tutors to get both quantitative and qualitative results. The power of this method has been described earlier (Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2005), i.e. we used both electronic questionnaires and focus interviews to assess the perceptions of teachers.

A web based questionnaire was presented to tutors both at the beginning and at the end of the course in 2013 and 2014. The first questionnaire enquired the attitudes of the teachers towards the use of iPad and their perception on their own competence as a tutor on this particular subject matter. In 2013 the questionnaire comprised of four open-ended questions and seven statements placed on a 5-point Likert-like scale. In 2014, one additional open-ended question and two more statements were added in the questionnaire. This is why the results from the two years cannot be combined.

The questionnaire at the end of the course consisted of five questions on teacher's attitudes, 11 statements on teacher's ways of using iPad and 11 statements on how students used iPads. Identical forms were used both in 2013 and 2014. Most of the tutors answered the questionnaire, in 2013 9/10 and in 2014 6/11.

Focus group interviews were made after the 2014 course with four of the tutors at the end of the follow-up period, to get a qualitative view of the perceptions. These tutors had returned the questionnaire both years and had at least two years of previous experience of tutoring on this course. The results from the questionnaire were shown to the interviewees and 12 questions were presented to clarify their meaning. The tutors discussed the questions and answered as a group.

The study performance of the students was monitored by routine formative assessment comprising of standard sets of 10 true/false statements in closing session of each of the cases. During the assessment, all use of mobile devices was forbidden. The results of the whole student cohort were compared to those of the previous years.

Data analysis

The number of tutors tutoring in one particular course is small. Therefore the sampling of this study stays under the limit of reasonable statistical analysis and the numerical data was confirmed by interviews.

Results

The questionnaires

At the beginning of the course, tutor's attitudes towards the use of tablet computers in teaching were very positive or positive. The tutors were then asked about their prior use of iPads. All tutors were familiar with the use of iPads and had acquainted themselves with the device before the course started. The tutors were also confident or confident to some extent that they mastered the material they were teaching and that they also were able to teach difficult concepts.

In the second survey, we enquired about the tutors' own perceptions of the tablet computer (Figure 1) on

a dichotomized scale. In 2013 all and in 2014 all but one of the teachers took the time to familiarize themselves with the Inkling book. Most of the teachers used the tablet computer many times every day but some only once a week or less. In 2013 all and in 2014 all but one of the teachers used iPad to find information or teaching materials. One third of the teachers were actively promoting the use of iPad for drawing pictures, sharing notes and pictures through AppleTV-connection, utilizing new applications and exploiting web-dictionary. Rest of the tutors settled for a more passive role in respect to technology. Interestingly, the active teachers themselves, in turn, got guidance from the students to use new applications. These results obtained in 2014 were identical with those from the questionnaire in 2013.
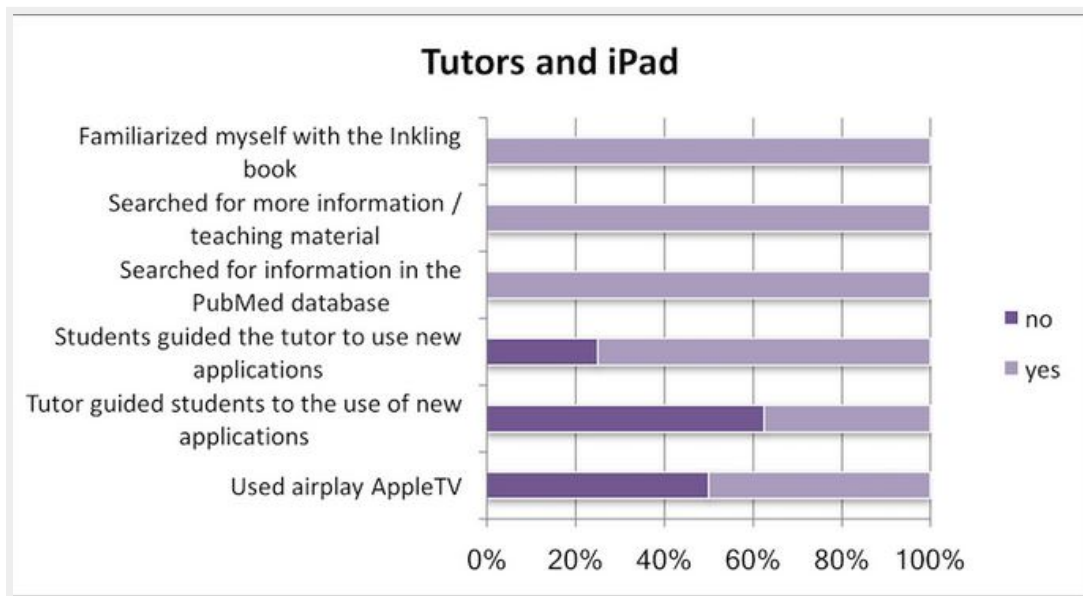

Figure 1. Results on how teachers used iPads. These results are from second questionnaire in 2013. Next we asked the tutors how the students used their tablet computers in PBL session (Figure 2). All the students brought the iPad containing the electronic textbook to the PBL session, but only a few of the students brought also the paperback book. Students formed own groups in social media. Teachers further observed that students readily adapted new applications and new technology, including wireless AppleTV-connection to TV-screen. Consistent data on these subjects were gathered in both 2013 and 2014.
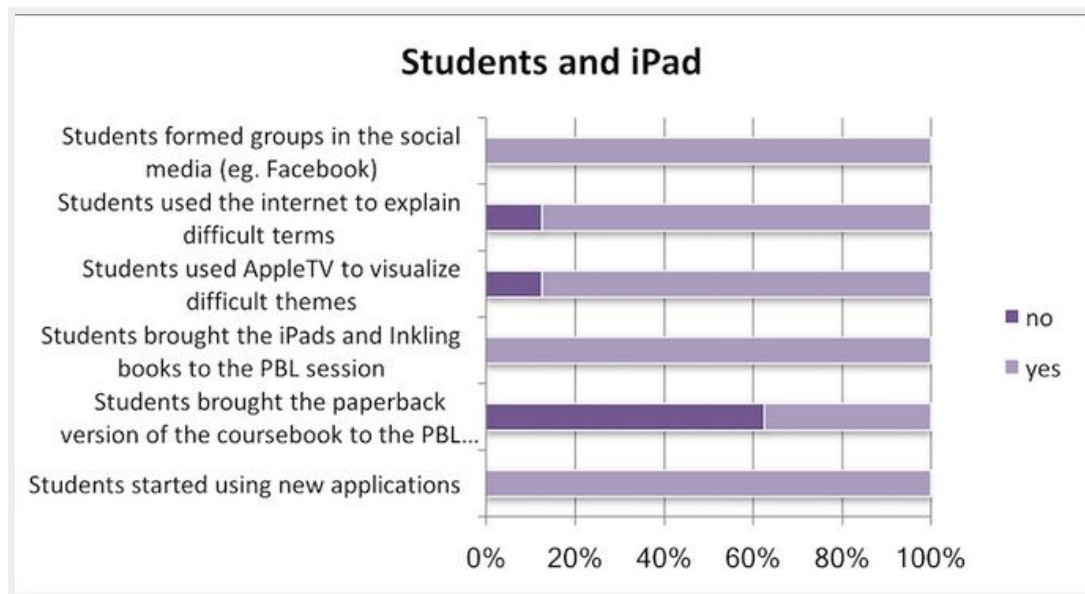
Figure 2. The use of tablet computer in PBL sessions by students. From the 2013 survey.

A variation was observed in the way brainstorming was conducted in 2013 and 2014 cohorts. In 2014 teachers noted that students preferred the traditional way of brainstorming with using post-its on the board, but in 2013 almost all students started using electronic whiteboard application for structuring the opening of the PBL case.

The last series of statements concerned the effect of tablet computer on the dynamics of the PBL group function (Figure 3) and were evaluated with a 5-point Likert-like scale. The use of tablet computer did not seem to affect the overall learning or the study performance of the students. This was verified by the collective results of the whole course from the formative assessments in the PBL sessions: the extra points obtained for the final grade were on the same level as in previous years. Tutors did not observe any major change in the student's way of participating in or following the conversation. Teachers strongly contradicted the statements, that the students irrelevantly used the internet during the PBL session or that they did not stick to the subject. In 2013 teachers did not either agree with the claim that the students couldn't recall the studied subject from memory but in 2014 half of the teachers agreed somewhat with the statement. In other respects the results from both cohorts were similar.
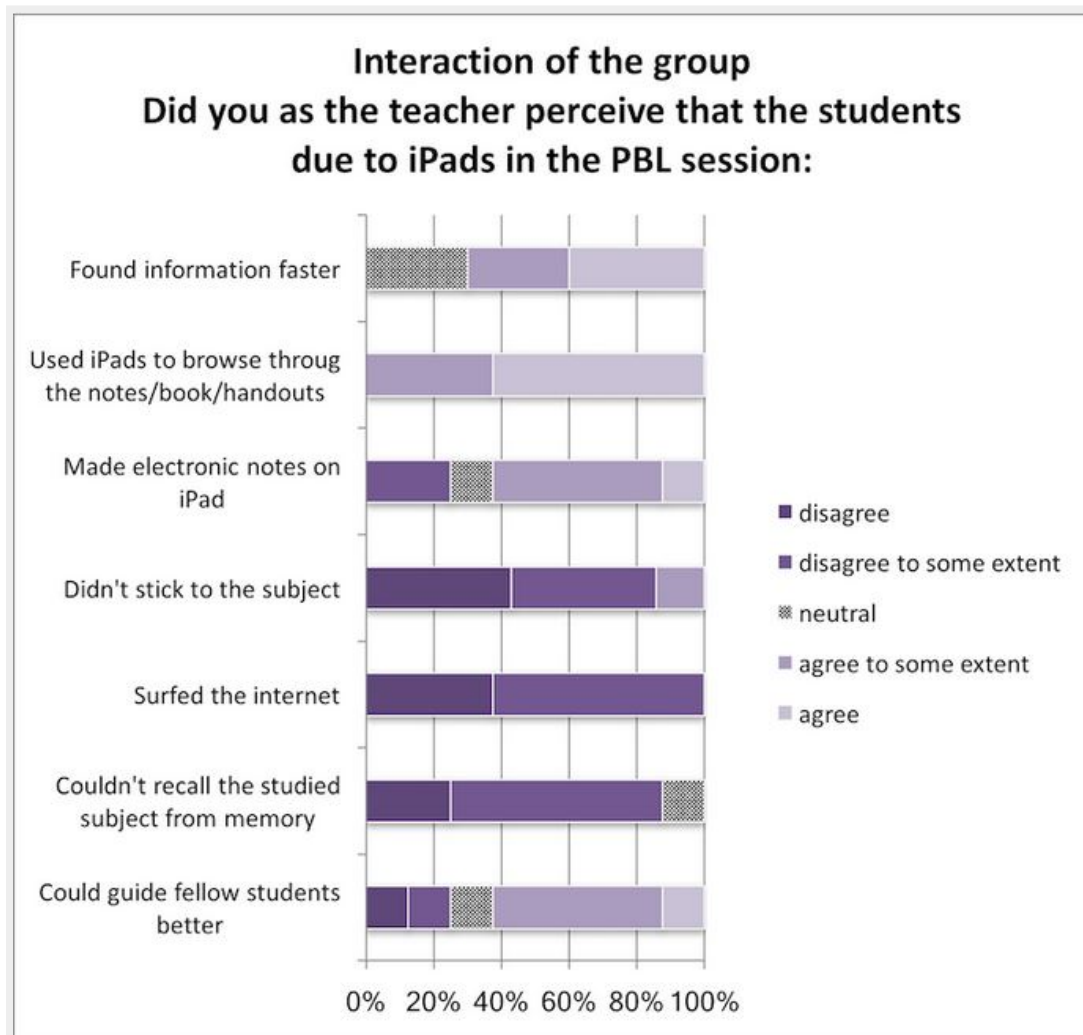
Sundvik M, Masalin T, Hervonen H
MedEdPublish
http://dx.doi.org/10.15694/mep.2016.000032

Figure 3. The effect of tablet computers on the group dynamics as observed by the tutors. These results are from the 2013 survey.

Tutors claimed that they had observed tree positive tendencies. (1) The students seemed to find missing information faster than before, (2) they used tablet computers to browse through the notes, handouts and textbooks, and (3) they actively made electronic notes.

Finally, the tutors were asked to list three main advantages of the iPads in PBL sessions. These were unanimously: taking notes, reading the course textbook and searching for information. In all aspects the use of mobile devices improved the PBL sessions, as none of the tutors had negative perceptions about the use of iPads. The results from 2013 were corroborated in the answers from the questionnaire in 2014.

The interview

Firstly, the interviewees in the focus group interviews agreed on, that the questionnaires were justified and covered relevant issues concerning actions and processes in PBL sessions. In their opinion, the results from the questionnaire represented the general and common view of the tutors.

From the teacher's point of view the process of seven steps of PBL advanced similarly as before the iPad project. The teachers confirmed that in general there was more interaction within the PBL group than in the previous years. Teachers observed a change in the role of secretary, when a collaborative whiteboard-application was used and the whole group could participate in arranging the ideas. However, the role of the student chairman remained the same, and tutors did still have to act as facilitator, guide

and pilot.

Teachers brought up that it was easier for the students and tutors to carry around all the needed learning and teaching material, from own notes to electronic books in the iPad. Preparation for teaching was easier for the tutors as they have all the material in one device. Moreover, information was more easily available via the tablet computer and hence the students also found the information faster.

Students did use internet connections during the PBL sessions, but mainly to verify specific fact or a meaning of a word. Only in some occasions instruction was needed. Students only rarely used iPads in adverse ways during PBL session (e.g. irrelevant use of social media, or unproductive browsing of databases). Tutors agreed that the use of internet during PBL session was rarely disturbing.

The teachers expressed, that the new technological advances have brought totally new elements into the interaction with the students, which challenges the teacher's competences in a new way. They found the changes in principle positive, but also pointed out that they needed more training on the use on equipment and software. As an example, tutors longed for a convenient drawing application, when they discussed cell and tissue structures.

The negative experiences with the mobile device in PBL sessions were mainly technical. There were problems with internet connections. Opening and logging into the applications proved in many cases laborious. Valuable contact teaching time was spent on dealing with these issues.

The main conclusion from the interview was that none of the tutors wanted to go back to teaching without tablet computer. When tutors were asked how they would advise a new teacher for tutoring the answer was that the tutor should make sure that i) there is genuine discussion, ii) the tablet computer should not be used for information search during the brainstorming, and iii) the mobile device should indeed be used when the newly learnt material is processed and presented in final session of each case.

Discussion

The teachers expressed that the tablet computers, have brought the new technology into the classrooms and the teaching and learning environment has markedly changed also within PBL session. This has brought up challenges, which the tutors should face. Many of the tutors found their command of the tablet device and its software at best tolerable. Therefore it was pleasing to notice, that the students willingly helped the teachers to keep up. The benefits of the development of adopting were recognized in this study, but teachers also expressed their increasing demand for wider and deeper training to find the best uses of the technology. It is therefore important, that when adopting new technology both the students and the teachers get proper support and training on use of the mobile device, associated equipment and the applications.

In spite of gaps in mastering the new device, tutors were in general very positive about the trend to update the curriculum with new technology. The tutors found that the students performed well in PBL and the use of tablet computer helped the learning process. Teachers emphasized the obvious advantages of tablet computers: light weight, fast opening and functions, internet connection and storage of all the necessary learning materials within the device. The portability of iPads and all the data within (books, notes, etc.) has earlier been reported as an important feature (Archibald et al., 2014). The same study found that apps are the most useful resource (Archibald, Macdonald, Plante, Hogue, & Fiallos, 2014) and another one (Bullock, 2014) pointed out that students used social media to form study groups. Our observations support all these views. However, it depends on the user, environment, process and object of study what recourse is the most valuable.

The overall structure of the PBL session was not affected by the introduction of the tablet computer.

However, some changes were noticed in group dynamics, especially in the way the brainstorming was conducted. When the group used tablet computer and its collaborative whiteboard application the role of secretary was diminished when everybody in the group, in addition of bringing forward ideas, could also actively participate in constructing the explanation model for the case. This was the point where group dynamics was especially positively affected by the use of the devices in the PBL session. Teachers considered that with mobile device the students were able to find information faster than before in the PBL session, which in turn might contribute to more comprehensive covering of the subject. On the other hand, in 2014 half of the teachers agreed that students could not recall the studied subject, which might suggest that students have a tendency to rely on efficient outside recourses. This challenges us teachers to think over our learning goals: shouldn't we foster and encourage profitable use of mobile devices since they are already everywhere?

Initially, we made the decision not to prevent or limit the use of tablet computer or internet during the PBL session. The expectations were therefore, that the use of internet during PBL session might become excessive and disturbing for the learning processes. One of the main findings was, that students did indeed use, as expected, the internet during the PBL sessions. The answers from the questionnaires and the interview emphasized, however, that internet was used mainly for information search. As observed by the tutors, students only rarely used iPads for irrelevant issues during PBL session, e.g. use of social media, or unproductive browsing of databases.

One concrete concern expressed at first by the teachers was, that students would use the brand new gadgets in irrelevant ways, like playing games, hanging in social media or watching sports or movies. From other studies within this iPad project, we know that most of the students are already at this point of their studies skilled users of various fun and recreational applications (Masalin, Pyörälä, Romanov, & Hervonen, 2015). However, our teachers did not observe any of these disturbing the PBL sessions. Our first assumption is that students appreciate the learning opportunity so much that they don't want to waste it. Secondly, students might fear that the tutor would fail them if they would stray too much from the subject.

It is not all charm with technology and tablet computers. Teachers reported that a lot of time was lost because of insufficient capacity of WiFi-network that was needed for internet connection, for AirPlay to AppleTV-monitor-equipment and for the whiteboard application. There were also problems in opening, logging in and running of some applications. These technical issues, even if as such minor, could become quite disturbing in the middle of intensive discussion. These observations emphasize that it is fundamentally important to make sure that the technical environment is tested to meet the requirements and that the users are familiar with the applications, which will be used.

The major limitation of this study was the small number of teachers studied, which made it impossible to do statistical analysis on the acquired material. To increase the reliability of our observations we followed-up for two consecutive years (2013 and 2014), and we made focus group interview to ensure common understanding of the teacher's perceptions. Triangulation of the quantitative and qualitative results supported each other and suggested that the findings were consistent and valid. As with all the findings and research on the use of tablet computer in teaching, also the findings in this study have to be taken with some caution, as there might be a "hype" associated with the advancement in technology (Luo, Chapman, Patel, Woodruff, & Arora, 2013).

Take Home Messages

The take home message that we found in the interview is the following: the tutor should make sure that i) there is genuine discussion, ii) the mobile device is not to be used for information search during the brainstorming session, and iii) the mobile device should indeed be used when the learnt material is processed and presented. Taken together, this study shows that the tutors find the use of tablet computer as a positive new avenue in medical education.

Notes On Contributors

Maria Sundvik (PhD), is a postdoctoral researcher at the Medical Faculty with interest in developing pedagogic skills further. Completed a teacher's degree in biology and geography in 2008 and has afterwards studied university pedagogics.
Teemu Masalin (MSc), is a IT Specialist at the Medical Faculty and undergraduate student working towards his PhD in pedagogics.
Heikki Hervonen (MD, PhD), is a docent and university lecturer at the Medical Faculty and a founding member of Teachers´ Academy at University of Helsinki.

Acknowledgements

Bibliography/References

Archibald, D., Macdonald, C. J., Plante, J., Hogue, R. J., & Fiallos, J. (2014). Residents' and preceptors' perceptions of the use of the iPad for clinical teaching in a family medicine residency program. BMC Med Educ, 14. doi: Artn 174.

http://dx.doi.org/10.1186/1472-6920-14-174

Bullock, A. (2014). Does technology help doctors to access, use and share knowledge? Medical Education, 48(1), 28-33.

http://dx.doi.org/10.1111/medu.12378

Davern, M. S., Sandsmark, E., Schwan, J., Ayres, L., Mehner, L., Gilmer, R., Taylor, M. (2014). Mobile learning: students' novel approach to practice problems. Medical Education, 48(11), 1106-1107.

http://dx.doi.org/10.1111/medu.12553

Davies, B. S., Rafique, J., Vincent, T. R., Fairclough, J., Packer, M. H., Vincent, R., & Haq, I. (2012). Mobile Medical Education (MoMEd) - how mobile information resources contribute to learning for undergraduate clinical students - a mixed methods study. [Research Support, Non-U.S. Gov't]. BMC Med Educ, 12, 1.

http://dx.doi.org/10.1186/1472-6920-12-1

Dolmans, D. H. J. M., De Grave, W., Wolfhagen, I. H. A. P., & van der Vleuten, C. P. M. (2005). Problem-based learning: future challenges for educational practice and research. Medical Education, 39(7), 732-741.

http://dx.doi.org/10.1111/j.1365-2929.2005.02205.x

George, P., Dumenco, L., Dollase, R., Taylor, J. S., Wald, H. S., & Reis, S. P. (2013). Introducing technology into medical education: two pilot studies. Patient Educ Couns, 93(3), 522-524.

http://dx.doi.org/10.1016/j.pec.2013.04.018

Hervonen, H., Masalin, T., Selänne, L., & Viranta-Kovanen, S. (2013). Student attitudes and use of tablet computers in medical education in Helsinki. Paper presented at the An International Association For Medical Education.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educational Researcher, 33(7), 14-26.

http://dx.doi.org/10.3102/0013189X033007014

Luanrattana, R., Win, K. T., Fulcher, J., & Iverson, D. (2012). Mobile technology use in medical education. J Med Syst, 36(1), 113-122.

http://dx.doi.org/10.1007/s10916-010-9451-x

Luo, N., Chapman, C. G., Patel, B. K., Woodruff, J. N., & Arora, V. M. (2013). Expectations of iPad use in an internal medicine residency program: is it worth the "hype"? J Med Internet Res, 15(5), e88.

http://dx.doi.org/10.2196/jmir.2524

Masalin, T., Pyörälä, E., Romanov, K., & Hervonen, H. (2015). Diginatives or not? Medical students stumble with mobile learning skills. Paper presented at the An International Association For Medical Education.

Neville, A. J., & Norman, G. R. (2007). PBL in the undergraduate MD program at McMaster University: Three iterations in three decades. Academic Medicine, 82(4), 370-374.

http://dx.doi.org/10.1097/ACM.0b013e318033385d

Nuss, M. A., Hill, J. R., Cervero, R. M., Gaines, J. K., & Middendorf, B. F. (2014). Real-time use of the iPad by third-year medical students for clinical decision support and learning: a mixed methods study. J Community Hosp Intern Med Perspect, 4(4).

http://dx.doi.org/10.3402/jchimp.v4.25184

Onwuegbuzie, A. J., & Leech, N. L. (2005). On Becoming a Pragmatic Researcher: The Importance of Combining Quantitative and Qualitative Research Methodologies. International Journal of Social Research Methodology, 8(5), 375-387.

http://dx.doi.org/10.1080/13645570500402447

Ortega-Rivas, A., Saorin, J. L., de la Torre, J., & Elsheikha, H. (2013). Touch-pad mobile devices for blended learning in immunology practicals. Medical Education, 47(5), 518-519.

http://dx.doi.org/10.1111/medu.12177

Pyörälä, E., Romanov, K., Masalin, T., & Hervonen, H. (2015). Incorporating iPads into medical education fosters collaborative learning. Paper presented at the An International Association For Medical Education.

Scaffa, M. E., & Wooster, D. M. (2004). Effects of problem-based learning on clinical reasoning in occupational therapy. Am J Occup Ther, 58(3), 333-336.

http://dx.doi.org/10.5014/ajot.58.3.333

Silenti, M., & Masalin, T. (2014). Supporting teachers integrating mobile technologies in medical education. Paper presented at the An International Association For Medical Education.

Treadwell, I. (2006). The usability of personal digital assistants (PDAs) for assessment of practical performance. [Comparative Study Evaluation Studies]. Medical Education, 40(9), 855-861.

http://dx.doi.org/10.1111/j.1365-2929.2006.02543.x

Appendices

Declaration of Interest

The author has declared that there are no conflicts of interest.