Clinical Educator and Student Perceptions of iPad™ Technology to Enhance Clinical Supervision: The Electronically-Facilitated Feedback Initiative (EFFI)

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Abstract

Purpose: Growing demands placed upon healthcare systems require more health professionals to be trained. Clinical placement education is an integral component of health professional training, however accommodating increasing numbers of student placements is a challenge for health services. Personal digital assistants such as iPads™ may assist in delivery of clinical education, by facilitating transfer of knowledge and skills from clinical educators to health professional students, however such an initiative has not been formally investigated. The present study sought to explore perceptions of clinical educators and allied health students regarding the impact of an iPad™-based feedback delivery system on student reflection and learning. **Methods**: A pilot study was performed using iPads™ with specialised software to deliver electronic formative feedback to physiotherapy, occupational therapy and speech pathology students during clinical placements. Students and clinical educators completed a questionnaire exploring advantages and disadvantages of the technology. **Results**: Nine clinical educators and 14 students participated and completed the survey. Clinical educators largely (n=7, 78%) reported the electronic feedback system was easy to use and 67% (n=6) reported it improved the quality of feedback provided to students. Five (56%) clinical educators thought electronic feedback improved student performance. Most students (n=10, 71%) reported electronic feedback facilitated reflection upon performance, and 64% (n=9) reported improved performance as a result. Disadvantages included poor wireless internet access and software inefficiencies (n=7 [78%] clinical educators, n=7 [50%] students), and difficulties using iPads™ in settings requiring infection control (n=2 [22%] clinical educators). **Conclusions**: Clinical educators and students perceived electronic feedback as a positive adjunct to student learning on clinical placement, however technological and software interface factors need to be considered for implementation in some settings.

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ABSTRACT

Purpose: Growing demands placed upon healthcare systems require more health professionals to be trained. Clinical placement education is an integral component of health professional training; however, accommodating increasing numbers of student placements is a challenge for health services. Personal digital assistants such as iPads™ may assist in the delivery of clinical education by facilitating transfer of knowledge and skills from clinical educators to health professional students. However, such an initiative has not been formally investigated. The present study sought to explore perceptions of clinical educators and allied health students regarding the impact of an iPad™-based feedback delivery system on student reflection and learning. **Methods**: A pilot study was performed using iPads™ with specialised software to deliver electronic formative feedback to physiotherapy, occupational therapy and speech pathology students during clinical placements. Students and clinical educators completed a questionnaire exploring advantages and disadvantages of the technology. **Results**: Nine clinical educators and 14 students participated and completed the survey. Clinical educators largely (n=7, 78%) reported the electronic feedback system was easy to use, and 67% (n=6) reported it improved the quality of feedback provided to students. Five (56%) clinical educators thought electronic feedback improved student performance. Most students (n=10, 71%) reported electronic feedback facilitated reflection upon performance, and 64% (n=9) reported improved performance as a result. Disadvantages included poor wireless internet access and software inefficiencies (n=7 [78%] clinical educators, n=7 [50%] students), and difficulties using iPads™ in settings requiring infection control (n=2 [22%] clinical educators). **Conclusions**: Clinical educators and students perceived electronic feedback as a positive adjunct to student learning on clinical placement, however technological and software interface factors need to be considered for implementation in some settings.

BACKGROUND AND SIGNIFICANCE

The growing demands placed upon healthcare systems necessitate the training of greater numbers of health professionals.[1] Clinical education in the healthcare setting is an essential component of medical and allied health professional training; consequentially, healthcare settings must be able to accommodate the educational requirements of health professional students. Increasing numbers of health professional students create challenges for modern healthcare systems, which have finite capacities to host and educate students on clinical placement.[1,2] Therefore, it is essential to optimise the delivery of health professional clinical training by assisting clinical educators to effectively transfer to students the knowledge and skills required to practice their profession.

High quality clinical placement education requires regular assessment and provision of feedback to actively facilitate student reflection on performance and learning.[3,4] Feedback should be provided to students in a timely and individualised manner to optimise development of clinical skills.[5,6] Currently, performance feedback is most commonly provided by clinical educators to students in a face-to-face manner. Educators may also provide written paper-based feedback throughout clinical placements and in formal assessments (both formative and summative). Both methods are time consuming, and as a result of competing demands on educators, feedback may be provided to students in a sub-optimal manner and at a time that is distant from the actual performance. Given the challenges confronting clinical education in modern healthcare settings, innovative ways to provide efficient, meaningful, and timely feedback are required to facilitate student learning in workplace-based healthcare settings.[7] Developing more efficient methods to deliver individualised student feedback in the clinical setting may be one strategy to enhance learning for increasing student numbers.

Personal digital assistants (PDAs), such as iPads™ (Apple Inc., CA) or tablet devices have been used in a variety of contexts to facilitate student learning and may be useful in a healthcare clinical education setting as a tool for assessing student performance and providing feedback.[8-10] Mobile devices have been employed in a university setting for student clinical skill examination and feedback through the use of specialised software for recording performance and providing student feedback.[11,12] With respect to clinical placement, PDAs have been used by students for reflection, assessment, and information retrieval.[13-15] However, there are no published reports of the use of PDAs by clinical educators for student assessment and provision of student feedback for facilitating learning in the clinical setting.

Given the growing demand for the training of healthcare professionals, the need to develop innovative means of facilitating clinical education, and the importance of feedback to facilitate student learning, the aim of this study was to determine the feasibility and usefulness of providing electronic student feedback during clinical placements.[1,16] Specifically, we sought to evaluate clinical educators and students' perceptions of the usefulness of electronic feedback for enhancing student learning in the clinical setting.

METHODS

Ethics Approval
Ethical approval was granted by The University of Newcastle Human Research Ethics Committee (ref no. H-2013-0062). All participants gave written informed consent prior to involvement in the study.

Participants and Recruitment
Purposive sampling was used to recruit clinical educators and students participating in practical clinical placements in three allied health disciplines across a wide variety of clinical settings. Nine potential clinical educator participants were sourced from the clinical educator databases of each of the participating disciplines (Occupational Therapy [OT], Physiotherapy [PT] and Speech Pathology [SP]) at The University of Newcastle, Australia. Clinical educators were clinicians who regularly supervised students in the healthcare settings in which they worked. The selected clinical educators were specifically invited to participate in this study because of their ongoing involvement with the programs of their respective disciplines at the University. All students (n = 19) that attended a clinical placement with the participating clinical educators during the trial period were identified and invited to participate in the study. A clinical placement was defined as a practical (not observational) educational experience within the healthcare setting relevant to the discipline. These placements had a standardised length of time for each discipline, and the research study did not seek to alter this. PT and SP students attended 5-week placements and OT students attended 12-week placements.

Intervention
The Electronically-Facilitated Feedback Initiative (EFFI) was a strategy devised and implemented by a team of researchers at The University of Newcastle and The University of Queensland, Australia. It comprised the application of iPad™-based student assessment software to the clinical placement setting with the goal of facilitating the delivery of effective, frequent, and individualised feedback to students. As part of the EFFI, each of the nine participating clinical educators were provided with an iPad™ (iPad 2, Apple Inc., Cupertino CA) containing a program (Mark-Rite™, Clarity Data Solutions, Brisbane, Australia) designed for appraisal of student performance and recording of feedback.[12] Clinical educators used the system for the duration of their clinical placements during the 5-month trial period.

Mark-Rite™ is a software platform originally developed for use in university-based practical assessments.[12] Briefly, Mark-Rite™ has an interface for designing assessments accessible by assessors via a web-enabled device. The system has flexibility for designing examination proformas that may assess desired criteria. Each discipline participating in the study had standardised national assessment tools for clinical education that were usually administered on paper forms (for OT: Student Practice Evaluation

Form-Revised Edition [SPEF-R]; for PT: Assessment of Physiotherapy Practice [APP]; for SP: Competency Assessment in Speech Pathology [COMPASS®].[17-24] The items on these assessment tools were entered into the Mark-RiteTM platform for use on web-enabled devices by the clinical educators.

Clinical Educators' Utilisation of Mark-RiteTM

Mark-RiteTM was not used for formal clinical assessments; these were completed on paper in the traditional manner. Rather, this electronic system was used for providing daily, or almost daily, formative feedback to students to assist their learning. This feedback was linked to the discipline competency standards, as each discipline's national assessment tool was the basis of the electronic assessment and feedback forms. Clinical educators were instructed to use the system in various ways depending on students' individual learning needs. They could complete the web-based assessment form either in full or partially, focussing on a particular aspect of learning (e.g., communication or professional behaviour). They could also choose to use the tool to evaluate and provide feedback on overall performance at the end of a clinical day, or to focus on a specific activity such as assessment of a single patient. Evaluation and feedback was undertaken by the educator selecting standardised feedback statements that were analogous to the assessment criteria on each discipline's assessment form and also by providing free text comments. This information was emailed to students at the end of each clinical day.

Training

Before the trial, clinical educators received a day of training in using Mark-Rite™ via an iPad™ as well as seminars on best practice in providing student feedback with an emphasis on electronic feedback for health professional students. During the clinical placements, technical support was available to all of the clinical educators through a research assistant familiar with the technology.

Outcome Measures

Clinical Educator Questionnaire

A 12-question paper-based questionnaire was developed to explore clinical educator attitudes and experiences using the electronic feedback system. As no precedence existed for a questionnaire on this subject, a tool was developed in consultation with academic and clinical education staff. The questionnaire sought to capture basic demographic information of participating clinical educators as well as their professional background, clinical setting, student education experience, frequency of feedback delivery, and perceptions regarding the use and utility of the electronic feedback system, through both open-ended and Likert scale questions. After the clinical placements, participating clinical educators received a document package containing the clinical educator questionnaire and a reply-paid envelope. Data were collated and stored in an anonymised manner to ensure participant confidentiality.

Student Questionnaire

Student attitudes and experiences using the electronic feedback system were assessed using a 13-question paper-based questionnaire. As for the clinical educators, this questionnaire was also developed in consultation with academic and clinical education staff, as no precedence existed for a questionnaire on this subject. The questionnaire sought to capture basic demographic information of participating students as well as their perceptions of the impact of electronic feedback on their learning during clinical placements through both open-ended and Likert scale questions. At the conclusion of their clinical placements, the students of the participating clinical educators received a document package via the educator that contained a participant information statement, the student questionnaire, a consent form and a reply-paid envelope. Data were collated and stored in an anonymised manner to ensure participant confidentiality.

Data Analysis

Questionnaire responses were analysed using descriptive statistics. Chi-square tests were used to explore relationships between the questionnaire responses to the Likert scale questions and health professional discipline, student and clinical educator demographics. An alpha of 0.05 was considered significant.

RESULTS

Clinical Educators

Nine clinical educators completed the questionnaire (100% response rate). The mean age of respondents was 32.3 years (SD $\pm$ 4.7). Gender, professional background, previous experience, clinical setting, student load during the trial and frequency of feedback provided are reported in Table 1.

Clinical educator responses to Likert scale questions regarding their perceptions and use of the electronic feedback system are reported in Table 2. There were no significant differences observed in responses between clinical educators of different ages, genders, health professional disciplines, experience, or number of student supervised during the trial. Open-ended responses from the clinical educator questionnaire on the advantages and disadvantages of using the electronic feedback system are reported in Table 3.

Table 1. Characteristics and clinical settings for clinical educator and student responders participating in the Electronically Facilitated Feedback Initiative.

Clinical educator characteristics (n = 9)	n (%)
Gender	
Female	6 (67)
Male	3 (33)
Clinical setting (discipline) during the trial	
Acute/intensive care (physiotherapy)	4 (44)
Outpatient musculoskeletal (physiotherapy)	1 (11)
Community home visits (occupational therapy)	3 (33)
Community aged care (speech pathology)	1 (11)
Previous supervision experience	
1 student	1 (11)
10+ students	8 (89)
Student load during the trial	
1 student	2 (22)
2 students	3 (33)
4 students	4 (44)
Frequency of feedback provided during the trial	
Every day	1 (11)
3-4 days per week	4 (44)
1-2 days per week	3 (33)
Missing	1 (11)
Student characteristics (n = 14)	
Gender	
Female	9 (64)
Male	5 (36)
Clinical setting (discipline) during the trial	
Acute/intensive care (physiotherapy)	7 (50)
Outpatient musculoskeletal (physiotherapy)	1 (7)
Community home visits (occupational therapy)	3 (21)
Community aged care (speech pathology)	3 (21)

Table 2. Clinical educator (n = 9) questionnaire responses to Likert scale items regarding perceptions and use of the electronic feedback system.

Item	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
I found the electronic system easy to use	1 (11)	1 (11)	0 (0)	5 (56)	2 (22)
Using the electronic system improved the quality of feedback I provided to students	0 (0)	2 (22)	1 (11)	4 (44)	2 (22)
I believe the additional electronic feedback helped my students to improve their performance	0 (0)	3 (33)	1 (11)	5 (56)	0 (0)
The electronic system made it easier to supervise more than one student during the placement	1 (11)	4 (44)	2 (22)	2 (22)	0 (0)
Given the choice, I would use electronic feedback again when supervising students on clinical placement	0 (0)	2 (22)	1 (11)	4 (44)	2 (22)

Table 3. Advantages and disadvantages of using electronic student feedback reported by clinical educators (n = 9) in open-ended questionnaire responses, with number of clinical educators reporting each response.

Item	Educators n (%)
Advantages	
Electronic feedback records were useful for documenting student performance for formal assessments	5 (56)
Electronic feedback records enabled monitoring of student progress	4 (44)
Using the iPad™ and feedback system was a good prompt to deliver and record regular student feedback	4 (44)
The system has potential to be an effective education tool if technical barriers are addressed	3 (33)
The system was beneficial for managing students co-supervised by two part-time clinical educators	1 (11)
Student engagement in clinical education was enhanced by the electronic feedback system	1 (11)
Disadvantages	
Technological barriers (poor wireless internet connections, software malfunctions) detracted from the effectiveness of the system	7 (78)
Inefficiencies in design/function of the software made providing electronic feedback time consuming	5 (55)
iPad™ was inappropriate for use in settings requiring infection control	2 (22)
Providing electronic feedback reduced face-to-face feedback	2 (22)
Standardised feedback statements were less useful than free text comments	2 (22)

Students

Nineteen students undertook clinical placements with the participating clinical educators. Fourteen students consented to participate and completed the survey (74% response rate), with the mean age of respondents 23.7 years (SD $\pm$ 4.8), and nine were female (64%) and five were male (36%). Characteristics of respondents of the student questionnaire are presented in Table 1.

Student responses to the Likert scale questions regarding their perceptions of electronic feedback and its effects on their learning in the clinical setting are reported in Table 4. Notably, the majority of students (n = 10, 71%) agreed or strongly agreed that the electronic feedback assisted them to reflect on their performance and that it highlighted areas for improvement that they had not previously considered. Nine students (64%) agreed or strongly agreed they improved their performance due to the electronic feedback, and over half (n = 8, 57%) indicated they would use the electronic feedback in preparation for their next clinical placement.

The only significantly different response between students of different ages, genders, or health professional disciplines observed was that fewer physiotherapy students (50%) agreed the feedback highlighted areas for improvement compared to other disciplines (100%; χ^2 (6, 14) = 13.6, p = .035). Students' open-ended questionnaire responses regarding advantages and disadvantages of using electronic feedback on clinical placements are reported in Table 5.

Table 4. Student (n = 14) questionnaire responses to Likert scale items regarding perceptions and use of the electronic feedback system.

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)*
The feedback was provided in a timely manner	1 (7)	1 (7)	5 (36)	6 (43)	1 (7)
The feedback helped me to reflect on my performance	1 (7)	1 (7)	2 (14)	6 (43)	4 (29)
The feedback was specific to my learning needs	1 (7)	3 (21)	0 (0)	7 (50)	3 (21)
The feedback was consistent with my perceptions of my performance	0 (0)	1 (7)	3 (21)	10 (71)	0 (0)
The feedback highlighted areas for improvement which I had not considered	0 (0)	2 (14)	2 (14)	6 (43)	4 (29)
The amount of electronic feedback was sufficient	0 (0)	2 (14)	2 (14)	6 (43)	4 (29)
I found it easy to access my feedback	0 (0)	1 (7)	0 (0)	8 (57)	5 (36)
I improved my performance as a result of the electronic feedback	0 (0)	3 (21)	2 (14)	6 (43)	3 (21)
I will use this feedback in preparation for my next clinical placement	0 (0)	3 (21)	3 (21)	6 (43)	2 (14)
The electronic feedback was of no benefit to me	6 (43)	3 (21)	2 (14)	2 (14)	1 (7)

Table 5. Advantages and disadvantages of using an electronic feedback system reported by students (n = 14) in open-ended questionnaire responses, with number of students reporting each response.

Item	Students n(%)
Advantages	
Electronic feedback was a useful record of performance that facilitated reflection	8 (57)
Electronic feedback was related to professional competency standards and this was viewed favourably	4 (29)
Received more regular feedback than on previous placements	1 (7)
Disadvantages	
Technological barriers (poor wireless Internet connections, feedback emails not being received) detracted from the effectiveness of the system	7 (50)
Standardised feedback statements were non-specific and were less useful than free text comments	4 (29)
Electronic feedback at time duplicated verbal feedback already provided	2 (14)

DISCUSSION

This pilot study suggests that electronic feedback, recorded and delivered through the use of iPads™ and the Mark-Rite™ software platform, successfully facilitates feedback delivery by clinical educators and assists with student self-reflection. Clinical educators reported the electronic feedback system was an effective means of keeping regular and accurate documentation of student performance that was useful when evaluating student performance for formal assessment or identifying areas for student improvement. Students reported that electronic feedback was a useful adjunct to traditional verbal feedback and that the system prompted the educators to provide more feedback than usual. Importantly, the electronic feedback was aligned with national discipline-specific assessment instruments, and students were able to track their progress against competency criteria. Thus the implementation of an electronic feedback system in clinical education has the potential to improve student reflection and learning resulting in better prepared and more knowledgeable graduate practitioners who benefit the healthcare system through improved patient care.

Student reflection on performance is a vital component of learning, and feedback from a clinical educator can facilitate a student to reflect upon their performance.[25,26] Electronic feedback may enhance student learning in the clinical setting, as students in the current study reported that the frequent and individualised feedback, made easily accessible through email, helped them reflect on their practice. Students reported that feedback was specific to their learning needs, highlighting areas for attention to improve performance, which is an important quality of effective feedback.[3,6,26] Students may also be more satisfied with electronic feedback as it allows them to receive and reflect on less positive comments about their performance without the anxiety of an immediate face-to-face discussion with the clinical educator. This student satisfaction with electronic feedback regarding performance is consistent with previous work that has reported positive responses from final-year undergraduate medical students using mobile technology during work-place-based learning.[14] While the majority of students, nine of fourteen, reported the electronic feedback improved their performance, only five of the nine clinical educators agreed with this statement. The impact of electronic feedback on student performance cannot be determined from these data, as performance was not measured objectively and questionnaires were anonymous. However, the effects of electronic feedback on student performance in clinical settings warrants further investigation to determine the impact on student learning.

Mobile technology plays a substantial role in modern clinical education.[27-30] However, its ease of application appears to vary between clinical settings. Clinical educators in the study reported that using the iPad™ for student feedback was feasible in outpatient, rehabilitation, and community healthcare settings, while educators working in an acute hospital context had difficulties using the device during consultations. In the acute setting, it was not always practical for clinical educators to use an iPad™, as they may need to assist a student with a sterile technique and consequently be unable to use the iPad™ for infection control reasons. Additional issues previously reported as barriers in the clinical setting include concerns for security of information and

patient confidentiality.[14,31-34] These were not reported in the current study. However, the participating clinical educators were experienced in supervising students and thus likely to be familiar with balancing patient confidentiality and student feedback.

Clinical educators were able to provide specific and personalised feedback using the electronic system, but this was challenging at times as a result of technological difficulties. Responses from both clinical educators and students suggest that alterations to the electronic feedback form available in the software would be beneficial. Although the free text sections of the form were reported by both students and clinical educators as valuable sources of information, the standardised feedback statements were less helpful. The clinical educators found the standardised statements useful for prompting them to provide feedback that related to the discipline specific competencies; however, the statements themselves were viewed by the students as too generalised when given or received alone as feedback compared to the specific free text feedback. In addition, the time spent navigating the technology meant that educators spent more time than desired entering their feedback. Clinical educators are under immense pressure to accommodate students and provide practical experiences that meet registration standards.[35] If the process of providing electronic feedback is excessively time consuming, it could add an additional burden to the clinical educator's already heavy workload. Therefore, it is essential that electronic systems used for student feedback are optimised for operator efficiency in clinical settings. If electronic feedback systems are designed such that clinical educators are easily and quickly able to utilise them to provide immediate and personalised feedback to students, evidence suggests that this type of feedback may be associated with improved educational outcomes.[36,37]

A hypothesised benefit of the EFFI was that its implementation might enable educators to supervise multiple students concurrently. However, only two clinical educators agreed that it might help them to supervise more students (one educator who already supervised multiple students concurrently and another who usually supervised a single student). Clinical educators generally reported that rather than saving them time, providing electronic feedback required more of their time than traditional feedback. Despite this, clinical educators generally viewed electronic feedback positively. This was likely a result of the student record of performance that the electronic feedback provided that assisted them with their educational decision-making and provided evidence for later decisions made at the time of formal assessments. Whether or not an electronic feedback system may help educators to supervise additional concurrent students is worth further investigation, as increased student supervisory capacity is valuable to modern healthcare education given the challenges of increasing cohort sizes, limited healthcare resources, and the need for more healthcare professionals.

Technology-related issues, including software malfunction and poor Internet connectivity, were the primary problems of the EFFI. This is consistent with concerns reported by health professionals using various mobile devices in health-care settings.[32,34] In the current study, some educators reported the software "crashed" or "timed-out," which often led to data loss, and the educator would then have to log in again and re-write the feedback. The wireless internet connectivity available in healthcare settings was also a source of difficulty and was variable within and between clinical placement sites. In locations with poor internet access, this impacted on the function of the iPads™. Technological issues, such as unfamiliarity with the sensitivity of the iPad™, have previously been reported as potential barriers to the introducing new technology into a clinical setting.[12,33]

The study revealed anxiety was an issue experienced by some students and clinicians when using unfamiliar technology with inadequate training and support.[12] It may be that the age difference between the students and the clinical educators contributed to a lack of comfort and familiarity with the particular technology used in the study resulting in the educators rating it as less useful than the students. This may be largely addressed by improved training and by altering the technology to make it easier for the end-user. Coulby et al have suggested that the use of keyboard attachments or audio recording of verbal feedback may assist in the provision of feedback to students.[14] Moreover, providing adequate training and support may improve familiarity with new technology. Rectifying the software issues encountered in the current study may further enhance the effectiveness of electronic feedback as a clinical education tool.

Limitations and Future Research
As this was a pilot study, the sample size was small and limited to a single geographical region. Though this limits the generalisability, the sample was recruited purposively to represent a wide range of clinical settings and health disciplines. All clinical educators were new users of the Mark-Rite™ software platform, so it is not known whether educators with experience using this software might perceive it differently. Future research is required using larger samples across varied healthcare and geographical settings. Importantly, investigation is required into the impact of electronic feedback on measured student performance.

Conclusion
This pilot study suggests that electronic feedback, recorded and delivered through the use of iPads™ and the Mark-Rite™ software platform, may facilitate feedback delivery by clinical educators. This feedback appears to assist students in self-reflection and

learning. The software provides a record of performance that assists in tracking student progress. Limitations included technological barriers and practical difficulties using an iPad™ in an acute clinical setting. Further research is needed to explore the utilisation of electronic feedback in clinical education, particularly its effects as measured on student performance.

REFERENCES

1. Allied Health Professions Australia. Policy Paper: *Australia's Workforce of Allied Health Professionals*. Melbourne: Allied Health Professions Australia; 2013.
2. National Health Workforce Taskforce. Health Workforce in Australia and Factors for Current Shortages Australia, 2009. p. 3-6. Available from: http://www.ahwo.gov.au/documents/NHWT/The%20health%20workforce%20in%20Australia%20and%20factors%20influencing%20current%20shortages.pdf. [Accessed May 18th 2016].
3. van de Ridder JM, Stokking KM, McGaghie WC, ten Cate OT. What is feedback in clinical education? *Medical Education*. 2008;42:189-97. [PMID: 18230092]
4. Rodger S, Fitzgerald C, Davila W, Millar F, Allison H. What makes a quality occupational therapy practice placement? Students' and practice educators' perspectives. *Australian Occupational Therapy Journal*. 2011;58:195-202.
5. Perera J, Lee N, Win K, Perera J, Wijesuriya L. Formative feedback to students: The mismatch between faculty perceptions and student expectations. *Medical Teacher*. 2008;30(4):395-9. [PMID: 18569661]
6. Archer JC. State of the science in health professional education: effective feedback. *Medical Education*. 2010;44:101-8. [PMID: 20078761]
7. Boud D, Molloy E. Rethinking models of feedback for learning: the challenge of design. *Assessment and Evaluation in Higher Education*. 2013;38(6):698-712.
8. Gado I, Ferguson R, van't Hooft M. Using handheld-computers and probeware in a science methods course: Preservice teachers' attitudes and self-efficacy. *Journal of Technology and Teacher Education*. 2006;14:501-29.
9. Corr P. Using e-learning movies to teach radiology to students. *Medical Education*. 2012;46:1119-20. [PMID: 23078709]
10. Rivett DA, Snodgrass SJ, Russell TG, Ashby S. *New tricks using new technology - turning OSCEs into e-OSCEs using iPAD and specialised software*. Proceedings of the Australian Physiotherapy Association Business and Leadership Symposium; Adelaide 2012.
11. Hernandez C, Lewis A, Castiglioni A, Selim B, Cendan J. OSCE standards-setting procedure facilitated by digital technology. *Medical Education*. 2013;47:1132. [PMID: 24117576]
12. Snodgrass S, Russell T, Ashby S, Rivett D. Implementation of an electronic Objective Structured Clinical Exam (eOSCE) for assessing practical skills in pre-professional physiotherapy and occupational therapy programs: examiner and course coordinator perspectives. *Australian Journal of Educational Technology*. 2014;30(2):152-66.
13. Luanrattana R, Win KT, Fulcher J. *Use of personal digital assistants (PDAs) in medical education*. 20th IEEE International Symposium on Computer-Based Medical Systems CBMS; 20-22 Jun 2007. p. 307-12. Available from: http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1657&context=infopapers. [Accessed May 18th 2016].
14. Coulby C, Hennessey S, Davies N, Fuller R. The use of mobile technology for work-based assessment: the student experience. *British Journal of Educational Technology*. 2011;42(2):251-65.
15. Nierenberg DW, Eliassen MS, McAllister SB, Reid BP, Pipas CF, Young WW, Ogrinc GS. A web-based system for students to document their experiences within six core competency domains during all clinical clerkships. *Academic Medicine*. 2007;82(1):51-73.[PMID: 17198293]
16. Mason J. *Review of Australian Government Health Workforce Programs*. Canberra: Australian Government Department of Health; 2013. Available from: https://www.health.gov.au/internet/main/publishing.nsf/Content/D26858F4B68834EACA257BF0001A8DDC/$File/Review%20of%20Health%20Workforce%20programs.pdf. [Accessed May 18th 2016].
17. Division of Occupational Therapy. *Student Practice Evaluation Form-Revised Edition (SPEF-R).* Student Practice Evaluation Form (SPEF)-Revised Edition Package. Brisbane: The University of Queensland; 2008. Available from: http://spefronline.com/griffith/Content/Documents/spefronline_manual.pdf. [Accessed May 18th 2016].
18. Rodger S, Coleman A, Caine A-M, Chien CW, Copley J, Turpin M, Brown T. Examining the inter-rater and test retest reliability of the Student Practice Evaluation Form-Revised (SPEF-R) for occupational therapy student. *Australian Occupational Therapy Journal*. 2014;61(5):353-63. [PMID: 25167762]
19. Rodger S, Chien CW, Turpin M, Copley J, Coleman A, Brown T, Caine AM. Establishing the validity and reliability of the Student Practice Evaluation Form-Revised (SPEF-R) in occupational therapy practice education: A Rasch analysis. Eval Health Prof. 2016 Mar;39(1):33-48. Epub 2013 Nov 8. doi:10.1177/0163278713511456 [PMID: 24214417]

20. Dalton M, Keating J, Davidson M. Development of the Assessment of Physiotherapy Practice (APP): A standardised and valid approach to assessment of clinical competence in physiotherapy. [Australian Learning and Teaching Council (ALTC) Final report PP6-28]. Brisbane: Griffith University, 2009. Available from: http://academicleadership.curtin.edu.au/local/docs/fieldwork/altc/grants_pp_physiotheraphy_instrument_griffith_report_2009.pdf. [Accessed May 18th 2016].

21. Dalton M, Davidson M, Keating J. The Assessment of Physiotherapy Practice (APP) is a valid measure of professional competence of physiotherapy students: a cross-sectional study with Rasch analysis. *Journal of Physiotherapy*. 2011;57(4):239-46. [PMID: 22093122]

22. Dalton M, Davidson M, Keating J. The Assessment of Physiotherapy Practice (APP) is a reliable measure of professional competence of physiotherapy students: a reliability study. *Journal of Physiotherapy*. 2012;58(1):49-56. [PMID:22341382]

23. McAllister S, Lincoln M, Ferguson A, McAllister L. COMPASS(R) (Competency Assessment in Speech Pathology) Assessment and Resource Manual. Melbourne: Speech Pathology Australia; 2006. Available from: https://www.speechpathologyaustralia.org.au/SPAweb/Resources_For_Speech_Pathologists/COMPASS/COMPASS__Online_Assessment_Tool/SPAweb/Resources_for_Speech_Pathologists/COMPASS/Compass_Online_Assessment_Tool.aspx?hkey=f6a0b3ac-435e-4bd2-b85c-dcdd39fe8be3. [Accessed May 18th 2016].

24. McAllister S, Lincoln M, Ferguson A, McAllister L. Nature of workplace competency for university educated professionals. Higher Education Research and Development Society of Australasia (HERDSA); Adelaide 2007.

25. Boud D. Using journal writing to enhance reflective practice. *New Directions for Adult and Continuing Education*. 2001;90:9-17.

26. Clynes M, Raftery S. Feedback: An essential element if student learning in clinical practice. *Nurse Education in Practice*. 2008;8:405-11. [PMID: 18372216]

27. Van Schoor AN, Navsa N, Meiring JH, Treadwell I, Bosman MC, Greyling LM. Perspectives on the use of PDAs as assessment tools. *Clinical Teacher*. 2006;3(3):170-4.

28. Marceglia S, Bonacina S, Zaccaria V, Pagliari C, Pinciroli F. How might the iPad change healthcare? *Journal of the Royal Society of Medicine*. 2012;105:233-41. [PMID: 22722967]

29. Greenberg R. Use of the personal digital assistant (PDA) in medical education. *Medical Education*. 2004;38:570-1. [PMID:15107122]

30. Kim B, Ball M. Mobile use in medicine: taking a cue from specialized resources and devices. *The Reference Librarian*. 2011;52:57-67.

31. Ortega-Rivas A, Saorin J, Torre J, Elsheikha H. Touch-pad mobile devices for blended learning in immunology practicals. *Medical Education*. 2013;47(5):518-9. doi: 10.111/medu.12177. [PMID: 23574070]

32. Garrett B, Klein G. Value of wireless personal digital assistants for practice: perceptions of advanced practice nurses. *Journal of Clinical Nursing*. 2008;17(16):2146-54. [PMID:18705736[

33. McAlearney A, Schweikhart S, Medow M. Organizational and physician perspectives about facilitating handheld computer use in clinical practice: results of a cross-site qualitative study. *Journal of the American Medical Informatics Association*. 2005;12(5):568-75. [PMID: 15905482]

34. Gururajan R, Moloney C, Soar J. Challenges for implementing wireless hand-held technology in health care: views from selected Queensland nurses. *Journal of Telemedicine and Telecare*. 2005;11:S37-8. [PMID:16375791]

35. Hobbs C, Henley E, Higgs J, Williams V. Clinical education program strategies for challenging times. *Health Professional Education: a Multi-Disciplinary Journal*. 2000;2(2):1-14.

36. Treadwell I. The usability of personal digital assistants (PDAs) for assessment of practical performance. *Medical Education*. 2006;40(9):855-61. [PMID: 16925635]

37. Garner M, Gusberg R, Kim A. The positive effect of immediate feedback on medical student education during the surgical clerkship. *Journal of Surgical Education*. 2014;71(3):391-7. [PMID: 24797856]