Enhancing assessment in medical education

A MyKnowledgeMap white paper

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Enhancing assessment in medical education

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Assessment systems to support medical education

MyKnowledgeMap is one of the UK's leading assessment technology providers. Drawing on internationally acclaimed research and teaching projects that have used MyKnowledgeMap technology, this paper looks at the opportunities and challenges for assessment in medical education.

Using two case studies—the work currently being done by the University of Leeds School of Medicine, and the research undertaken by the Assessment and Learning in Practice Settings (ALPS) programme led by five Yorkshire Universities between 2005 and 2010—we will outline some approaches to assessment developed specifically for medical schools and other healthcare disciplines, and set out the technology required to support innovative, quality assessments.

After introducing the case studies that the paper draws on, we'll review the challenges and opportunities for medical education, and then go on to outline the design of an assessment system that addresses these requirements.

“*The iPhone changed everything. The medical school uses it in two main ways. The first is as an information resource. Students are given electronic copies of clinical handbooks and the British National Formulary. In the modern age, when white coats and their accompanying deep pockets are becoming a distant memory, this is an important function in itself.*

However, it's the second use—to support clinical learning—that I find most interesting. Gareth tells me that a dedicated app allows students to upload reflections on cases they have seen (with sensitive information removed) to an online portfolio in real time. Workplace-based assessments can also be completed on the spot by clinicians: in short, the iPhone is helping the medical school to provide consistent support for students, and to get them into good habits for the future.”

Niall Boyce writing in *The Lancet*
vol. 379, issue 9812, p. 209, 21 Jan 2012


Perspectives

The Lancet Technology: January, 2012

Case studies

The University of Leeds School of Medicine programme

In 2010, the University of Leeds first issued smartphones to all fourth and fifth year medical students, giving them access to assessments and progress files for collecting and recording evidence of their capabilities.

This was the first time that a UK medical school has provided undergraduates with all the tools they need to study off-campus via mobile phone technology. Under the scheme, each year 4 and year 5 medical student is loaned an Apple iPhone 3GS for the remainder of their course. At this stage of the Leeds medical degree, undergraduates typically spend much of their time in hospitals, GP surgeries and community health clinics. They can find it difficult to keep in regular contact with tutors and have to carry around any reference manuals or record books that they might need during their work placement. Assessment and feedback can be difficult when students are away from the university.

Key aims of the project include:

- Providing tools that the students can use to record evidence and reflection on their experience. This is, for example, used for Continuous Professional Development (CPD), Lifelong Learning and as notes for project work or future assignments / reports.

- Providing tools for students to be assessed by clinical and healthcare professionals and for that assessment to be captured in the near patient environment and recorded immediately
- Providing tools for University teachers to set exercises for their cohort of students and send them to the mobile devices of their students for completion.

To support these aims, MyKnowledgeMap were asked to provide an infrastructure—the ReallyManaging Assessment system—which allows comprehensive management of students' assessments and reflections.

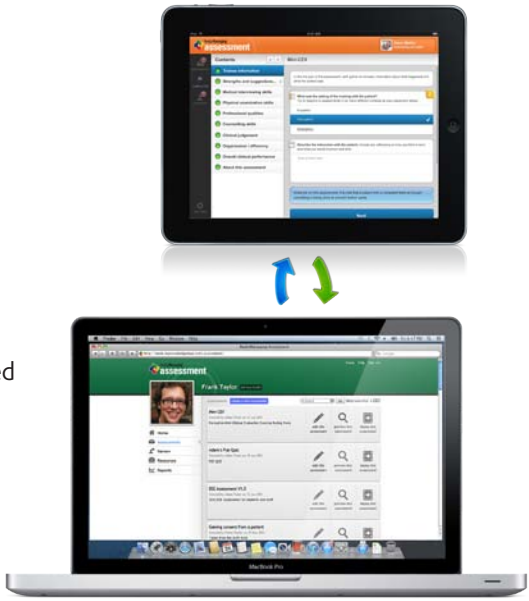
This online system was supported by a number of apps:

- Progress file includes a blogging tool for students to reflect and record evidence immediately whilst in the clinical work place. The output is sent to the student's private area of their online Progress File.
- The Mini-CEX app enables students to record an assessment of their performance with a patient. This is based on the Mini-CEX (mini Clinical examination) format used in many areas of medical education. The output of this assessment is sent to the Progress File and shared with the student, clinical or healthcare professional and the University teacher.
- A Learning Suite app which allows teachers to build exercises and distribute them to their cohort of students. Output is published to the Progress File or to the student if the exercise is for self-assessment.

The University of Leeds' assessment infrastructure now transports hundreds of assessments a month, directly between students on hospital placements and the university tutors. The apps have been

consolidated into a single application which gives students access to assessments and progress file reflections in one place. The tools run on the iPhone (as well as iPad) and provide students with a convenient way to respond to assessments in the workplace. For tutors, it is possible to author and deploy context-specific materials directly to students' iPhones.

Offline working is critical—it is typically very difficult for students to access any kind of network connection. In many of the wards, no high-speed data signal is available, and students have to be able to receive assessments when they have connectivity, fill them in offline, and sync back to the server when they're connected again. Other tools to allow students to record experiences on a more ad-hoc basis are also needed.



Right: The system allows assessments to be authored online, and deployed to mobile devices for offline use. Responses are then gathered back into the web-based online system.

The ALPS programme

The Assessment and Learning in Practice Settings (ALPS) Programme was a research partnership of five Yorkshire universities and three private-sector organisations. The projects that it undertook looked at how teaching and learning could be improved while students were away from the institution on work placements.

One of the partnership's key aims was to develop a service platform allowing tutors to send assessments and supporting materials to the mobile devices of Health and Social Care students on work-based practice. The ALPS partners were the Health and Social Care faculties of Leeds, Bradford, Huddersfield, Leeds Metropolitan and York St John Universities, as well as the NHS Yorkshire and the Humber. The other bodies involved are T-Mobile, ecommnet and My-KnowledgeMap.

The service platform created for the ALPS project allowed tutors to tailor assessments for particular students or groups of students, and to push them out to the smartphones which the students used while on work-based practice. Tutors across all five institutions could create assessments using a wide range of question types including multiple choice, fill in the gaps, and free text.

The assessments were uploaded to a secure application on students phones, and packaged with supporting materials such as additional instructions or extra reading. The students could then complete the assessments whilst at work and submit their answers for marking and feedback.

The ALPS project won the gold award at the IMS Global Learning Impact Awards in 2011. It also won the Innovation Award in the Tertiary, FE & HE category at the 2009 Handheld Learning Awards and the Techworld Mobility Project of the Year 2008.

Designing a system to assess medical students

The decisions that we took in designing systems for medical assessment—decisions taken in partnership with the University of Leeds and the ALPS institutions—were influenced by what we saw as the weaknesses and challenges in current assessment. Some of the key drivers that we needed to address were:

- Student satisfaction with assessment and feedback. In surveys of student satisfaction, Assessment and Feedback scores have tended to trail other areas. A 2008 report by the Higher Education Academy

Above:the ALPS team using an early version of the ReallyManaging Assessment mobile app in 2008.

noted that the National Student Survey (NSS) "has highlighted that students are notably less positive about assessment and feedback on their assignments than about other aspects of their learning experience. Students' concern about issues relating to assessment and feedback is reflected in the many institutional experience surveys that have been carried out since the late 1980s."[1]

- TIME. Assessment can involve a significant time commitment for overstretched academic and clinical staff. Despite the evidence that forms of assessment like the Mini-Clinical Evaluation Exercise improve student outcomes, and the increasing recognition of the importance of practice assessment, time pressures make it difficult to deliver as frequently as institutions would like.
- FOCUS ON CONFIDENCE AND COMPETENCE, which called for a different assessment culture. Institutions have tended to be good at assessing knowledge and academic competence using traditional assessment methods. They have focussed less on the assessment of the skills and behaviours that people need to master to practice effectively and confidently and more on the knowledge and theoretical underpinnings of a discipline. This can make it difficult to provide feedback that's relevant to the student's experience of practice. It could be argued that this is a bias inherited from the Humboldtian model of the university, and the ALPS programme sought to bring in fresh ideas from the world of vocational education.

1 *Exploring the National Student Survey Assessment and Feedback Issues*, CRQ/HEA (2008)

Improving the assessment process

Assessment is a broad subject, and in order to develop a clear and effective assessment methodology, it is necessary to be clear on what is being assessed, and how improvements can be made to what is already being done.

What are we assessing?

After graduating from medical school in the UK, doctors undertake two years of professional development, known as the Foundation Programme. The curriculum that they follow is set out by the General Medical Council, and consists of a set of professional development standards designed to give trainees a range of general experience to enable them to take on supervised responsibility for patient care as a professional in the workplace, before choosing an area of medicine in which to specialise.

In order to be eligible to apply for full registration with the GMC at the end of Foundation Year 1, and to then enter a core or specialty training programme at the end of Foundation Year 2, doctors are required to complete the GMC's Foundation Programme Curriculum.

The curriculum involves showing competence across a broad range of skills—areas like professionalism, ethical behaviour and safe prescribing. Throughout the curriculum, there's a consistent focus on patient safety and personal development.

By delivering short assessments directly to the students in the workplace, asking them to evidence occasions when they demonstrate competence and confidence in these areas, students are able to build up a progress file in cooperation with their assessors that records the competencies that they have displayed.

Managing competency

When we first started working with the ALPS Programme, one of the key areas of research was to develop effective core competency frameworks across the Health and Social Care professions. These frameworks covered areas like Communications, Teamworking and Ethical Practice.

ALPS developed a number of assessment tools that could help students with the recording of their experiences and outcomes, and the infrastructure that we built tracked and reported on the evidence using these competence mappings. So students in practice and their tutors were able to view personal reports on the frameworks showing completion; they could check which areas they had demonstrated their competence in.

The system that has grown out of the ALPS programme which is now being used by Leeds School of Medicine has these competency frameworks built into every stage of the delivery and reporting process, so that tests and activities can be mapped against job roles or standard industry competencies for more targeted assessments of non-student roles. It is optional—assessments can be managed without the need to attach them to frameworks—but it provides institutions with a means for ensuring that students have the confidence and competence that they need. It's proved ideally suited for assessment against the Foundation Programme Curriculum.

Increasing student satisfaction with the assessment process

The National Student Survey is an annual survey conducted by HEFCE designed to assess students' opinions of the quality of their degree programmes, with seven different scores published. Results from the survey are published on HEFCE's Unistats website where they are intended to help students shortlist their university choices, and they are often incorporated into League tables of British universities, so

they are seen as directly impacting the competitiveness of institutions.

In the most recent NSS, overall satisfaction stood at 83%, while the satisfaction rate for assessment and feedback was just 68%. It has been widely recognised that one of the keys to improving the overall student experience is to improve student's experience of assessment and feedback.

The School of Medicine at the University of Leeds set out to improve the student experience of assessment by providing a system that gives quick tutor feedback directly back onto an app on the student's iPhone in addition to being directed to their progress file.

Both students and tutors are alerted of new activity in a way that allows them to see what is high priority. They can then respond to it in a more timely way, and involve one another in a dialogue or feedback loop.

In 2011, the NSS found that 97% of final year medical students were satisfied with their experience at the Leeds School of Medicine, up 12% on the 2010 survey. These were the first final year students to have used the iPhone assessment tools through their course and the greatest increases were in the area of assessment & feedback.

Increasing the validity of the assessment process

Mini-CEX—the Mini Clinical Evaluation Exercise—is a structured assessment of an observed clinical encounter. This "snapshot" is designed to help medical educators to provide feedback on skills essential to the provision of good clinical care. The student doctors at Leeds were equipped with Mini-CEX assessments in app form on their smartphones, and were expected to complete a pre-defined number of assessments as part of their placement.

The exercise consists of a doctor selecting an observed encounter by a student with a patient. The observing doctor rates the student across a range of focus areas, and provides a commentary in a structured way.

A range of studies have found that the Mini-CEX improves the competence of student doctors, versus other less structured assessment processes. In 2010, this was validated by a comprehensive research review on Mini-CEX undertaken by the American Board of Medical Specialities. However, the review found that the most concerns related to the validity of the score interpretations—the conclusion was that more evidence of the circumstances of the Mini-CEX evaluation would improve the quality of the rating information.[2]

But one of the reasons for using the scoring format that's common in Mini-CEX, and one of the barriers to collecting additional evidence, is time: it is much quicker for the rater to circle a handful of Likert scales than it is to work through several pages of text-response forms.

Using mobile technology to deliver assessments like the Mini-CEX means that additional information can quickly be captured without a large time commitment. And with the voice recognition and voice recording capabilities of mobile devices, feedback can be captured which takes into account the circumstances at the point of assessment.

Getting an overview of student progress

In the world of vocational training, a range of practice-based assessment activities have for a long time been the norm:

- Guided professional discussions between students and assessors
- Recorded evidence of tasks that students have successfully undertaken, in written or video form
- Recordings of role-plays or presentations
- Witness statements, where an expert watched the student do something
- Accreditation of prior experience

2 "Constructing a validity argument for the mini-Clinical Evaluation Exercise: a review of the research", Acad Med. 2010 Sep;85(9):1453-61

The evidence of these activities is then collated into a portfolio, structured to show the students' learning journeys as they acquire the relevant skills and evidence.

Assessment tools currently do not value the student's experiential learning. Documenting activities currently serves the institution goals to the exclusion of professional life-long learning ideals.

The system that was developed in Leeds contains what the School of Medicine refers to as a student Progress File. Based on MyKnowledgeMap's MyShowcase component, the progress file captures notes, test results and media, ensuring that a complete record of their development is captured.

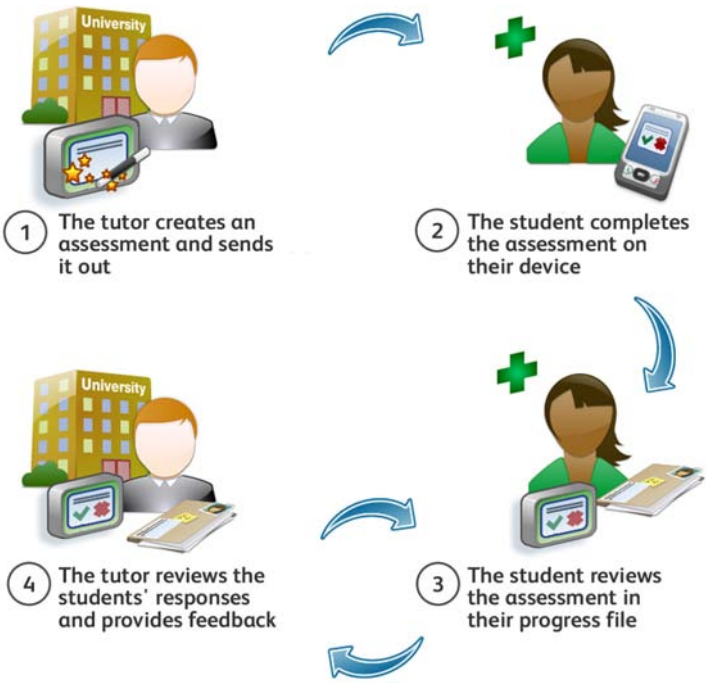
As well as capturing formal and pre-set assessment activities, because students are fully aware of the framework that their assessments are supposed to evidence, the progress file also allows them to save and store other salient evidence, as and when they have the opportunity in practice. This can either be submitted direct from their smartphone, or in the form of documents and statements uploaded or entered from a desktop computer when they are at home in the evening. Students may not have time in a practice setting to fully annotate and perfect a progress file post, so they are given a holding area where they can store evidence for future mapping.

Improving communication with students and other stakeholders in the assessment process

Medical students are unusual in the Higher Education context in that their educational activities take place in multiple sites: across a medical school and a number of different clinical and healthcare settings. The staff at the sites can have different attitudes to educational supervision. The absence of a coordinated and shared understanding is confusing for the students and staff alike, and the geographical issue makes it more difficult to engage with supervisors.

In order to address these issues, it is generally necessary to move

away from a university's standard online learning and assessment systems and processes, which tend to assume that all educators work for the institution (whereas they may work in a hospital for



Above: the assessment process

example), and that there is a simple neatly timetabled set of educational activities.

Mobile devices allow for the sending and receiving of feedback directly to and from a learner's phone. If a student completes an assessment, however far the learner is from the institution, their academic and hospital tutors receive timely alerts, and are able to provide the feedback that the student needs.

Involving non-academic medical staff

Assessors are in most cases not employed by the medical school. This has the potential for becoming a cause of poor communication, in cases where institutions may be over-reliant on systems designed for use within the university. By providing mobile access in a more student-centred system, new users outside the institution can easily be added and given access to the same communication tools that the students and academic staff are using.

Cost effectiveness

The cost of paper-based assessment, particularly in practice settings where there may be a large number of people based in disparate locations, can be considerable. Some of the benefits of switching to a mobile system include effectively doing away with the need to transport paper forms back to the institution, and a reduction in the time needed to collate assessment data and enter it from paper forms into computer-based record systems.

The University of Leeds School of Medicine also looked at the impact that use of the iPhone could have on infection prevention—with the device replacing multiple papers and books, vectors for infection could be reduced.

Going mobile

Given, then, a desire to embed assessment into practice environments, we need to consider the most efficient way of allowing students to respond to assessments in a challenging environment like a hospital.

The system used by the Leeds School of Medicine features deployment to mobile with a single native app that automatically optimises for iPhone and iPad, but also allows for offline use, so the student does not need internet or mobile signal for taking tests.

In a hospital, it can be very difficult for students to access networked PCs. Wireless connections are often poor or non-existent. Even mobile data signals are frequently poor: during the mobile phone boom when the networks were siting their masts, mobiles were still banned in many medical workplaces, so demand for a quality signal in hospitals was low. The Victorian masonry that still makes up many British hospitals poses a challenge for mobile signals.

So if students are going to be able to access assessments electronically, offline mobile working provides clear benefits. Students can use a native app which polls the server as the student leaves home in the morning, pulling down any new assessments. They can work on the assessments offline during the day in their workplace, and mark complete assessments as ready to be sent back to the server. Then, in the evening, when the student has a signal or a wireless internet connection, the assessments can be sent back up to their learning space. Because they can access the assessments and the learning space as easily from a desktop as they can from the mobile, if they have the time and space available they can log in using a browser to review assessment responses and organise their portfolio of work.

Securing sensitive data

One of the initial concerns about undertaking offline assessments on what, for many students, was a valuable personal device that might be carried around at all times with a risk of loss or theft, was the potential for sensitive patient data to be mislaid.

The ALPS programme, in particular, involved social care students dealing with users of social services, many of whom were vulnerable and all of whose data was highly confidential. It is common practice in disciplines like social care to involve service users in the assessment process, so many assessments contained detailed and highly confidential service user data.

Likewise, many of the medical school assessments—even something as routine as a Mini-CEX—had the potential to contain very sensitive patient information.

There was therefore a requirement that all assessment data be strongly encrypted, and that the system safeguard information throughout the assessment process, whether on a device or on the web.

The web side of this security used strong encryption to ensure all information was protected in transit, and used secure logins to control access to information. Fully securing data on the devices involved using our own strong encryption on the database within the app.

Developing an assessment infrastructure to meet these challenges

The system that we developed, ReallyManaging Assessment, is now available as an online, software-as-a-service product. ReallyManaging Assessment enables you to create, manage and deploy tests, questionnaires and learning materials on web, mobile and tablet, for use by students and doctors online and offline.

Key benefits of the system's designs include:

- Mobile and tablet app
  - for online and anytime, anywhere offline use
- Observational and reflective assessments
  - more than just quizzes and tests
- Competency frameworks
  - associate answers against a skills map
- Intuitive design and ease of use
  - delivering outstanding usability and productivity
- Tutor to student feedback loop
  - enabling rapid response
- Integrated web based tools
  - for quick, easy assessment creation

For more information visit www.myknowledgemap.com, email info@myknowledgemap.com or call +44 1904 659465.

Published by MyKnowledgeMap Ltd, 33–37 Micklegate, York, YO1 6JH
MyKnowledgeMap are registered in England no. 03954387

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