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Evidence-based arguments in support of medical education reform

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Medical education is undergoing major transformations. One hundred years and counting after Flexner, we are coming to realise that the practice of training highly skilled professionals such as modern doctors in separate stages is far from ideal. Research in education has been telling us that learning is a recursive process characterised by a to-and-fro dynamic between declarative and procedural knowledge,[1] between knowledge as culture and situated practice,[2] and between the academic setting and the workplace.[3,4]

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In this issue, McGaghie *et al.*[5] offer a critical review of an educational model that aims to bridge the gap between theory and practice and to move medical education in a coherent direction. The *critical* aspect is of utmost relevance and must be singled out. Not only do the authors[5] review the literature and report selected initiatives, but they also delve deeper into the long-term translational effects of these efforts. One can only agree that it is imperative for research in medical education to 'capture and reliably measure downstream results'.[5] This is of crucial importance in the current context of reform in medical education; without it we would be innovating for the sake of innovating, an oft-heard refrain from detractors.

It is imperative for research in medical education to 'capture and reliably measure downstream results'

Education reform is not an easy task, even at the best of times. From a student's perspective, as Wray and McCall report, education reform has its risks.[6] Students are not appreciative when faculty staff do not clarify course objectives or when they experience redundancy among different classes. Further, students certainly don't appreciate any discrepancy between what a teacher says and what he or she does. By contrast, students do appreciate the provision of immediate feedback on their learning and opportunities to do things in a manner that resembles that of future practice.[7] Simulation-based mastery learning (SBML) offers opportunities to overcome such sources of dissatisfaction and anxiety while fulfilling students' desires by providing them with the chance to engage 'in powerful and sustained educational activities […] focused on reaching the objectives'.[5] Because it helps students to gauge their progress and reduces instructor variability, SBML represents a promising avenue for medical education reform.

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Simulation-based mastery learning has been around for many years and is used in various fields outside medicine. For example, it is broadly recognised in medical education circles that pilots are routinely placed in high-fidelity simulators that allow them to acquire basic skills, to practise and hone them, to challenge their mastery of these skills in a variety of conditions, and to maintain their proficiency.[8] What is less recognised is that the flight simulator is used at all stages of pilot development. What would Flexner say

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about a highly sophisticated model of education that calls for the intensive use of biomedical knowledge and skill development at all stages of training? Research has shown that going from theory-based learning to practice in one fell swoop leads to unpredictable outcomes. Why then should the acquisition of basic knowledge be separated in time from the development of skills? This question is commonly asked when people advocate for the offering of clinical experiences early in training, but I ask it in order to prompt thoughts on offering a continued focus on biomedical knowledge during the later stages of training in a manner that blends the 2 + 2 Flexnerian model. By focusing on knowledge and skill integration, SBML truly turns the Flexnerian paradigm on its head.

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Of course, one important caveat that seems inevitable is that somewhere in the back of the student's head lurks the idea that the simulation is not real. Performing a lumbar puncture on a high-fidelity manikin is considerably close to performing the procedure in a real patient, but the student knows he is working in a safe and controlled environment and that if he fails the consequences will be minor. This means that when he performs the procedure with a real patient for the first time, he is likely to have some doubts and will still require supervision despite his demonstration of mastery on the simulator. The simulation allows the student to develop a certain degree of self-efficacy,[9] but only after that first real experience can we tell if skill proficiency will increase rapidly and be maintained over time. What provides the translational impetus is the high degree of realism built into the simulated situation. Surely, this type of long-term outcome, so rigorously outlined in the review by McGaghie *et al.*,[5] is enough to confirm the benefits of such an approach to learning?

What provides the translational impetus is the high degree of realism built into the simulated situation

After all, the ultimate stage in learning remains the actual demonstration of the mastery of competencies in a real-life setting. Simulation brings the student to the brink of autonomous practice, preparing him or her to make the final leap into authentic medical practice. However, the use of the word 'mastery' should not be considered as indicating that through SBME a 'final product' is created. Students and professionals must continue to perfect their skills, in real-life settings, with real patients, regardless of how skilled they are during and as they come out of training. To this end, McGaghie *et al.*'s[5] results clearly demonstrate that subsequent professional development is enhanced when basic skills are mastered and honed by SBML. Whether or not SBML creates a mindset that makes clinicians more liable to pursue continuous quality improvement with respect to their own abilities remains to be seen. For now though, SBML can be considered a powerful model of education comprising long-term pay-offs that promise to offset some of the initial costs involved in its implementation.

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