messages (using a copy–paste–send format). Ideally, the system could be set up and automated to send out some strong Brainwaves.

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Improving knowledge retention using KEEpad

Marina Sawdon

Context and setting Didactic lectures are traditional in medicine. They are intended to impart information on problematic topics and introduce difficult concepts. However, the type of sustained low-level activity that occurs in lectures does not promote effective learning or retention of knowledge; indeed it has been shown that attention wanes after about 15–20 minutes and knowledge recall following didactic teaching often amounts to only about 20% of the material presented. Thus, knowledge retention following conventional teaching often decays at an undesirable rate.

Why the idea was necessary The use of audience response systems (ARSs) has been suggested to improve and facilitate learning in a didactic lecture setting by increasing student participation, giving instant feedback, and improving knowledge retention.

What was done We used an ARS in a phase 1 medical programme to assess prior knowledge, understanding and information decay in Year 1 medical students. A total of 93 undergraduate medical students attended physiology lectures incorporating the use of the ARS KEEpad. KEEpad was used to ask the students a multiple-choice question (MCQ) before the lecture to assess prior knowledge of some aspects of renal physiology, at the end of the lecture to assess understanding and thus whether learning had occurred, and 5 weeks later to assess knowledge retention. Ethical permission was not required as the data represent part of anonymised, routinely collected data, the collection of which cannot harm. At the end of the module, students were asked to complete an evaluation form which included two questions on the use of KEEpad. The form used a 6-point Likert scale with the descriptors on an even scale and allowed space for free text comments. The two items regarding use of the ARS were: 'The KEEpad audience response system gives me feedback on my progress' and 'The KEEpad audience response system supports the learning experience.'

Evaluation of results and impact Before the lecture was delivered, 40% of the class selected the correct answer using KEEpad, showing a moderate degree of prior knowledge of this topic. This was expected as the students had been introduced to the concept of Starling forces in cardiovascular physiology and thus were demonstrating an ability to apply the knowledge to a different body system. At this point the correct answer was not given. The same question was then asked at the end of the lecture and the percentage of students who chose the correct answer increased to 79%. Five weeks later, the same question was put to the students, again using KEEpad. The percentage of students selecting the correct answer was 60%. This represents a 77% recall rate, considerably higher than rates suggested by the literature following conventional didactic lectures. The evaluation forms showed student levels of satisfaction regarding use of KEEpad were 100% and 98%, respectively. The use of KEEpad demonstrated that learning occurred during the didactic lecture and that the recall rate after 5 weeks was high. Students' satisfaction with the use of KEEpad for feedback and the learning experience during lectures was extremely high. The ARS is a useful and low-cost tool with which to improve knowledge retention in undergraduate medical education.

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Enhancing medical ethics instruction with a classroom response system

Shih-Chieh Liao, Walter Chen & Chih-Jaan Tai

Context and setting The objectives of medical ethics education are to familiarise doctors with the concepts and principles of medical ethics in medical practice and, more importantly, to allow them to develop analytical skills for resolving ethical issues in medicine. In Taiwan, postgraduate Year 1 residents (PGY1) are required to receive at least 8 hours of training in medical ethics. In China Medical University Hospital (CMUH), a classroom response system (CRS) was used to assist the delivery of instruction in medical ethics and to facilitate discussion among residents.

Why the idea was necessary The ability to make decisions in circumstances of medical ethical dilemma is developed through social communication. In the classroom context, however, the majority of students are reluctant to voice their opinions because they are shy, lack confidence in their answers, or are distracted. Only a small portion of students are actively involved in discussion. CMUH used CRS in medical ethics courses for PGY1 residents to encourage their participation in classroom discussion.
What was done In these medical ethics education sessions, the instructor explained the concepts and principles of medical ethics. This was followed by CRS-assisted case discussions. These cases were presented and shown on a screen along with possible decisions and the ethical principles that were applied, and students selected their choices by clicking with their CRS remote controls. The instructor was able to conduct immediate descriptive analyses of student responses and show them on the screen. Both the instructor and students were able to see the response patterns and students could compare their own responses with those of the class. The instructor was able to select different students to explain why and how they had made their decisions. This allowed the class to learn about the making of different decisions for the same case and enabled the instructor to coach the group on which decisions conformed to medical ethics. Such social constructive processes allowed for opportunities, through CRS, to help students develop their ability to make decisions in circumstances of medical ethical dilemma.

In October 2007, 25 PGY1 residents (19 males, six females) at CMUH received CRS-assisted medical ethics instruction. A questionnaire was administered at the end of the instruction to collect their responses to the course.
Evaluation of results and impact We found that 84% of participants agreed that the course improved their critical thinking ability, 80% agreed that the course was helpful for resolving medical ethics issues they might encounter in the future, and 72% agreed that CRS helped to enhance their learning motivation, improve the instructor–student relationship and encourage communication among students. In summary, CRS-assisted medical ethics education provided students with a channel for deep-level thinking and discussion and helped them to gain confidence in applying the concepts and principles of medical ethics to medical practice.

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The audience response system: a modality for course evaluation

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Context and setting We used an audience response system (ARS) as a method of evaluating courses in the context of lectures given to medical students in various years of study during the 2006–2007 and 2007–2008 academic years.
Why the idea was necessary Course evaluation is an important component of the teaching process. Accurate and honest feedback is essential to the continuing development of lectures and other teaching modalities. Typically, feedback, although encouraged, remains mostly voluntary. Commonly, feedback is provided via a pre-printed course evaluation form; however, multiple factors may exist that inhibit high compliance rates. This raises questions about the accuracy of such evaluations: do they represent the opinions of the entire class or do they reflect the motivated opinions of a minority? In an ARS, the audience uses a hand-held device, commonly called a 'clicker', to select answers to multiple-choice questions (MCQs). The responses can then be entered into a database for further analysis. Its use in education is extensive. However, no study could be found evaluating the feasibility of using an ARS as a course evaluation tool. This project was undertaken to determine whether using an ARS would increase participation in course evaluation.
What was done Four lectures were given to various medical student classes. Instead of using the standard course evaluation tool of a pre-printed form, the evaluation questions were delivered as MCQ slides at the end of the lectures. The students responded using ARS clickers. The answers were captured using the computer program Turning Point® (Turning Technologies, LLC., Youngstown, OH, USA). The number of answers given by clicker was compared with the number of students signed in on the course attendance sign-in sheet. Our institutional review board ruled this study exempt from ethical approval requirements.

The rate of responses was also compared with those of historical controls. These historical controls comprised three evaluation questions per speaker. For 27 lectures, 2597 responses were achieved out of a total of 4743 possible, for a response rate of 54.8%. In four lectures totalling 242 students using ARS, and for three questions comparable with the historical evaluation questions, there were 662 of a total of 726 responses, giving a response rate of 91.2%. A total of

