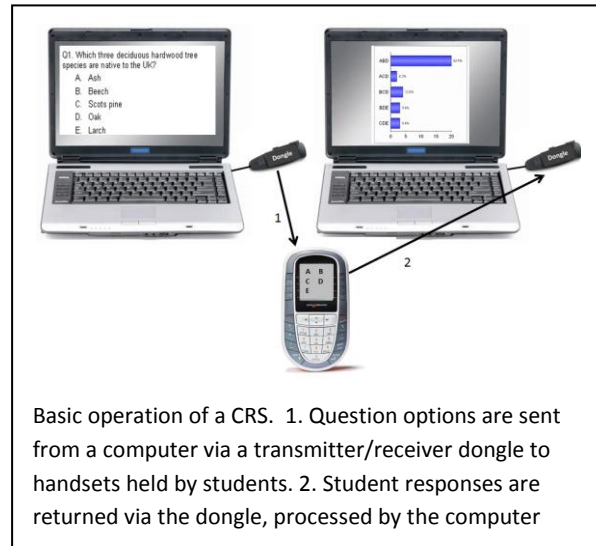


Formative assessment using Classroom/Personal Response Systems

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What is it?

Classroom response systems (CRS) are becoming increasingly common in many educational settings (Fies & Marshall, 2006). A CRS normally includes a set of individual hand-held or desktop keypads that transmit (usually via a wireless technology) student votes/responses to questions (usually multiple choice questions (MCQ)) set by the tutor, to a central device that collates, analyses and displays results to a classroom on screen (see figure).



Why use it?

There is general agreement that CRS promote learning when coupled with appropriate pedagogical methodologies (Fies & Marshall, 2006) and can significantly improve interactivity in the classroom (Siau et al. 2006). Perhaps more importantly, CRS facilitates easy delivery of frequent formative assessment of students (Roschelle et al. 2004). With CRS such feedback can be elicited from everyone in the class (rather than just from individuals who choose to put up their hands in response to questions) and allows tutors to evaluate the understanding and needs of a whole class (Caldwell, 2007).

What's involved?

There are lots of options to using a CRS formatively. The general principles are however the same. The tutor sets questions that test the knowledge and/or understanding of a group of students, the students enter their responses into their handsets and the results are collated and displayed in some way (usually graphically) for the tutor and normally the class to see. This allows the tutor to assess very rapidly the level of knowledge/understanding in the whole class and to make an informed decision to move on to something new or that further explanation/deliberation is required. The results can often be used by the tutor as a stimulus for further more in-depth discussion or as a means of unpicking any misconceptions that the students may have.

There are many variations on this theme. For example, it is generally agreed that discussion between students is beneficial to learning. Handsets can be shared (one between two or in larger groups). The tutor can set the question, and encourage the pairs/groups to discuss the questions and respond once they have come to a collective understanding. Again the results can be used by the tutor to make an informed decision about what to do next.

A further variation can foster critical debate between peers. The tutor sets a question and requests an immediate response from everyone in the class. The students are then required to discuss their answers in pairs, in groups or as a whole class and then to answer the question a second time. The differences between the two sets of results again provide the tutor with an opportunity to assess knowledge and understanding in the whole class and as a basis for further discussion.

Given the range of questions types available in many of the CRS technologies (e.g. MCQs, True/False, Yes/No, Ranking/Sorting, Likert Scale, Numerical and free text entry) and the option to use these in many different ways (see above) this is potentially a very powerful tool for formative assessment and teaching and learning in general.

Skills for producers and users

The technical skills are dependent to a great extent on the specific system being used but most current systems are very user friendly. Some are even embedded in familiar technologies such as PowerPoint. Several providers' web sites are given below.

The pedagogic challenges include designing objective questions that test more than basic factual recall (See below for some links to useful online tutorials) and interpreting the student responses in terms of their knowledge and understanding. The later is really dependent on the quality of questions set.

Further Information

Caldwell, J. E., (2007) Clickers in the Large Classroom: Current Research and Best-Practice Tips, *CBE Life Sciences Education* **6**(1): 9-20.

Fies C. and Marshall, J. (2006) Classroom Response Systems: A Review of the Literature *Journal of Science Education and Technology*, **15** (1), 101-109.

Roschelle, J., Penuel, W. R., and Abrahamson, L. (2004). Classroom Response and Communication Systems: Research Review and Theory. In: *Annual Meeting of the American Educational Research Association. San Diego, CA, 20*

Schreyer Institute for Teaching excellence: Writing multiple choice items to assess higher-order thinking

<http://www.schreyerinstitution.psu.edu/MultipleChoiceItems/> [Last accessed 21st Oct 2010]

A small selection of CRS providers

Promethean Learner and Student Response Systems

<http://www.prometheanworld.com/server.php?show=nav.16> [Last accessed 21st Oct 2010]

Quizdom Audience Response Systems <http://www.qwizdom.co.uk/> [Last accessed 21st Oct 2010]

TurningPoint Voting options <http://www.turningtechnologies.co.uk/products/voting-options.html> [Last accessed 21st Oct 2010]

10 Tips

1. Test the technology thoroughly in the actual room, well in advance of your session. Make sure the handset signals can be received from the back of the room.
2. Be clear what it is that you want to know about your students. What cognitive skills do you want to test?
3. Design your questions with care, with tip 2. in mind, so that you are testing more than simple factual recall.
4. Try your questions out on a colleague first.
5. Do not over use CRS in any one session – students will get bored of it. Three to four questions in an hour session is a good guide in general teaching situations.
6. Don't underestimate how much time it takes to deliver, debate, get a response and provide feedback on just one good question. Give yourself 10-15 minutes as a minimum per question. Make a session plan and stick to it.
7. Use the CRS to encourage discussion between your students.
8. Vary the use of individual and group answers within a session.
9. For formative purposes it is better to set up the CRS so that responses are received anonymously. This has been shown in most research to encourage participation.
10. Introduce an element of completion into group responses from time to time. CRS can be used very effectively for group quizzes and these can get a class buzzing.