Clickers in the Classroom

Contents

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Introduction to Clickers

It is often difficult in large lectures for
- students to ask questions
- lecturers to support active, group learning & targeted feedback

Clickers are an interactive technology that allows teachers to ask students questions in groups of 15 to 400+ and collect and view the class's response. Multi-choice questions (recall, conceptual understanding, critical thinking, perspective etc) are presented to the class. Students click in their answers using either a Turning Point clicker (available for hire from LRAT) or online via ResponseWare or similar tool.

Turning Point software creates a bar chart of the results. The teacher makes "on the fly" instructional choices in response to the bar chart by, for example, leading students in a discussion of the merits of each answer choice or asking students to discuss the question in small groups (see page 5).

Benefits for Teachers
- Drawing out student's background knowledge or beliefs
- Making students aware of their own and others' perceptions & interpretations
- Discovering confusions, misconceptions & knowledge gaps
- Elicit a misconception or dangerous belief
- Distinguishing similar concepts
- Realising connections or similarities
- Elaborating understanding of a concept
- Exploring implications of an idea in a new or extended context
- Set up subsequent instruction
- Status Check / exit poll promoting self-evaluation skills
- Demonstrate success
- Inject fun into exam preparation

Benefits For Students
- Popular with students
- Engage students in active learning
- See how they are measure up
- Facilitates students' ownership of learning
- Questions provide necessary breaks and thinking time
- Guides the perspective and emphasis of the lecture

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Explaining Why You're Using Clickers

- Everyone needs to buy-in and how the learning design will take place
- Vital to explain why you're using clickers at the beginning and (in the case of undergraduates) for up to the following three weekly sessions
- Students are used to being handed knowledge by their teachers
- Opportunity for students to understanding the reasoning rather than just the facts – deeper learning
- Explaining a concept to someone else helps deepen learning and can improve grades

Have a look at the following You Tube videos:

1. Explaining to your students why you're using clickers: http://youtu.be/NGx7EzDQ-lY
2. The anatomy of a clicker question: http://youtu.be/odJKnCdeJv8
3. How To Use Clickers Effectively: http://youtu.be/z0q5gQfQmng
4. Students and Teachers Speak: Clickers in the science classroom: http://youtu.be/tpAEx2abKBQ

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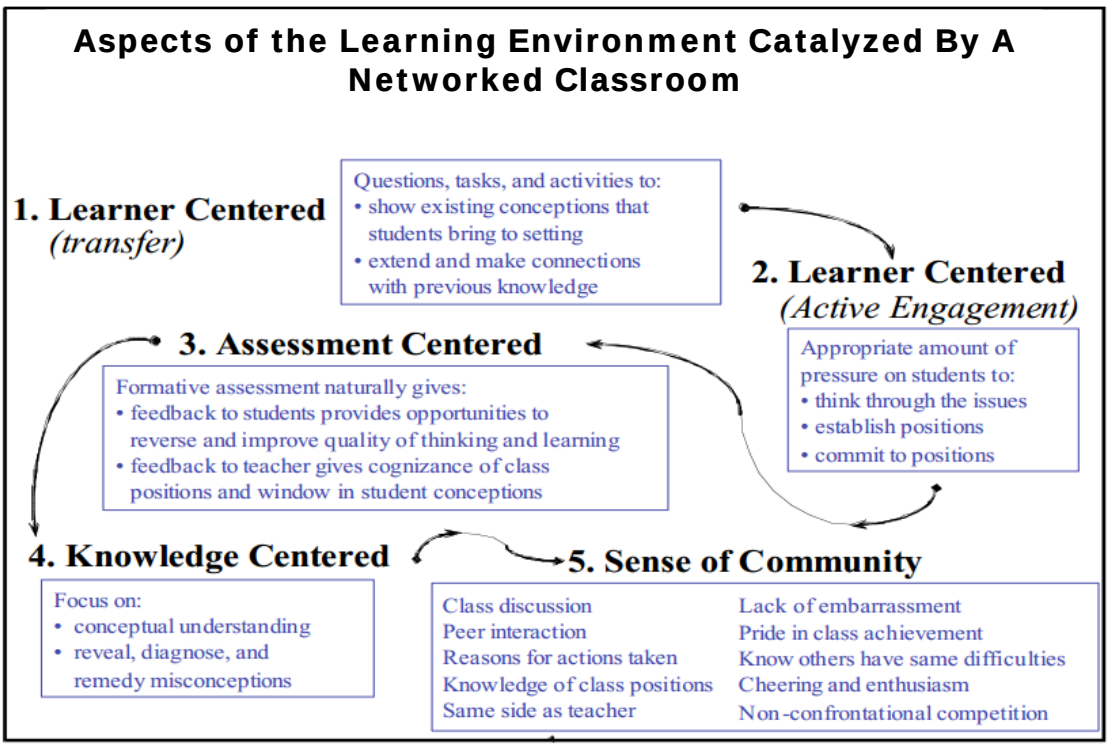
Why Consider Clickers in the Classroom?



Abrahamson, L. (2006) A Brief History of Networked Classrooms: Effects, Cases, Pedagogy and Implications. In: Banks, D.A. ed. *Audience Response Systems in Higher Education: Applications and Cases*. London: Information Science Publishing, p 14.

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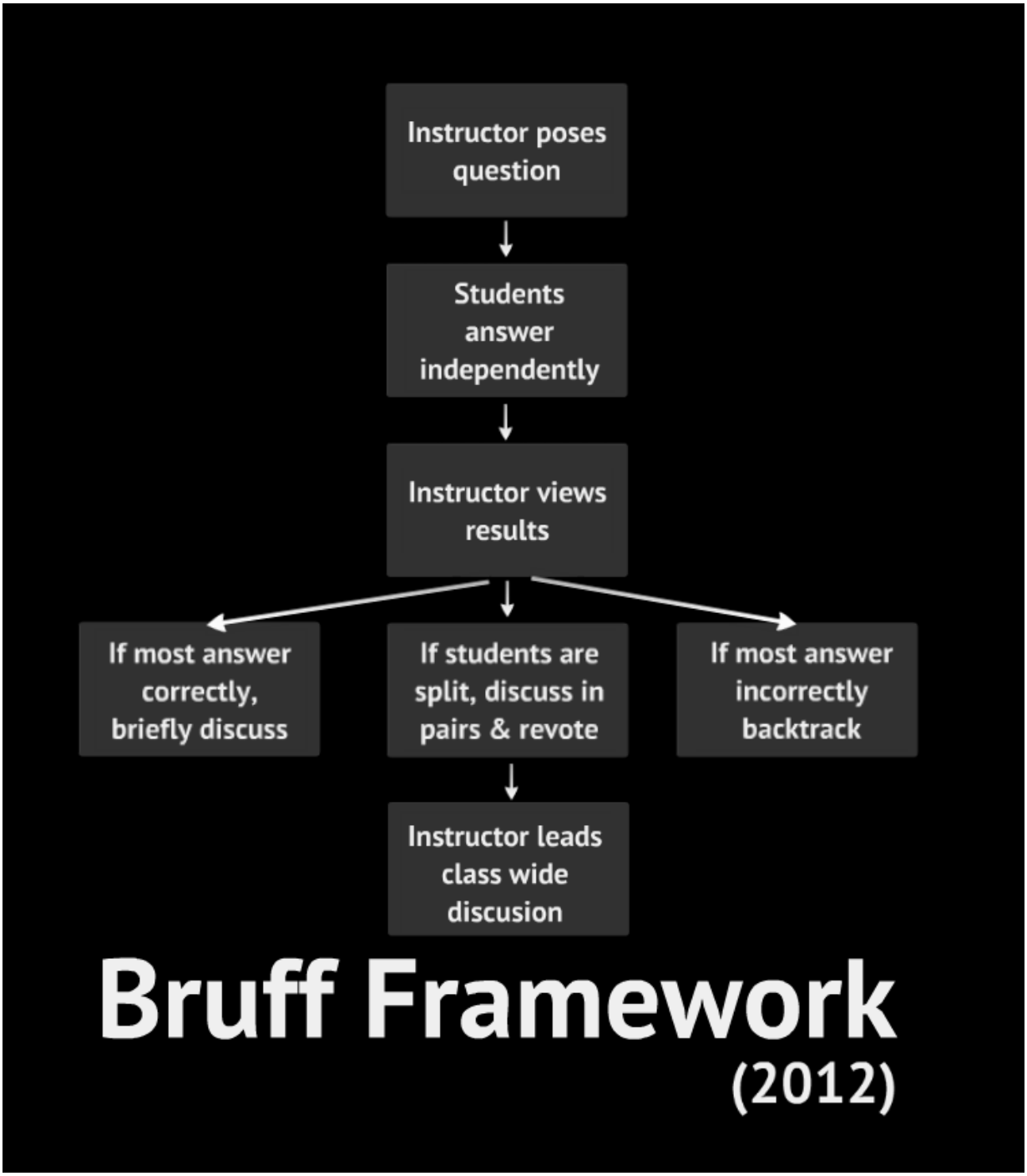
General Framework for Thinking about Question Design in Practise



Bruff, D (2009) Teaching with Classroom Response Systems: Creating Active Learning Environments, San Francisco: Wiley.

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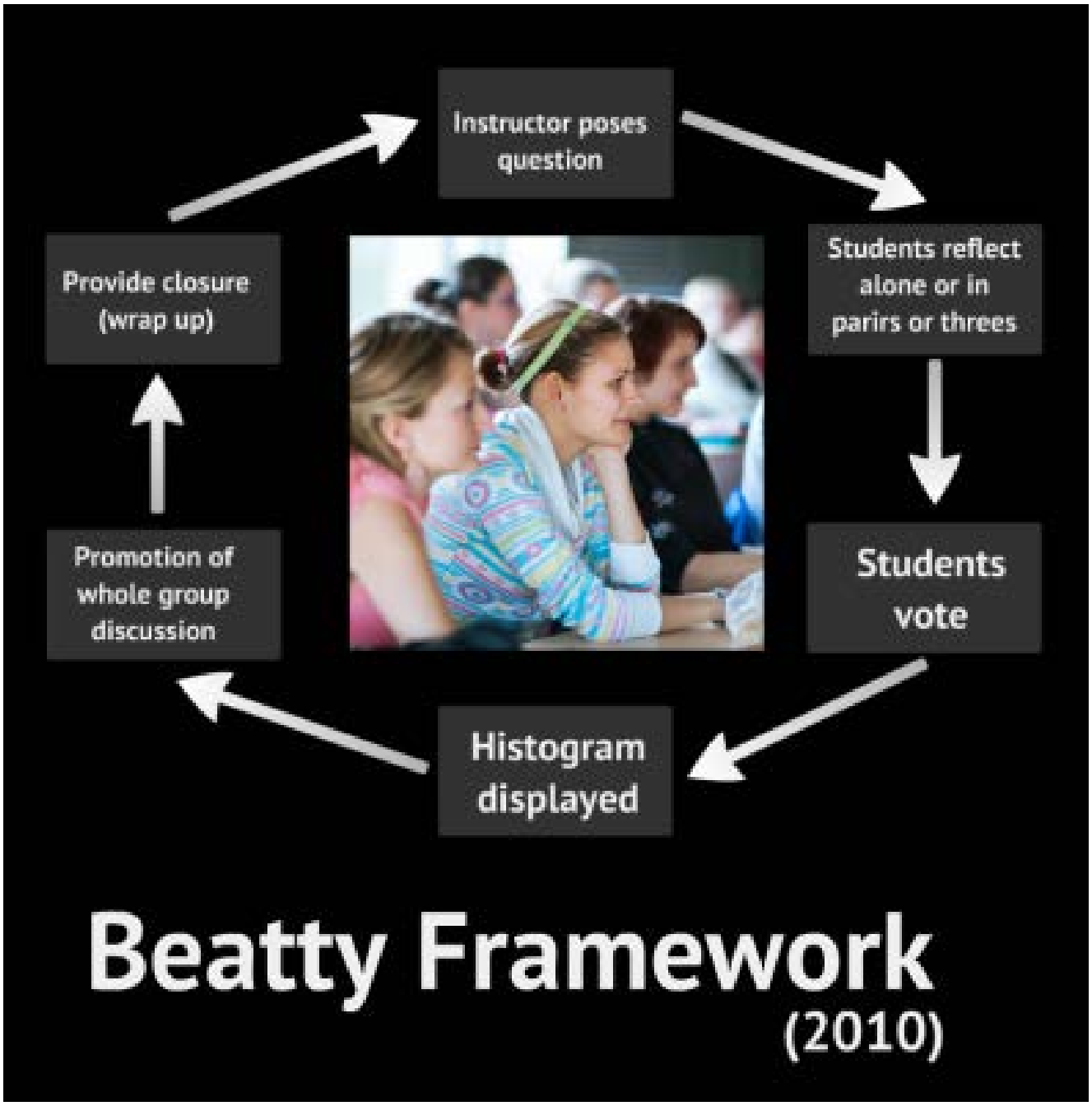

- Questions are presented to students in a way that encourages significant cogitation, rather than just memory recall or execution of practiced skills.
- Questions are accompanied by extensive discussion: within small groups before answers are collected and by the whole class afterward.
- The instructor continually probes for and adjusts to the students' learning needs

Designing effective questions for classroom response system teaching
Beatty, Gerace, Leonard, and Dufresne (2005). Am. J. Phys. 74 (1) [Online]
http://www.srri.umass.edu/sites/srri/files/beatty-2006deq.pdf Accessed: 25 July 2012.

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Creating Questions

A. Questions to Consider Before Starting

- What **student learning goals** do I have for the question?
- What do I hope to **learn about my students** by asking this question?
- What will my **students learn about each other** when they see the results of this question?
- How might this question be **used to engage students with course content** in small-group or class-wide discussions or by **creating a time for telling?**
- What **distribution of responses do I expect** from my students?
- **What might I do if the actual distribution turns out very differently**?

B. Potential Objectives

- Drawing **out student's background knowledge or beliefs**
- **Making students aware** of their own and others' perceptions & interpretations
- **Discovering** confusions, misconceptions & knowledge gaps
- **Elicit** a misconception or dangerous belief
- **Distinguishing** similar concepts
- **Realising** connections or similarities
- **Elaborating** understanding of a concept
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- **Set up** subsequent instruction
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C. Types of Questions

- Recall
- Conceptual understanding
- Application
- Critical Thinking
- Student Perspective
- Confidence level
- Monitoring
- Classroom experiment

D. Tactics for directing attention and raising awareness:

- Remove nonessentials
- Compare and contrast
- Extend the context
- Reuse familiar question situations
- Oops-go-back

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E. Tactics for stimulating cognitive processes:

- Interpret representations
- Compare and contrast
- Extend the context
- Identify a set or subset
- Rank variants
- Reveal a better way
- Strategize only
- Include extraneous information
- Omit necessary information

F. Tactics for formative use of response data:

- Answer choices reveal likely difficulties
- Use “none of the above”

G. Tactics for promoting articulation discussion:

- Qualitative questions
- Analysis and reasoning questions
- Multiple defensible answers
- Require unstated assumptions
- Trap unjustified assumptions
- Deliberate ambiguity
- Trolling for misconceptions

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The best clicker questions ….

- Are often focused on conceptual understanding
- Deal with important ideas in class
- Have common student mistakes as the wrong answers.
- Result in a lot of discussion and debate among the students.
- Require analysis and reasoning (not simple memorization).

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Taxonomy of Clicker Questions (Social Science Focus)

Types	Explanation	Why?	Example
Content Questions			
Recall Questions	Requires students to remember relevant facts, concepts or procedures.	• Typically used more for assessing student learning than engaging students. • Can be a useful way to help students prepare at the beginning of a class. • Can be used to make sure students have the base knowledge before proceeding with more complex tasks. • Can help build student confidence.	When you hear the term "water boarding," what comes to mind? A. Olympic event B. Fraternity initiation C. Interrogation technique D. Surfing E. Torture
Conceptual Understanding Questions	Requires students not only to recall information, but also to understand the concepts associated	• An effective question is one where incorrect answer choices are based on common student misconceptions of tangent lines. • Can result in students in class splitting their vote leading to rich small group & class wide discussion	The student next to you drops his test and you accidentally see the answers. This leads you to change one of your answers. **Ethical or unethical?** You get a B- on an exam. You would really like a B, so you ask your professor after class for a few extra points on a particular exam question, even though you know your answer probably doesn't deserve a higher score. **Ethical or unethical?**

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Application Questions	Requires students to apply their knowledge and understanding to particular situations and contexts	• Students required to remember & understand various rules and apply them to concrete scenarios • Encourages integrative learning (ideas across a module, multiple modules and the real world)	A question might ask students to view an issue from a particular perspective: *"What would author X say about situation Y"* or *"What would your response to situation Y be if you had the role of Z?"* Diagnosis of a problem*: "Here's a situation. What do you think the problem is?"* Case study discussion
Procedural Questions	Requires students to apply knowledge of a procedure or technique to a particular problem or situation	Useful question type to help students prepare for exams. Tutor provides a worked problem and asks students to determine whether the solution is the correct one. This can also be extended to questions that explore student's understanding of a worked example.	In a "math for the liberal arts" course students were given a *preference schedule* – a list of how each voter in an electorate (only four of them to keep things simple) ranked all of the candidates. Students were asked to determine which candidate would win the election using the instant run-off voting scheme. This is a straight-forward application of a particular algorithm. http://derekbruff.org/?p=674 "Do you understand the …… example I have just explained?" a) Yes b) No c) Sort of, but please explain it more
Prediction Questions	Requires students to take a position and encourages them to become invested in	Create a motivation for learning a topic.	Your sister calls to say she's having twins. Which of the following is more likely? (Assume she's not

	seeing and understanding the results of a scenario		having identical twins.) a) Twin boys b) Twin girls c) One boy and one girl d) All are equally likely.
One-best-answer Questions	Requires students not only to analyse a particular situation or set of issues but also to evaluate possible responses	Allows you to explore multiple ways a professional might approach a situation, some of which are often better than others depending on the information available in a particular case.	Tutor poses the question, "What is civilisation?" Several students' volunteer answers which are written on the board (tutor made add their own). Students vote for the best definition followed by a whole class discussion exploring the reasons students have for their choices.
Critical Thinking Questions	Requires students to analyse relationships among multiple concepts or make evaluations based on particular criteria	Can be used for assessing students and engaging students with course materials. Knowing that X% select a particular answer doesn't mean that they have well-developed / reasoned arguments. Often necessary to follow these questions with class discussion. May wish to follow a critical thinking question with a reason-focused question asking students to identify from a list the reason they answered the first question the way they did.	Students review selected journal article then vote on the construct validity of the research as high, medium or low. There is often diversity of opinion and students are asked to defend their answers during a class wide discussion followed by another vote. Discussion in small group → vote → class discussion
Peer Assessment Questions	Requires students to assess each other's presentations,	Provides peers with potentially valuable feedback on their work.	In a PBL activity students are asked to evaluate their assigned film for use in a public presentation about

	papers, or other work during class	Helps students better understand the module quality and assessment criteria. Can be a useful tool within a EBL/PBL design.	the Holocaust and defend to their peers as historically meaningful. Peers evaluate each group's presentation using clicker questions based on the marking rubric. After each question the results are shared with the class and the presenting group has a chance to defend their presentation. All students then revote, factoring in the additional comments.
Process Questions			
Student Perspective Questions	Provides useful information about students to help instructors tailor learning experiences to the unique makeup of students Useful for induction sessions as well as throughout a module	Question types include • Demographic • Opinion • Personal experience Help tutors get to know your students rather than just relying on assumptions often based on past student groups. Helps tutors tailor learning experiences and students get to know each other better and see value in considering perspectives other than their own. Can also help students see relevance of course content to their own lives by demonstrating how many of their peers are affected by course topics. Very useful in generating small group	Which of the statements most closely matches what you think? a. Humans evolved from other life with divine assistance b. Humans evolved from other life forms without divine assistance c. Humans were created by a divine being within the past 10,000 years *Philippa Levine, History, University of Southern California.* Asking students to remember a time when they were engages in some kind of activity prior to a more theoretical or academic discussion helps prepare students to value and engage in the discussion.

		and class discussion.	
Confidence Level Questions	Provides instructors with a level of information about their student's learning beyond a simple assessment of their accuracy	This type of question motivates students to think about and weight arguments that might compete with the ones they use to answer the questions.	How confident were you on your last answer? A. Very confident B. Somewhat confident C. Not very confident D. I just guessed
Monitoring Questions	Provides instructors with an opportunity to monitor various aspects of the student learning experience beyond comprehension and confidence levels	Tutors can monitor the progress students are making towards an essay, project etc. during semester(s). It provides a sense of where students are at, allowing for the tutor to provide tailored feedback and provide a benchmark for students to compare their progress. Tutors may create questions that address common module handbook questions. Reinforcing throughout the module aspects that the students need to know nearer to the time they need the information.	"Have you written the first draft of your essay yet?" "How well are you able to follow lectures in this module?" "Of the following 5 topics, which would you like to review before X?" "Is the session moving too fast, too slow, just about right?" "How am I doing?" A. The lecture is very clear so far, no questions B. I have a question or two C. I have a lot of questions D. I am so confused, I don't have any questions

Adapted from with Extracts:
Bruff, D. (2009). *Teaching with Classroom Response Systems: Creating Active Learning Environments*. San Francisco: Jossey-Bass.

Orientation Type Questions and Possible Answers

Adapted from Table 1. Kift p89 in Banks (2006)

Questions designed to enhance the retention of information and give immediate feedback to students

1. Are you having a good time?
   (*Engage and focus students' attention)*
   a. Yes
   b. No
   c. Don't know
   d. Do I get my degree now?

2. Which of the following best describes YOU?
   Raise awareness of diversity includes Qs 3&4)
   a. A Levels
   b. BTECH
   c. Foundation programme
   d. Mature entry

3. Your age?
   a. 18 or younger
   b. 19-23
   c. 24-30
   d. 31-40
   e. Over 40

4. Are you?
   a. Male
   b. Female

5. Do you intend to seek a job as _____ when you graduate?
   (Develop insights that link prior and introduced ideas)
   a. Duh… Yes
   b. Doo…No

6. Why are you studying _____?
   (*helps consider prior views/explore motivation)*
   a. My parents made me do it
   b. I have to spend my day doing something!
   c. To make buckets of money
   d. To meet other people
   e. To make a different to society
   f. Intellectual stimulation

7. Which factors do YOU think will impinge on your study?
   (*Apply new constructions to personally relevant issues)*
   a. Work

b. Home & family
c. Loneliness
d. Drinking and partying
e. Motivation

8. XXX 1st year students last year each provided ONE piece of advice for you. Which was their top advice?
   (Develop insights that link prior and introduced ideas)
   a. Be organised / keep up to date
   b. Make friends / meet others / enjoy
   c. Do all the readings / read more
   d. Ask for help / ask questions
   e. Party on with good study technique

9. Which of the following is the type of PLAGIARISM (= cheating) that could actually make you fail a module?
   (Develop insights that link prior and introduced ideas)
   a. The type where I get caught!
   b. Paraphrasing without referencing
   c. Cutting and pasting from the Web
   d. 2 of us putting in similar/same work
   e. All of the above

10. What's the difference between school and university?
    (Promote some ideas over others, includes Q11)
    a. Haven't thought about it
    b. Knowing / understanding is not enough
    c. No different
    d. Expected to take responsibility for my own learning

11. What are you expecting University teaching staff to be like?
    (Clarify and expose misconceptions)
    a. Teacher who'll help if I'm proactive
    b. Famous researchers in the field
    c. Friends who worry that I mightn't pass
    d. My mum
    e. My old school teacher

12. What's the difference between a lecture and a seminar?
    a. Between and what and a what?
    b. Lectures are bod, seminars are small
    c. Lectures are boring and seminars are scary
    d. Lectures includes everyone, seminars are smaller groups (XX) and I'm expected to contribute (a lot)