Summary of active learning approaches (Adapted from King 1993; Ruiz-Primo et al., 2011; Wolff et al., 2015). Categories of active learning approach are Conceptually orientated tasks (COTs), Collaborative learning activities (CL), Technology (TECH) and Inquiry based projects (IBPs) (see text for further details).

Active learning approach	Overview of approach	References
Pause procedures (COTs)	Scheduled pause during learning session allowing learners to clarify and assimilate information.	Angelo & Cross, 1993; Ruhl et al., 1987; Stead, 2005.
One minute paper (COTs)	Learners asked to write down response to question based on information already provided during session.	Angelo & Cross, 1993; Stead, 2005.
The muddiest point (COTs/CL)	Scheduled pause during learning session where learners reflect and discuss with peers what they have heard and any areas of confusion.	
Think – pair share (COTs/CL)	Learners initially asked to respond to a question, then pair with neighbour to compare responses and identify agreed answer. Then share with group.	Hake, 1998; Mazur, 1997.
Case-based learning (CL)	Use of cases to facilitate discussions between learners.	Chamberlain et al., 2012; Maudsley 1999; Wood, 2003.
Concept maps (COTs/CL/TECH)	Learners individually or in a group create concept maps or diagrams to show relationship between difference pieces of information.	Briscoe and LaMaster, 1991; Cutrer et al., 2011; Daley and Torres, 2010; Eisobu and Soyibo, 1995; Fisher et al., 2000; Kumar et al., 2011 Torre et al., 2013.
Role-play (CL)	Learner assigned a part or specific viewpoint to research and act out.	
Commitment activities (COTs/TECH)	Learner forced to make a decision e.g. through voting using clickers.	Freeman et al., 2007; Gauci et al., 2009; Nelsen et al., 2012.
Jigsaw (CL)	Learners assigned different components of an interrelated topic to research and present as part of a bigger picture.	Aronson, 1978; Doymus, 2008; Perkins and Saris, 2001; Persky and Pollack, 2009; Summers and Svinicki, 2007.
Peer collaboration (COTs/CL/IBPs)	Learners work together to solve a problem which may or may not be solvable individually.	Lumpe and Staver, 1995.
Team based learning (CL)	Learners pre-read information for class session where they are challenged as a team to apply core knowledge to specific	Thompson et al., 2007; Warrier et al., 2013.

	scenarios.	
Problem-based learning (IBPs)	Learners in small groups solve problems set as cases.	Koestler et al., 2009; Maudsley, 1999; Wood, 2003.
Thinking hats (CL)	Different learners assigned different metaphorical hats during an exercise to approach a particular topic or problem.	De Bono, 1985
Discovery based learning (COTs/IBP/TECH)	Learners exposed to different situations, questions, tasks that help them to 'discover' for themselves the intended concepts or material.	Wilke and Straits, 2001.
Classroom flipping (COTs/TECH)	Content in the form of pre-learning material is delivered prior to the in-class session. Class session is used for applying knowledge and developing skills.	Mortenson and Nicholson, 2015; Ryan and Reid, 2016; Vanderbilt, 2013.
Laboratory mental model activities (COTs/CL/TECH)	Pre- and post-laboratory questions used to allow students to verbalise mental models and expected outcomes of experimental work.	Modell et al., 2000, 2004.