Examples of active learning activities

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Table 1. Examples of active learning activities (complementing Wolff, Wagner, Poznanski, Schiller, & Santen, 2015).

Activity	Definition	Resources	Faculty requirement	Preparation (minimal - moderative - extensive)	Didactic or cooperative	Examples of activities in
Pause procedures	A brief pause in a learning session to allow learners to clarify and assimilate information (Wolff et al, 2015).	None	One per any sized group	Minimal	Didactic	Bonwell & Eison (1991) Wolff et al (2015)
One-Minute Paper	A type of pause procedure. Pose a question to the group related to the information that was just presented and ask them to write down their response. (Wolff et al, 2015.)	None	One per any sized group	Minimal	Didactic	Bonwell & Eison (1991) Lom (2012) Stead (2005) Wolff et al (2015)

The Muddiest Point	A type of pause procedure where learners reflect on and share areas of confusion (Wolff et al, 2015).	None	One per any sized group	Minimal	Didactic	Wolff et al (2015)
Think-Pair-Share	Pose a question to the group and have learners consider their response individually. Next, instruct learners to pair with a neighbor to compare responses and reach consensus. End by randomly calling on pairs to share with the group. (Wolff et al, 2015.)	None	One per any sized group	Minimal	Didactic	Lom (2012) Wolff et al (2015)
Questioning using small informal groups	Consists of using pre-planned short questions, that students work with with their neighbours to come up with an answer. The teacher then guides the students towards the answer without answering his/her own question.	Preparing of short, clear and nontrivial questions beforehand	One per any sized group	Moderate	Didactic	Larson & Ahonen (2004)

Concept maps	A technique that involves visualizing relationships between concepts by creating a diagram. Can be done individually or in groups. (Wolff et al, 2015.)	If being used as a note-taking aid, a partially completed concept map will need to be provided. If students do their own, no resources needed.	One per any sized group	Minimal/ Moderate	Didactic or cooperative	Witmer (2015) Wolff et al (2015)
Case-based learning	A technique that use vignettes of real or hypothetical cases to facilitate a discussion (Wolff et al, 2015). Students analyze case studies of historical or hypothetical situations that involve solving problems and/or making decisions (Prince and Felder, 2006).	Preparing of cases	One per any sized group	Moderate	Didactic	Bisantz & Paquet (2002) Jonassen et al (2009) Knight et al (2008) Wolff et al (2015) Yadav et al (2010)

Commitment activities (e.g. audience response systems)	Exercises that force learners to make a decision. Can be done individually, in pairs or groups. (Wolff et al, 2015.) Are based on the combination of executive attention, social engagement, and rapid, meaningful feedback (Wallis, 2015).	Audience response system – flash cards, clickers or online audience response program (e.g. Kahoot) Preparing of questions	One per any sized group	Moderate	Didactic	Arteaga & Vinken (2013) Chen et al (2010) Donohue (2014) Enriquez (2010) Gómez Puente & Swagten (2012) Oliveira & Oliveira (2013) Schmidt (2011) Van Dijk et al (2001) Wolff et al (2015)
Jigsaw	A topic is divided into several smaller, interrelated pieces. Each member of the team is assigned to read and become an expert on a part of the topic. After each person has become an expert, they teach their team members about their piece. After each person in the group is finished teaching their portion, the puzzle is assembled. (Wolff et al, 2015.)	Preparing of prereadings	This can be done with one faculty member, but additional faculty members can be helpful facilitating small groups	Extensive	Cooperative	Lom (2012) Sagsoz et al (2015) Wolff et al (2015)

Thinking hats	During this exercise, learners wear different metaphorical hats that represent a different way of approaching a problem or topic Wolff et al, 2015).	Preparation of topics	One faculty member for small–medium-sized group	Extensive	Cooperative	Wolff et al (2015)
Disassemble/ Analyze / Assemble (DAA) activities	Activities involve deconstruction of an artefact, analysis and possible reconstruction of its components. The goal is to understand the physical, technological and developmental principles of the artefact. (Ogot & Kremer, 2006.)	The artefacts	One faculty member for all sized groups	Moderate	Cooperative	Dalrymple et al (2011) Edward (2004)
Problem-based learning	Case-based learning in small groups (Wolff et al, 2015). Student groups encounter authentic, real-life problems that are a tool to achieve required knowledge and skills to solve the problem through self-directed learning (Barrows,	Cases	One faculty member for each small group	Extensive	Cooperative	Chang & Wang (2011) Macho-Stadler & Elejalde-García (2013) Mantri (2014) Ribeiro & Mizukami (2005) Sahin (2010) Wolff et al (2015) Yadav et al (2011)

	1996). Focus is more on the learning process than on the final product.					
Project-based learning	Includes a project or an assignment that is carried out in order to make a final product (Prince and Felder, 2006; Blumenfield et al, 1991). Focus is more on the final product than on the learning process.	Assignments	This can be done with one faculty member, but additional faculty members can be helpful facilitating small groups	Extensive	Cooperative	Atadero et al (2015) Edward (2004) Fernandes et al (2014) Liu et al (2011) Nedic et al (2010) Pascual (2010) Safferman et al (2001)
Team-based learning	Small-group learning that involves preclass preparation so that learners are ready to learn. This is followed by a classroom portion where learners are tested on the preclass material and then challenged to apply core content to scenarios as a team. (Wolff et al, 2015.)	Prereading Test materials Cases	One faculty member facilitating multiple small groups	Extensive	Cooperative	Wolff et al (2015)

Collaborative learning	Two or more students working together on a task (Felder & Brent, 2004).	The task	Depending on the task one or more faculty members	Extensive	Cooperative	Bjorklund et al (2004) Dori et al (2007) Kapp et al (2011) Panetta et al (2002) Rutledge et al (2015) Terenzini et al (2001)
Cooperative learning	Students work together in order to ensure the learning of all the members of the group in conditions where five criteria are satisfied: positive interdependence, individual accountability, face-to-face promotive interaction, teamwork skills, and group processing (e.g. Johnson et al, 1998; Smith et al 2005). A subcategory for collaborative learning.	The task	Depending on the task one or more faculty members	Extensive	Cooperative	Hsiung (2012) Mourtos & Allen (2001) Pinho-Lopes (2011)

Flipped classroom	What was traditionally done in class is now done at home and vice versa (Bergman & Aaron, 2012; Lage et al, 2000). Classroom time is reserved for interactive learning, and homework consists for example of watching lectures or other video content (e.g. Bishop & Verleger, 2013; Fulton, 2012) or other preparing tasks such as reading (e.g. Knobbs & Grayson, 2012)	Preparing and recording of videos / finding appropariate videos to use / choosing other material for pre-assignments	One per any sized group	Extensive	Didactic/ Cooperative	Asiksoy & Özdamli (2016) Foertsch et al (2002) Hotle & Garrow (2016) Knobbs & Grayson (2012) Love et al (2014) Petrillo (2016) Touchton (2015) Yelamarthi & Drake (2015) Making of lecture videos: Brame (2016)
Inquiry-based learning	Students work with problems by forming and/or answering questions. In open inquiry students define the problem themselves and find out ways to solve it. In guided inquiry, students find out a way to solve a given problem. In structured inquiry, students are given	Depending on the type of inquiry: Defining the context, problem, questions and/or outline for problem solving.	This can be done with one faculty member, but additional faculty members can be helpful facilitating small groups	Extensive	Didactic/Cooperative	Biernacki & Wilson (2001) Lord & Orkwiszewski (2006) Salmisto & Nokelainen (2015)

	both the problem and an outline for solving it. (Staver & Bay, 1987.)					
Students as instructors	Students work with the content in order to teach it to other students. They for example design and create an instructional artifact (Impelluso & Metoyer-Guidry, 2001) or product video or other material (Rooney-Varga et al, 2014).	Preparing of the task	This can be done with one faculty member, but additional faculty members can be helpful facilitating small groups	Extensive	Cooperative	Impelluso & Metoyer-Guidry (2001) Rooney-Varga et al (2014)
Challenge-based learning	Students face challenges with guided instruction.	Challenges Phases of the exercise	This can be done with one faculty member, but additional faculty members can be helpful facilitating small groups	Extensive	Didactic	Lissenmaeir et al (2008) Pandy et al (2004)

Simulations	Simulate some real-life situation or phenomenon, which students work with. Includes i.e. virtual versions of laboratory machines or roleplay in real-life-like scenarios. In role-play learners act out a part or a particular viewpoint to better understand the concepts and theories being discussed (Wolff et al, 2015).	Purchasing of (possibly needed) softwares, creating assignments	This can be done with one faculty member, but additional faculty members can be helpful facilitating small groups	Extensive	Didactic/ Cooperative	Abdulwahed & Nagy (2009) Fraser et al (2007) Guikema et al (2001, roleplay) Koh et al (2010) McLaughlan & Kirkpatrick (2004, roleplay) Wankat (2002)

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