Teaching in Active Learning Classrooms

produced by Andrew Middleton and Ian Glover

Active Learning Classrooms

Active Learning Classrooms (ALCs) are designed to engage students in individual and small group activities by requiring them to develop, apply and evaluate their knowledge together. The design and arrangement of the physical space contrasts with teacher-centred classrooms. In the ALC, the teacher has a more fluid role, being less dependent on 'teaching from the front'. The role is facilitative and characterised by working more closely with student groups and monitoring their understanding of knowledge.

The Active Learning Classroom has three distinguishable features,

- The 'front' of the room is no longer dominated by a 'teaching wall' because the teacher spends much of the class amongst their students;

- Tables are generally arranged for small group work;

- Wall space, table space and floorspace become more important to foster group spaces, for example for whiteboarding.

Active learning incorporates methods such as problem-based and project-based learning constructed around real world scenarios. Such authentic learning activities simulate professional situations, often using real world methods and data. They offer a way for students to develop their confidence by using collaboration and communication skills as they become more responsible for their own learning. Such methods challenge the learner to explore topics deeply, for example by interrogating and applying information rather than simply remembering it.

Active learning methods are used to challenge and inspire students, developing their capabilities and confidence. They provide opportunities for students to gain experience in a variety of techniques such as generating ideas, evaluating information, and applying theoretical knowledge using multiple tools and media to co-produce learning artefacts.

Students are expected to engage in study between classes; on their own and with peer groups. Typically, they engage in pre-class activities to acquire the foundational knowledge they will use and develop in class. Class-time is spent developing deeper dimensions of knowledge with peers drawing upon the support of their tutor.

In an active learning classroom, the aim is to develop knowledge and student self-efficacy therefore.

Spaces for Learning
Teaching and Assessment Essentials

Sheffield Hallam University

Problem-based Learning

A complex real-world problem is an essential component of Problem-based Learning (PBL). 'Content' or knowledge is introduced *through* authentic problems and the way they are tackled. In PBL the problem is usually expressed in the form of a scenario to establish the activity context with the students.

Good problem scenarios are authentic and ill-structured. They require students to go beyond their textbooks to pursue deep knowledge. Well-formed scenarios feel real, containing realistic situations and settings, data, key players, consequences, and problem statements that require analysis and further research.

Problems used in active learning scenarios vary in size. They can take the form of small puzzles or large-scale challenges connecting across modules or lasting throughout the course. In each case they form the basis of meaningful activities in which problem statements can be discussed and resolved. Small-scale activities help individuals and groups to identify knowledge gaps and strengths. From this, students can develop strategies for developing their knowledge and skills.

PBL provides students with the opportunity to develop skills related to:

- Working in teams;
- Managing projects and holding leadership roles;
- Oral and written communication;
- Self-awareness and evaluation of group processes;
- Working independently;
- Critical thinking and analysis;
- Explaining concepts;
- Self-directed learning;
- Applying course content to real world examples;
- Researching and information literacy;
- Problem solving across disciplines.

Learning comes from *working out* solutions, not by having the 'right' solution. Well-designed problems feel real, realisable, open-ended, negotiable and require problem-solving strategies. They have multiple possible 'right' answers and students need to use their collective ingenuity and capabilities to use their knowledge well.

Further information can be found in the **Spaces for Learning toolkit**: http://blogs.shu.ac.uk/learningspaces

Whiteboarding

Whiteboards are key to the active classroom. Low tech, they offer extensive space within the room for students to work creatively and collaboratively. Using whiteboards, students visually develop and represent their learning e.g. through mind maps, lists, and process diagrams. Student groups can draft out ideas and receive immediate feedback on them from teachers or peers. These workings can be captured using smart device cameras by the students and further developed elsewhere.

There is a wide range of uses for whiteboards in an active, student-centred classroom, e.g.,

- Students can begin sessions in a **question generation** activity by listing things they would like to find out about. At the end of the session, the class can **review questions**, note how much they have learnt and identify those questions which have not yet been addressed.

- Students can **collect data from classroom activities and experiments**, create graphical **visualisations**, and **present information** on whiteboards. They can **synthesise their work**, or that of other groups, during the session. Alternatively, students can **create video commentaries** from their whiteboard work and these can be shared online, such as through Blackboard or on a Padlet board.

- Table-based discussions can be used initially to generate ideas on post-its or flip charts. **Desk work can be categorised** by being stuck on the boards using board magnets, Blutack or post-its. Key ideas on paper can form connecting nodes in **concept maps** with connections, boundaries, hierarchies, etc., being developed and drawn onto the board. The results can be photographed to create a record of the information then analysed using criteria to categorise data.

- Processes can be broken down or constructed using diagrams. Serial photographs of **processes described on whiteboards can be captured as animations with spoken commentaries** using smart apps such as Stop Motion.

- Whiteboards make excellent **'parking spaces' for project and problem-based discussions**. Parking space boards allow students to record important but 'off-topic' thoughts for later consideration and ensure the discussion focus is not lost.

- Work created and presented on whiteboards results in an instant **'group work gallery'**. The gallery can be toured by peers who can provide feedback on, or further develop, the work of their peers while also encouraging alternative perspectives and ideas to be revealed on group boards around the room.

Ensure there are whiteboard pens and erasers for the students if you are planning to use whiteboarding. Work can be captured by using a phone or tablet and made available for review via Blackboard or other online platforms.

Further information can be found in the **Spaces for Learning toolkit**: http://blogs.shu.ac.uk/learningspaces

Stand Up Pedagogy

Stand Up Pedagogy is an active learning method based on research conducted in Australia that focuses entirely on the use of whiteboards. In a Stand Up Pedagogy session, all other furniture and IT equipment is moved aside to allow groups of students to gather around whiteboards in a way that reduces distractions and concentrates attention on the discussion and output being generated on the whiteboard.

This approach makes use of whiteboarding to assist students in collaboratively developing knowledge in the topic being covered, but also supports the development of learning and graduate capabilities including problem solving, co-operative and team-based learning, self-efficacy and leadership, and creative and critical thinking.

By creating a 'distraction-free' space, the Stand Up Classroom makes it clear to staff and student users of the space that they are their own resource during the session. Between them they will draw upon what they know, their previous experience, existing skills, imagination and ingenuity to describe and solve problems and develop ideas. The situation is rich therefore, being,

- active and challenging;
- supportive and full of feedback;
- collaborative and requiring interactivity and peer co-operation;
- diverse in how it values a range of student dispositions, skills and knowledge.

Note: While the method is called Stand Up Pedagogy, this is simply to denote the major difference between this and other methods. It does not preclude involvement from students in wheelchairs or others who are unable to stand for extended periods of time.

Further information can be found in the **Spaces for Learning toolkit**: http://blogs.shu.ac.uk/learningspaces

SCALE UP

SCALE UP (Student Centred Active Learning Environment for Upside-down Pedagogy) brings together active learning approaches into a distinctive physical environment specifically designed to make this work well.

The model emphasises the value of the time that students and tutors spend together by engaging students in small-group problem-based learning activities. Students tackle manageable and challenging problems by researching and applying knowledge under the guidance of their tutor.

A 'flipped learning' approach is used. This involves students engaging in pre-class activities to develop and evaluate foundational knowledge supporting class topics. This ensures that time spent together in session is used to focus on collaborative problem solving and the application of and deeper development of knowledge. The information students need to know is provided to them in advance, typically as a set of online resources. Ideally, this information remains available in a form that allows the students to refresh and compare their understanding during the session. Diagnostic activities, before or at the outset of class, are used to check for misconceptions before SCALE UP classroom activities are introduced.

The tutor role during the SCALE UP session is facilitative, with the tutor roaming amongst groups observing, clarifying and advising them through problems. The tutor therefore spends less time projecting content and more time engaging with students to use knowledge.

SCALE UP rooms have circular tables seating nine students who work collaboratively, usually in three groups of three. These triads adopt different roles (discussed later). Each triad has access to a computer which the students use to access online resources and to produce artefacts based on the research and problem-solving.

SCALE UP sessions can be based around a single large problem, but more frequently they incorporate a series of smaller problems as this allows for increased opportunities for sharing and feedback and keeping groups engaged. A structured problem-solving technique assists students in breaking down the activity into meaningful subtasks. One such recommended technique is the GOAL framework:

- **Gather** information - carefully read the problem and quickly search for relevant resources

- **Organise** the approach - classify the problem and agree a plan of action

- **Analyse** the problem - generate and record potential solutions

- **Learn** from the results - reflect on the approach taken and consider how to address a similar problem in future.

5

A feature of SCALE UP is that student groups will report back on their findings to their peers. This can take the form of each triad sharing their findings with the two other triads on a table or the tutor can select a group to share their work with the entire room.

By offering a supported, student-led learning experience, SCALE UP allows students to take responsibility for their learning by exploring the limits of their knowledge while learning from their peers. In addition, it encourages students to develop collaborative and problem-solving skills that are applicable to other learning situations.

Further information can be found in the **Spaces for Learning toolkit**: http://blogs.shu.ac.uk/learningspaces

Triad groups for active learning

SCALE UP and other active learning methods use student triad groups in which each student is given a specific role and responsibilities. The roles are rotated periodically so that students experience different responsibilities over time. Usually the assigned roles are Coordinator, Questioner and Scribe.

Coordinator

The Coordinator is responsible for timekeeping and ensuring that everyone contributes, as well as summarising the merits of the suggestions made. The Coordinator acts as leader, though they are not individually responsible for the work of the group or for "bossing people around".

Typical Coordinator statements include:

- "It looks like we are getting pulled in different directions. I'm going to call the tutor over for some advice"

- "For this task we need someone to look up the formulas on the internet and pick out the relevant ones. Jill, can you do that please?"

Questioner

The Questioner's role is to challenge the assumptions of the group to ensure that potential approaches to the problem are identified and considered. The Questioner ensures that the group does not go too far in a particular direction before considering whether there are alternatives that could produce better results.

Typical Questioner statements include:

- "Is there an alternative method we can try?"

- "Let's go back a step and see if we can think of a new way to tackle the issue"

Scribe

The Scribe makes the definitive record of the group's work. The Scribe records the discussions, ideas, decisions and actions taken, and makes sure everyone understands and agrees before moving on. The Scribe is extremely important as it is their record of the group's work that is used when reporting back findings or when discussing with tutors during the session.

Typical Scribe statements include:

- "Does everyone agree that is an accurate reflection of our discussion?"

- "Which of the ideas we've had should I write down as our solution to this step?"

Further information can be found in the **Spaces for Learning toolkit**: http://blogs.shu.ac.uk/learningspaces

Bibliography

Active learning and Active Learning Classrooms

Baepler, P., Brooks, C., & Walker, J.D. (2014) Active learning spaces. New Directions for Teaching and Learning. 137, Spring 2014.

Petersen, C., & Gorman, K. (2014). Strategies to address common challenges when teaching in an Active Learning Classroom. New Directions for Teaching and Learning. 137, 63-70. DOI: 10.1002/tl.20086 http://onlinelibrary.wiley.com.lcproxy.shu.ac.uk/doi/10.1002/tl.20086/full

Problem-Based Learning

Boud, D. & Feletti, G. (1997). The challenge of problem-based Learning. 2nd ed. London: Kogan Page.

Duch, B.J., Groh, S.E. & Allen, D.E. (2001) The power of problem-based Learning. Virginia: Stylus.

Macdonald, R.F. & Savin-Baden, M. (2004). A briefing on assessment in problem-based learning. LTSN Generic Centre Assessment Series. Higher Education Academy's Resource. Online at: http://bit.ly/2shYalh

Whiteboarding and Stand Up Pedagogy

MacIsaac, D. & Falconer, K. (2004). Whiteboarding in the classroom. Available online at: http://physicsed. buffalostate.edu/AZTEC/BP_WB/index.html

Schaffner, D., Schaffner, M. Seaton, K. (2015). Whiteboarding in senior mathematics classrooms. 'Back to the Future', The MAV 52nd Annual Conference, 3 & 4 December 2015

Yost, D. (2003). Whiteboarding: A learning process. Available online at: http://modeling.asu.edu/modeling/ Whiteboarding_DonYost03.pdf

SCALE UP and Triads

Beichner, R. J., & Saul, J. M. (2003). Introduction to the SCALE-UP (Student-Centered Activities for Large Enrollment Undergraduate Programs Project. Available online at: http://www.ncsu.edu/per/Articles/Varenna_SCALEUP_Paper.pdf

Beichner, R., Saul, J., Abbott, D., Morse, J., Deardorff, D., Allain, R. et al. (2007). Student-Centered Activities for Large Enrollment Undergraduate Programs (SCALE-UP) project. In: E. Redish & P. Cooney (Eds), Research-based reform of university physics (pp. 1–42). College Park, MD: American Association of Physics Teachers.

Beichner, R. (2011). Video explaining SCALE UP: https://goo.gl/Rh6zJB

Further information can be found in the **Spaces for Learning toolkit**: http://blogs.shu.ac.uk/learningspaces