

WHITE PAPER

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The Case for Active Learning Environments in University Education

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Lecture Theatres Aren't Working

Traditional lecture theatres were designed to enable large numbers of high-calibre students to hear expositions of knowledge and understanding. Students commonly listen to texts being read verbatim, without visual reinforcement or interaction. But lectures fail to cater for the wider range of students who are now entering universities because they treat all students as if they are equal, fail to ensure that knowledge is retained, and insufficiently engage students, resulting in poor attendance and feedback. Tiered lecture theatres are also inefficient because they cannot be used for other purposes. Now many UK students are required to pay large fees, universities must pay greater attention to student expectations.

In the USA, over 200 universities and colleges have adopted active learning initiatives which have delivered dramatic improvements in every aspect of learning. New learning environments enable large student groups to work collaboratively in small teams in a single space, using visual information and creating knowledge as they learn from each other and their instructors. Students can jointly edit each other's work when displayed on team screens, or share material with a whole class via class screens arrayed around the room, or on team screens integrated into each table.

An excellent, pioneering example of active learning is the 'SCALE-UP' programme developed by Professor Bob Beichner at North Carolina State University which was initially designed for teaching physics on introductory college courses. It features a collaborative, 'hands-on', computer-rich environment. Instead of passively listening to lecturers, students are set tasks that actively engage them in finding solutions through discussion and team work. They use high-quality audio visual facilities and

online resources. All students are required to participate. The approach results in deeper learning and an enhanced undergraduate experience.

Research into the SCALE-UP outcomes over many years found that it improves problem-solving and conceptual understanding. It also generates more positive attitudes, and failure rates are drastically reduced, especially for women and members of minority groups. 'At risk' students do better.¹

SCALE-UP now stands for **S**tudent **C**entred **A**ctive **L**earning **E**nvironment with **U**pside-down **P**edagogies. Other acronyms or abbreviations have been coined for similar pedagogies for increasing student engagement and outcomes.

TEAL at MIT (Massachusetts Institute of Technology) = Technology Enhanced Active Learning

TBL at the University of Bradford = Team Based Learning

TILE at the University of Iowa = Transform, Interact, Learn, Engage

The 'Upside-down' element refers to the arrangement whereby information that would previously have been delivered as a lecture is provided in pre-session course work which students complete before team-based learning takes place. This is also known as the 'flipped classroom' or 'reverse instruction' model of teaching, as advocated by Beichner and others including Salman Khan (Khan Academy), Jonathan Bergmann (Flippedlearning.com), and Aaron Sams (Sams Learning Designs).

There is no best way to teach a class, but some instructional methods have been shown through research to enhance learning gains by students, especially at the deeper levels of Bloom's Taxonomy.² Instructional strategies such as collaborative learning,³ problem-based learning,⁴ and team-based learning,⁵ depend upon successful interactions between students working together in a supportive community. Traditional classrooms do not facilitate such student interaction, and whilst instruction in traditional lecture theatres can be improved by adopting such methods,⁶ the improvement occurs in spite of the environment. Active learning classroom environments remove some of the barriers that prevent instructors from implementing pedagogical innovations.⁷

Academic Benefits

Students learn more in active learning rooms, forming closer relationships with their peers and instructors. A single room can be used for a short 'lecture' to set the scene and group learning. It has been observed that 'Students enjoy the classroom experience and they are fully engaged with the learning process.'⁸ Failure rates are reduced, and the academic results of the best students are increased. There is no

'back of the class' in which students can hide, and team projects generate beneficial peer pressure. Whilst technology enables group interactions, the key dynamics are those of students becoming tutors and instructors becoming coaches. A consistent message from studies is that its dedicated spaces and associated methods provide a much more enjoyable and challenging learning experience for students. The benefits of increased attendance, engagement and attainment have been replicated at universities and colleges across the USA, Australia and Asia.⁹

Tables and Teams

The most obvious outward features of active learning are student-centred tables and technology. Technology in this case means anything that is used to facilitate visual learning: displays, whiteboards, projectors and microphones (so all students can hear and be heard). In most American active learning environments, nine students typically sit in groups of three at round tables that are 7ft (2.1m) in diameter. The diameter is not accidental; studies revealed that smaller tables made the students feel cramped, while larger tables prevented table-wide discussions.¹⁰ Three-person groups are also preferred on the basis of research,¹¹ although other sizes could be facilitated. Each group of three students shares a laptop computer, but the 'group' display is located away from the table either fixed to a wall or on a mobile mount.

With nine students on each table working as three teams, each team is likely to interfere with the work of the others. Research has also shown that collaboration declines when a team numbers more than six, because larger groups enable some members to avoid contributing. Nine students on one table may have a similar effect, especially when all groups are working simultaneously on the same material.

The UK Experience

UK universities began to introduce active learning environments about 16 years after SCALE-UP was launched at North Carolina State University. Different seating arrangements were preferred, usually a table that accommodated one team of five or six students. Such tables are more efficient than American round tables. More students can be accommodated within a given area, and each table can have a dedicated integrated display. Teams of six or fewer work better collaboratively than nine. Even where educators want to follow the methodology of having nine students on a table, large plectrum-shaped tables that integrate the display are being used. At the University of Bradford, a team based learning room was installed in the faculty of Life Sciences during summer 2012, specifically for pharmacy. It accommodates 108 students at 18 tables (6 per table).

To be successful, instruction in an active learning environment must emphasise the students' learning rather than an instructor's lecturing. Therefore, there is no 'front'

to the classroom, and ample space is provided for teaching staff to circulate amongst the students asking questions and giving support. The TBL room at the University of Bradford¹² has proved incredibly successful. When first-year undergraduates were faced with conducting their second-year studies in traditional rooms and lecture theatres, they argued for the provision of a second room. From the outset, Bradford also realised that their room's success would ultimately be reliant on its audio Visual and IT equipment as this would enable participation by every student.

A Catalyst for Change

“Change is a problem because it unsettles people, but sometimes unsettling people gives them a fresh start.”¹³

The benefits of active learning extend beyond the experience itself. Faced with competition from online education, social interaction is something that universities can claim to provide, and this is a central feature of active learning. It also provides many more benefits for universities:

- Active learning enhances the student experience through providing supportive learning environment
- It raises academic achievements through encouraging a deeper understanding of subjects and concepts
- It develops transferable skills relevant to employment, such as problem-solving, critical thinking and capacity for teamwork.
- It makes better use of space as rooms can be used more extensively than lecture theatres
- It reduces drop-out rates, thereby raising student completion rates and strengthening income

Instructor Training

A requirement for the introduction of active learning is that instructors must receive training before they are allowed to teach in these situations. It is vital for instructors to be effective with visual and audio tools to support active learning and student construction of knowledge. Ineffective use of active learning spaces compromises investment because it inhibits student attainment. Teachers should be obliged to attend a formal course of one or two days that emphasises the integration of new pedagogies with room facilities, including the challenges involved in preparing for active learning.

Active learning makes novel demands on teachers who have taught in lecture theatres. How do they convert existing lectures into new activities? How do they

prepare students for active learning? How are successful groups created? How should students' progress be assessed? What should happen if things go wrong?

At the University of Iowa, existing and new instructors alike undertake a three-day TILE workshop (Transform, Interact, Learn, Engage) to prepare them for active learning methodologies. In institutions with only a few active learning environments, typically rooms are only bookable for use by instructors who have undergone the necessary training.

Risk Assessment

An institution that wishes to develop active learning will need to analyse costs and other factors. The kinds of questions that might be asked include the following.

Does this fit within the university's strategic aims in providing, better student experience, better academic outcomes, developing transferable skills, maintaining student income streams, and helping with space utilisation? Can the institution undertake organisational change? Can the necessary change in pedagogy be organised?

Economic Investment

Active learning environments are more expensive than spaces without technology, and the best technology for active learning, so-called 'invisible technology' is the most expensive. However, it has been found that installations with expensive technology and high-quality furniture, are treated with respect by students, and on-going maintenance and refurbishment costs are lower. Moreover, enhanced use of technology in specially equipped rooms can act as a catalyst for improving technology use in all teaching spaces. Students now arrive at university having experienced the use of interactive whiteboards in school classrooms and expect good facilities in return for their fees. For universities, active learning rooms can be attractive assets in recruiting students.

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