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Resource Pack on Active Learning

Roisin Donnelly

Technological University Dublin, roisin.donnelly@tudublin.ie

Marian Fitzmaurice

Technological University Dublin, marian.fitzmaurice@tudublin.ie

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Resource Pack on Active Learning

Roisin Donnelly &
Marian Fitzmaurice

MODEL OF ACTIVE LEARNING

Introduction

- The massification of higher education is now a global phenomenon
- Huge changes in the teaching and learning milieu within colleges
- The forces of massification have brought multiple challenges with regard to pedagogy
- What kind of pedagogy to employ?
- The role of the lecturer is to empower learning and it is challenging and complex
- There is a need to employ a pedagogy which requires students to do things, to access information, to solve problems, to reflect on what they are doing and make connections to real world problems

Educational research has revealed a number of important lessons for educators:

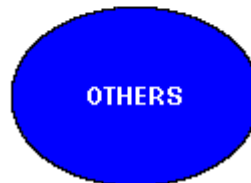
- Importance of active and student-centred learning
- Importance of developing lifelong learning skills
- Importance of learning in context
- Students cannot be treated as “empty vessels”
- Students construct their own knowledge and understanding
- The potential of group learning

Why active learning is to be developed:

- Encourage students to adopt a deeper learning approach
- Increase student motivation and hence engagement
- Achieve all levels of cognitive learning
- Allow students to interact with the unknown
- Allow students to develop and construct their own understanding based on what they already know
- Allow the students to take responsibility and be more independent
- Ensure the students are interacting with each other, the tutors and resources.

EXPERIENCE OF:

DIALOGUE WITH:





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STRATEGIES FOR ENGAGING STUDENTS

SMALL GROUP ACTIVITY

A typical view of a 'small group' is around eight to 12 learners facilitated by a teacher. In small groups learners can discuss content, share ideas, and solve problems. They present their own ideas as well as consider ideas put forth by others. In this way, they can be exposed to a variety of viewpoints on a given subject. Small group teaching is necessarily more demanding of staff and room resources and time than lectures; however, well-designed small group teaching has clear benefits for student learning in terms of retention of information, critical thinking and consolidation of learning from different parts of a programme.

Brainstorming

Rationale

Brainstorming can be of particular value at the beginning of a lecture/course to stimulate interest in the topic to be discussed, or where the aim is to expand students' thinking in an area, or when looking for ideas that may not be arrived at by rational methods.

A few simple rules towards successful group brainstorming:

1. At the beginning of the teaching session, explain the ground rules to students; and then present students with a question.
2. The lecturer should encourage an enthusiastic, **uncritical attitude** among participants and encourage participation by all members of the team.
3. The session can be announced as lasting a **fixed length of time**; all contributions are **recorded** on blackboard, poster, overhead.
4. Participants in the brainstorming process should come from as **wide a range of disciplines** with as broad a range of experience as possible. This brings many more creative ideas to the session.
5. Participants should be encouraged to have fun brainstorming, coming up with **as many ideas as possible, in any order**, from solidly practical ones to wildly impractical ones in an environment where creativity is welcomed. All ideas will be accepted and inserted.
6. **Ideas must not be criticised** or evaluated during the brainstorming session. Criticism introduces an element of risk for a group member in putting forward an idea. This stifles creativity and cripples the free running nature of a good brainstorming session, blocking the smooth running of brainstorming. It's a lot easier to discard the less important ideas at the end than having more. (But isn't it a time loss? No, if these ideas are apparently unrealisable or strange, they can stimulate other original or innovative ideas in other group members...).
7. Participants should be encouraged to **build on other peoples' ideas**, and try combinations, enhancements and improvements; participants should not only come up with new ideas in a brainstorming session, but should also 'spark off' from associations with other people's ideas and develop other peoples ideas.
8. After producing as many ideas as possible, the group can start **prioritising** and **clustering** them.
9. Another approach is making a group develop on a central idea generated by an individual, in **several directions**, more than what the original author could have done.
10. As we have seen, there is no attempt at evaluation during the brainstorming session itself. Any tendency to evaluate would kill spontaneity and convert the session into one of critical analysis. Evaluation is carried out later by the same group or even by another group. Groups can then **vote** on their top 5 favourite ideas to take forward; the categories can form basis for further discussion, or at the end of the evaluation session, there can be these three lists:
 - Ideas of immediate usefulness
 - Areas for further exploration
 - New approaches to the problem.



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Story-telling

"Today we live, but by tomorrow today will be a story. The whole world, all human life, is one long story"
(Isaac Bashevis Singer, 1984)

Rationale

Storytelling is one of our oldest, most basic methods of communication and the transmission of knowledge about our world. Stories make concepts vivid and clear by *illustrating* them rather than simply explaining them. Especially in large classes, where the teacher is more of a lecturer and less of a facilitator, stories can help make material come alive for students by helping them feel more personally connected to the subject matter: they bring the "known" (the down-to-earth language and images of a story) into relationship with the yet "unknown" (the course material).

Personal Experience and Family Stories

The power of the story embeds facts in students' memories.

Stories from the Media

Dramatic or humorous stories.

Sources: newspapers, magazines, radio, TV, WWW, family gatherings, novels, nonfiction books, work and life experience, children & grandparents

Storytelling Tips

- Stories are 1-3 minutes in length; story may be about any generation in their families; all stories may be humorous, suspenseful or simply illustrate a family tradition
- After hearing the stories, the students make a list of the topics they have identified in relation to the question
- Feedback to whole class

Syndicate groups

Rationale

Students seldom learn what you are lecturing about while they are still in the lecture room. The most efficient time for applying a new idea is immediately. Apart from the importance of immediate rehearsal and application of new ideas and methods, the other major reason for setting students problems during lectures is that:

- Allows students to interact with peers and gives them immediate feedback
- Promotes communication skills, problem-solving, collaborative learning
- Encourages participation by all students and generates ideas

Small groups of students (4-12) working on the same problem simultaneously. The students can request the lecturer to join the group. If the solution to the problem is a matter of opinion, small groups are likely to obtain consensus and in a shorter time. On completing the problem, groups report to the lecturer in hearing of other groups. Bligh¹ suggests 5 types of task suitable for use in problem-centred groups:

¹ Bligh, D (1972) *What's the Use of Lectures*. Penguin: Harmondsworth.



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TASK	OBJECTIVE	NOTES
To search for, select & organise info	<ul style="list-style-type: none"> - Knowing facts & their organisation - Knowing how to find facts - Using available literature on a topic 	Can set reading before class; groups can then spend more time on organisation & understanding of facts from different viewpoints
To find the correct answer to a problem	<ul style="list-style-type: none"> - Consolidating knowledge of general principles - Applying general principles - Relating knowledge of facts to principles 	Problem can refer to interpretation of facts or identifying the cause of a phenomenon
To locate alternative problem solutions	<ul style="list-style-type: none"> - As above - Being aware of & understanding different points of view 	Lecturer needs to preserve a balance between the different viewpoints put forward
To make a judgement on a case or situation	<ul style="list-style-type: none"> - As above 	Lecturer poses a number of questions that crystallise and polarise the central issues so students' answers form a closely knit argument
To revise/consolidate earlier work or prepare for an exam	<ul style="list-style-type: none"> - Helping students see the breadth of possible interpretations of questions - Suggesting ways of organising answers 	Problems are set which require the group to plan answers to exam questions

At the conclusion of the task, students are instructed to do something such as compare answers, draw conclusions, raise issues, identify misunderstandings or to make evaluative judgements with the person seated beside them or with the group members. Lecturer requests feedback and then concludes by drawing ideas together and summing up.

Size of Group

"Teams of four are ideal. A team of three is often a dyad and an outsider; in a team of three there are 3 possible lines of communication; in a team of four there are six. Doubling the lines of communication increases learning potential.....Teams of five often leave an odd man out and leave less time for individual participation." (Kagan, 1988)

Criteria for Group Formation

- Must decide on the basis of the outcomes you desire
- Different compositions will be appropriate at different times
- Good mix of abilities/ Mixed-gender groups

Organisation of Small Group Work

- Thoroughly plan the activity: clearly define aims for the session, structure for time and tasks
- Clearly display instructions
- State the problem in a clear, succinct and interesting manner
- Form groups and assign space / Distribute resources
- Clarify the Task
- Appoint/ Elect Personnel; A leader should take control of the session, initially defining the problem to be solved with any criteria that must be met, and then keeping the session on course. The leader should try to keep the brainstorming on subject, and should try to steer it towards the development of some practical solutions; a time-keeper, a recorder; a reporter
- Brief Personnel
- Take feedback



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Small Group Work Environment

- Find suitable location: Noise levels
- Adequate space / Ensure individuals/ groups are equidistant
- Circle / Tables
- Return room to original arrangement

Skills of Small Group Work

- Important for teachers to help students to develop the skills of groupwork
- How to listen to each other/ How to encourage each other
- How to record and report back/ How to seek help when needed

Skills of becoming "unstuck"²

When the group runs out of ideas or feels it is 'going around in circles'.

- Hold one part of the problem constant, change the rest
- Select and solve one part of the problem
- Work on a related problem
- Check you've used all the information given/ don't reject a solution too quickly
- Restate the problem to take account of progress to date
- Analyse the procedures used to date; don't dwell on the problems encountered
- Work on an unconnected problem and see if any procedures can be transferred
- Go back and see if something that was right at the time could now be changed to take the problem forward
- Take an unlikely or wrong path for a while to see what it reveals

LARGER GROUP ACTIVITY

Active learning means that students are engaged in processing the information being presented, not just passively receiving it. Research shows that techniques that promote active learning lead to better student performance. Teaching situations vary and what works for one instructor in one classroom may not be as effective in another situation.

Pyramiding/snowballing

Involve students initially working alone, then in pairs, then in fours and so on, and then returning to the large group to pool the outcomes/conclusions or solutions of the groups. The method was developed by the OU³ for tutorial groups of mature students.

Rationale

Setting individual students a task to do during a lecture may not work well if there is no clear demand on the student to produce an outcome. On the other hand, demanding that individuals report the outcome of their work in public in a large lecture class can be unnerving. Suggesting that students take the outcome of their individual work to their neighbour involves just enough social obligation for them to get on with the task, without too much threat of humiliation if they don't get very far with it. If students are given a very short period to work on their own to prepare some ideas beforehand, then they are much more likely to start a useful discussion straight away. One minute spent alone and three spent in a pair can save ten minutes at the start of a syndicate (group of 4-6).

² Brown and Atkins (1988). *Effective Teaching in Higher Education*. London: Methuen.

³ Northedge, A. (1975) *Learning through Discussion in the Open University*. Teaching at a Distance, No. 2



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Stage 1: Individual Work: Quiet Time (3 mins)

Students individually note some issues of their own relating to the given topic.

Stage 2: Paired Work (10 mins)

Pairs of students try to answer one another's issues.

- Involves everyone
- Encourages sharing of ideas
- Active use of language by student
- Develops listening skills
- Promotes understanding
- Builds self-esteem
- Students appreciate their own capabilities

Stage 3: Group of Four (20 mins)

Pairs join to make a group of four, discuss their responses, identify general problems and areas of controversy, solutions if appropriate to the question.

Stage 4: Plenary (3 mins/group)

A representative from each group of four reports to the whole group.

Each stage of the pyramid is accompanied by a progressively more complex and demanding task which builds on the achievement of the previous stage. Tasks designed in such a way that students are doing something different at every stage reduces the potential for boredom often experienced when students feel they are not moving forward. The quality of reporting improves when each group appoints a rapporteur.

Poster presentations

1. What is a poster presentation?

- Effective visual communication of research results or information
- Eye-catching & attractive/ Easy to follow, good flow
- 3 to 4 points to get across/ conciseness

2. Advantages - what is a poster for?

- Reaching a wide audience at a conference or meeting/ Networking
- Available for longer times than a lecture presentation
- Possibility of asking questions in a non threatening situation
- Also, in depth one to one discussion of research between presenter and conference participants.

3. Aims

To produce a unified piece of information on a poster to a standard size. A commonly used size is 2m wide x 1m high but it is necessary to check with the conference organisers on each occasion.

4. Think about:

a) Content

- A poster is not an essay stuck up on a board
- Divide into several 'stand alone' sections which make an essential point. Each section should have a heading and then supporting text –use bullet points.
- Make the information flow from one stand alone section to the next
- Be concise evaluate every word for clarity. Would the meaning be changed if words were omitted?
- Make sure the content is correct
- Don't forget references
- EDIT RUTHLESSLY



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b) Visibility

Aim to make the poster easy to read from a metre away. Suggested font sizes:

- ☺ Main title in 72 font including the
- ☺ Names of the authors 48 font .
- ☺ Use sub headings in at least 36 font.
- ☺ Make points in 24 to 28 point font.
- ☺ Use bullet points to make the reading easier and your main points more visible.
- ☺ Use bold, lower case and a clear font e.g. 'Arial'
- ☺ Ensure a good contrast between the text and the background colour.

c) Layout

- A good poster has substantial proportions of blank space marking stand alone sections.
- Make the poster straight vertically - line up the text
- Make the ideas flow logically and smoothly by using arrows or space or numbering to draw the eye to information in an appropriate order.
- Try different layouts on a piece of A4 graph paper
- Don't tuck away your most important conclusions at the bottom of the poster but make them central.

d) Attractiveness

- The aim is to make the poster so attractive that the audience read your poster before reading the others on display.
- Use colour computer graphics, scan in photographs etc.
- Use coloured fonts and backgrounds- make sure it is still readable.

5. On the day of the presentation


- You will be expected 'to talk through' your poster to your audience either to individuals or to groups of people. Work out ahead of time what you will say and practice it.
- Be prepared to answer questions on the background to your poster.
- Have an A4 copy of the poster to hand out to people who are interested or your e-mail address on bits of paper if you don't want to give away your results.

ACTIVITY MATRIX


There are a number of ways of making your lectures interactive, but the most important issue is to explain to students **why** you are involving them. Treat the suggestions below as a menu from which to select. Try a number of them and evaluate as you go along. Do not expect that it will work perfectly the first time; you will need practice as well as your students.

Active Learning Strategy	Benefits – to help students:	How implemented?	Examples
Applying theory to practice	to enhance their learning increase their understanding of a topic/help them understand a difficult concept in their mastery of content	<p>Comparing I've outlined these two theories, what are the most important similarities and differences between them? Make notes on this for a couple of minutes</p> <p>Prediction (part way through a derivation of proof) What is the next stage? Note down what you think it will be</p> <p>Setting a question (more advanced) What would be a good question which would test your understanding of what I've said so far?</p> <p>Using video clips Use 5-10 minute clips; give an explanation of why you are using the video and give out a set of questions before the showing to focus attention and aid learning.</p>	We welcome specific case studies from around all faculties in DIT!




		<p>Allow students 4-5 minutes to discuss the video in small groups after showing to help clarify issues and to lead to a more focused feedback session</p>	<p><i>Roisin Donnelly & Maria Fitzmaurice</i></p>
<p>Enquiry-based learning (including project and problem-based)</p>	<p>accept there is more than one right answer to read and come prepared for class to read current professional or relevant popular literature to read the research to become lifelong readers in your discipline to effectively read and use their textbooks use different kinds of resources for papers to see the application/real world relevance of a concept become self-directed learners to increase problem-solving skills</p>	<p>Apply this concept In threes, analyse this case / problem / text using the concepts I have just outlined</p> <p>Engagement with the debate (1) I've presented one theory or model. Suggest one way in which it could be tested empirically</p> <p>Engagement with the debate (2). I've presented one theory or model. Offer one critique or counter example</p> <p>Role Plays Can illustrate controversial issues or put across differing points of view. Can often raise more discussion of the issues than could have been achieved by just telling the students. Role cards are produced and the student plays out the role according to the instructions on the card</p>	<p>PBL Students Online in Nursing Integrated Curriculum (SONIC) http://www.uclan.ac.uk/faculty/health/nursing/sonic/descript.htm</p> <p>Kahn, P., & O'Rourke, K. (2004) Guide to curriculum design: enquiry-based learning, http://www.heacademy.ac.uk/resources.asp?id=359&process=full_record&section=generic</p> <p>Fox, R., & Rowntree, K. (2004) Linking the doing to the thinking: using criterion-based assessment in role-playing simulations, <i>Planet 13</i>, 9-15. Available at: http://www.gees.ac.uk/pubs/planet/index.htm#P13</p>



 <p>Collaborative Learning</p>	<p>to interact with peers to contribute more to class based upon out-of-class work to share their learning based upon their own research</p>	<p>Think-Pair-Share Ask a question/pose a problem Individuals spend one minute <i>thinking</i> about an answer/solution. <i>Pair</i> students up to discuss (<i>share</i>) their answers Lecturer asks several students to share their answers with the whole class</p> <p>A Round Everyone is given a chance to speak in turn and is a useful way of setting the scene that your lectures will be active; divide the students into smaller groups. E.g. ask students to:</p> <ul style="list-style-type: none"> - Share with others in their group what they hope to gain from your set of lectures - Talk about their expectations - Mention one aspect that they found easy to understand in the last lecture - Mention one aspect that they found difficult - Express one concern about the course <p>Groups then feedback: display outcomes on acetate for whole class</p> <p>Goldfish Bowl Discussion takes place with students looking on as if observing fish in a bowl! The inner circle can be briefed to discuss a scenario, and with an exchange mechanism by which students outside the group wanting to make contributions could replace someone in the group. Can be especially interesting if you get people with opposing or different points of view.</p> <ul style="list-style-type: none"> - It is a good idea to use your colleagues, 3rd-4th year students, or guest speakers. - To aid discussion, students can prepare questions with one of them nominated as the "question person". - Topical and newsworthy items relevant to your subject area can provide a really good stimulus to debates <p>Numbered Heads In a group of 4, you set a task, and assign a number to all students; call out a number; the students do not know what number you are going to call out for an answer; so they all need to be prepared on the day</p>	<p>Roisin Donnelly & Maria Fitzmaurice</p>
<p>Evaluating teaching</p>		<p>CATS: Classroom Assessment Techniques (Quick n' Easy Evaluations) In middle, and at end of your class, ask your students to write down on a page:</p> <ul style="list-style-type: none"> - What is your thinking at this stage? - What questions do you have at this point? - What do you think you have learnt at his stage? - What areas of difficulty do you have on this topic? <p>And/or, you can encourage your students to keep anonymous reflective notes on these questions, and collect these at the end of each class. Put the main points onto an overhead/slide at the start of the next class</p>	<p>http://www.fla-guide.org</p>



 <p>Questioning</p>	<p>to question the written word, even textbooks to see flaws in their reasoning or correcting improper conclusions to participate more in class to engage them in the subject from the first day</p>	<p>Questions Helping students question the material; critiquing the 'experts' rather than taking down facts without thinking. Helping students to feel free to ask questions. Asking questions to provoke critical thinking in students.</p> <p>Participatory Lecture Involve students in a large lecture by asking them to contribute to it⁴. If part of your lecture will consist of a list of things, have the students begin the list by calling out suggestions. Write their suggestions on the board/OHP and then complete the gaps. If you have a statement to make, pose it as a question instead, so that students can take part in making the statement. If you are starting a new topic, invite students to call out what they know (or think they know) about the topic; write their suggestions on the board/OHP, then as the lecture progresses, you can refer to this answers as examples. Can also be used to create a mental or visual image to go with your lecture; ask them to think about a recent reading, lab experiment, demo, event or experience. Then ask them to call out a brief description of the most salient image that has stuck in their minds from this. The mental collage of images that results will enhance the visual aspects of the topic.</p>	<p><i>Roisin Donnelly & Maria Fitzmaurice</i></p>
<p>Reflecting</p>	<p>to write better reflective journals to take worthwhile notes reflect on what they should be learning to increase their understanding to learn how to do good summaries</p>	<p>Read your notes Take two minutes to look at your notes. Check them, fill in gaps, make sure you understand them</p> <p>Read another's notes Swap notes with the person next to you and see what they have written about. You may spot things you could add to your notes when you get them back</p> <p>Write down one or two questions Write down one or two questions you have at this point in the lecture. Get the question exactly right so that it addresses what you are really interested in or confused about</p> <p>Dual Notes Work in pairs, one take notes, the other listens. 10 minutes at end of class given for pairs to consolidate the work and make sense of it</p> <p>Forming an overview Towards the end of the class: What do you think were the two or three (whatever is the appropriate number) key points made in this class? Write them down and compare notes with your neighbour</p> <p>Planning Take two minutes to plan out what further work you need to do on this topic - what you need to read, try out, get practice on...</p>	

⁴ Frederick, P. (1987) Student Involvement: Active Learning in Large Classes. In M. Weimer (Ed.) *New Directions for Teaching and Learning: Teaching Large Classes Well*. San Francisco: Jossey-Bass.



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Marian Fitzmaurice

FURTHER READING & RESOURCES

Lectures

- Brown, GA (1978) *Lecturing and Explaining*. London: Methuen.
- Brown, S. and Race, P. (2002) *Lecturing: a practical guide*. London: Kogan Page.
- Entwistle, N and Ramsden, P, (1983) *Understanding Student Learning*. London: Croom Helm.
- Gibbs, G, Habeshaw, S and Habeshaw, T (1986) *53 Interesting Things to do in your lectures*. Bristol: Technical and Educational Services Ltd.
- Gibbs, G. (1992) *Lecturing to more students: Teaching more students 2* (Oxford: Polytechnic and Colleges Funding Council).
- Knight, P.T. (2002) *Being a Teacher in Higher Education*. Buckingham: SRHE.
- Race, P. (2001) *The lecturer's toolkit: A resource for developing learning, teaching and assessment*. London: Kogan Page 2nd edit.

Tutorials

- Jaques, D (1984) *Learning in Groups*. London: Croom Helm.
- Tiberius, RG (1999) *Small Group Teaching: A Trouble-Shooting Guide*. London: Kogan Page.

Laboratories

- Boud, D, Dunn, J and Hegerty-Hazel, E (1986) *Teaching in Laboratories*. London: SRHE/NFER-Nelson.

Active Learning Strategies

- Bonwell, C. and Eison, J. (1991) *Active learning: creating excitement in the classroom* (ASHE-ERIC Higher Education Report No. 1). Washington, DC: George Washington University.
- Cameron, B. J. (1999) *Active learning Green Guide 2*. Halifax, Nova Scotia: Society for Teaching and Learning in Higher Education.
- Denicolo, P., Entwistle, N. and Hounsell, D. (1992) What is active learning? *Effective Learning and Teaching in Higher Education* Module 1, Sheffield: CVCP Universities' Staff Development and Training Unit.
- Hanson, S. and Moser, S. (2003) Reflections on a Discipline-wide Project: developing active learning modules on the human dimensions of global change, *Journal of Geography in Higher Education* 27(1), 17-38.
- Harwood, W.S. (2003) Course enhancement: a road map for devising active-learning and inquiry-based science courses, *International Journal of Developmental Biology* 47, 213-221.
- Jenkins, A. (1992). Active learning in structured lectures, in Gibbs, G. and Jenkins, A. (eds) *Teaching large classes in higher education: how to maintain quality with reduced services*. pp.63-77. London: Kogan Page.
- Jones, P.C. and Merritt, J.Q. (1999) The TALESSI Project: promoting active learning for interdisciplinarity, values awareness and critical thinking in environmental higher education, *Journal of Geography in Higher Education* 23(3), 335-348; available at: <http://www.greenwich.ac.uk/~bj61/talessi/>
- Keyser, M.W. (2000) Active learning and cooperative learning: understanding the difference and using both styles effectively, *Research Strategies* 17, 35-44.
- Myers, C. and Jones, T.B. (1993) *Promoting active learning: strategies for the college classroom*. San Francisco: Jossey Bass.
- Silberman, M. (1996) *Active learning: 101 strategies to teach any subject*. Boston: Allyn and Bacon.
- Smith, A C, Stewart, R, Shields, P, Hayes-Klosteridis, J, Robinson, P, and Yuan, R (2005) Introductory Biology Courses: A Framework To Support Active Learning in Large Enrolment Introductory Science Courses, *Cell Biology Education*, 4, 143–156. Available at: <http://www.cellbioed.org/article.cfm?ArticleID=150>
- Sutherland, T.; Bonwell, C., Eds. (1996) *Using active learning in college classes: a range of options for faculty*. San Francisco: Jossey-Bass.
- Weimer, M. (2002) *Learner-centred teaching: five key changes to practice* San Francisco: Jossey-Bass.



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Problem-based Learning

Boud, D. and Feletti, G. (eds) (1997) *The challenge of problem based learning*. 2nd edn. London: Kogan Page.

Chappeell, A. (2006) Using the 'grieving' process and learning journals to evaluate students' responses to problem-based learning in an undergraduate curriculum, *Journal of Geography in Higher Education* 30 (1), 15-31.

Duch, B J, Groh, S E and Allen, D E (2001) *The power of problem-based learning: A practical 'How to' for teaching undergraduate courses in any discipline*. Sterling, Virginia: Stylus.

Mackay, S. (2003) Problem-based learning in radiographer education: testing the water before taking the plunge, in *Critical Encounters: Scholarly Approaches to Learning & Teaching*, Continuing Professional Development Series 8, York: Higher Education Academy. Available at: http://www.heacademy.ac.uk/profdev/case_study8.pdf

O'Neill, P. (2003) Development of problem-based learning following implantation, in *Critical Encounters: Scholarly Approaches to Learning & Teaching*, Continuing Professional Development Series 6. York: Higher Education Academy. Available at:

http://www.heacademy.ac.uk/profdev/case_study9.pdf

Savin-Baden, M. (2000) *Problem-based Learning in Higher Education: Untold Stories*. SRHE/Open University Press.

Savin-Baden, M. (2003) *Facilitating problem-based learning: illuminating perspectives*. Maidenhead: Society for Research into Higher Education and Open University Press.

Enquiry-based Learning

Budnitz, N. (2000) What Do We Mean by Inquiry?

http://www.biology.duke.edu/cibl/inquiry/what_is_inquiry.htm

Felder R.M. and Brent R. (2003) Learning by doing, *Chemical. Engineering Education*, 37(4), 282-283. <http://www.ncsu.edu/felder-public/Columns/Active.pdf>

Gibbs, G. (1988) *Learning by doing: a guide to teaching and learning methods*. London: Further Education Unit. Available: <http://www.glos.ac.uk/gdn/gibbs/index.htm>

Healey, M. (2005) Linking research and teaching exploring disciplinary spaces and the role of inquiry-based learning, in Barnett, R (ed) *Reshaping the university: new relationships between research, scholarship and teaching* McGraw-Hill/Open University Press, pp.67-78.

Hudspith, B. and Jenkins, H. (2001) *Teaching the art of inquiry*, Green Guide 3. Halifax, Nova Scotia: Society for Teaching and Learning in Higher Education.

Hutchings, W. and O'Rourke, K. (2003) Introducing enquiry-based teaching methods in literary studies, in *Critical Encounters: Scholarly Approaches to Learning & Teaching*, Continuing Professional Development Series 6. York: Higher Education Academy. Available at:

http://www.heacademy.ac.uk/profdev/case_study6.pdf

Jackson, N. (2003) A personal perspective on enquiry based learning

http://www.heacademy.ac.uk/resources.asp?process=full_record§ion=generic&id=328

Justice, C, Rice, J, Warry, W, and Laurie, I (2005) "Why Inquiry makes a difference: evaluative research on learning outcomes and teaching practice", Paper delivered at 2nd Annual Conference of the International Society for the Scholarship of Teaching and Learning (ISSOTL), Vancouver

Kahn, P. and O'Rourke, K. (eds) (2003) *Learning based on the process of enquiry: Proceedings of the 1-2 September 2003 conference*. Manchester: University of Manchester

<http://www.intranet.man.ac.uk/rsd/ci/ebi/cproceed.pdf>

Lee, V.S. (ed.) (2004) *Teaching & learning through inquiry: a guidebook for institutions and instructors*. Sterling, Virginia: Stylus.



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Longmore, M., Dunn, D. and Jarboe, G. (1996) Learning by doing: group projects in research methods classes, *Teaching Sociology*, 24, 84-91.

Lyte, G. (2003) Achieving enquiry-led teaching and learning: initiating the change process, in *Critical Encounters: Scholarly Approaches to Learning & Teaching*, Continuing Professional Development Series 7. York: Higher Education Academy. Available at: http://www.heacademy.ac.uk/profdev/case_study7.pdf

Weaver, F.S. (1989) *Promoting inquiry in undergraduate learning*, San Francisco: Jossey Bass

Learning Theory

A.P. McNeal and C. D'Avanzo (eds.) *Student active science: Models of innovation in college science teaching*. Fort Worth, Texas: Saunders College Publishing

Barr, R.B. and Tagg, J. (1995) From teaching to learning – a new paradigm for undergraduate education, *Change* (November/December), 13-25.

Biggs, J. (2003). *Teaching for quality learning*, Buckingham: Society for Research into Higher Education and Open University Press (2nd edition).

Bolander, K. 2000. *Student centred learning*. Glasgow: Teaching and Learning Service, University of Glasgow. Available at: www.gla.ac.uk/services/tls/ProjectReports/whole/index.html

Cassidy, S. (2004) Learning styles: an overview of theories, models, and measures, *Educational Psychology* 24, 419-444.

Chickering, A.W. and Gamson, Z.F. (1987) Seven principles for good practice, *AAHE Bulletin* 39, 3-7.

Coffield, F., Moseley, D., Hall, E. and Ecclestone, K. (2004) *Learning styles and pedagogy in post-16 learning* Learning and Skills Research Centre, London.

Cowan, J. (1998) *On becoming an innovative university teacher: Reflection in action*, Buckingham: Society for Research into Higher Education and Open University Press.

Cuthbert, P. (2005). The student learning process: learning styles or learning approaches, *Teaching in Higher Education* 10 (2), 235-249.

D'Avanzo, C and McNeal, A P (1997) Research for *all* students structuring investigations into first year courses, in A.P. McNeal and C. D'Avanzo (eds.) *Student active science: Models of innovation in college science teaching*. Fort Worth, Texas: Saunders College Publishing, pp279-300.

Entwistle, N.J. (1988) *Styles of learning and teaching*, London: David Fulton.

Entwistle, N.J. (1991) Cognitive style and learning. In *The foundations of student learning*, ed. K. Marjoribanks. Oxford: Pergamon.

Entwistle, N. (2003) Concepts and conceptual frameworks underpinning the ETL project, *Enhancing Teaching-Learning Environments for Undergraduate Courses*, *Occasional Report* 3.

Fielding, M. (1994) Valuing difference in teachers and learners: building on Kolb's learning styles to develop a language of teaching and learning. *The Curriculum Journal* 5 (3): 393-417.

Fink, L.D. (2003) *Creating significant learning experiences: an integrated approach to designing college courses*. San Francisco: Jossey Bass.

Gardiner, L.F. (1998) Why we must change: the research evidence, *The NEA Higher Education Journal*, 121-138. www.nea.org/he/heta00/f00p121.pdf

Kolb, D.A. (1984) *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, New Jersey: Prentice-Hall.

Kolb, D.A. (1985) *Learning style inventory* (revised edition). Boston: McBer.

Kolb A and Kolb D (2004) *Experiential learning theory bibliography* (<http://www.learningfromexperience.com/ELT%20bibApril%202004.rtf>) Accessed 30 July.

Kreber, C. (2001) Learning experientially through case studies? A conceptual analysis, *Teaching in Higher Education*, 6(2), 217-228.

Perkins, D. (1999) The many faces of constructivism, *Educational Leadership* 57 (3), 6-11.

Prosser, M. and Trigwell, K. (1999) *Understanding learning and teaching: the experience of higher education*. Buckingham: Open University Press and Society for Research into Higher Education.



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Robotham, D. (1999) *The application of learning style theory in higher education teaching*. Unpublished article; available at: <http://www.glos.ac.uk/gdn/discuss/index.htm>.
Simm, D. and McGuiness, M. (2004) Crisis resolution of student-led research projects at distant locations, *Planet* 13, 8-11. <http://www.gees.ac.uk/pubs/planet/index.htm#P13>
Simms, R. and Simms, S. (Eds) (2006) *Learning Styles and Learning: A Key to Meeting the Accountability Demands in Education*, Hauppauge, NY: Nova Science Publishers.
Svinicki M. D. and Dixon N. M. (1994) The Kolb model modified for classroom activities in Feldman
Wiske, M. S. (1998) *Teaching for understanding: linking research with practice*. San Francisco: Jossey-Bass.

Teaching Strategies

Angelo, T.A. and Cross, P.A. (1993) *Classroom assessment techniques*. San Francisco: Jossey Bass). 2nd Edit.
Moore, S., Walsh, G., and Risquez, A. (2007) *Teaching at College and University*. London: OU Press.
Ramsden, P. (2003) *Learning to teach in higher education*. London: RoutledgeFalmer 2nd edit.

UK Centres for Excellence in Teaching and Learning emphasising active learning and inquiry and research-based learning

1. University of Gloucestershire, the Centre for Active Learning in Geography, Environment and Related Disciplines (www.glos.ac.uk/ceal/)
2. University of Durham Active Learning in Computing (ALiC) (www.dur.ac.uk/alice/)
3. University of Manchester, Centre for Excellence in Enquiry-Based Learning (www.manchester.ac.uk/ceeb/)
4. University of Oxford Centre for Excellence in Preparing for Academic Practice (<http://www.learning.ox.ac.uk/iaul/CETL+main.asp>)
5. University of Plymouth Experiential learning in environmental and natural sciences (<http://www.plymouth.ac.uk/cetl/el>)
6. University of Reading Centre for Excellence in Teaching & Learning in Applied Undergraduate Research Skills (<http://www.rdg.ac.uk/cdotl/cetl-aurs/>)
7. University of Sheffield, Centre for Inquiry-based Learning in the Arts and Social Sciences (CILASS) (<http://www.shef.ac.uk/cilass/>)
8. University of Surrey, Surrey Centre for Excellence in Professional Training and Education (SCEPTrE) (http://portal.surrey.ac.uk/portal/page?_pageid=736,316367&_dad=portal&_schema=PORTAL)
9. Universities of Warwick and Oxford Brookes, The Reinvention Centre for Undergraduate Research (<http://www2.warwick.ac.uk/fac/soc/sociology/research/cetl/>)

And Web Sites...

AISHE Emerging Issues <http://www.aishe.org/readings/2005-1/>
Charles Bonwell Active Learning Site <http://www.active-learning-site.com/>
Cognitive Learning & Student Strategies Project (CLaSS) <http://www.uclan.ac.uk/facs/science/psychol/fdtl/>
Council on Undergraduate Research <http://www.cur.org/>



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Deliberations <http://www.londonmet.ac.uk/deliberations/>

Eve Fogarty Active Learning Bibliography <http://www.backflip.com/members/EveFogarty/12909292>

Higher Education Academy <http://www.heacademy.ac.uk> (incl resources from former ILTHE and LTSN)

Academy Connects <http://www.connect.ac.uk/ixbin/hixltp?page=home>

Subject Network <http://www.heacademy.ac.uk/474.htm> covers every subject in 24 centres
<http://www.heacademy.ac.uk/ourwork/networks/subjectcentres>

Supporting New Academic Staff (SNAS) www.heacademy.ac.uk/SNAS.htm

McMaster University Centre for Leadership in Learning, Inquiry-based learning resources
www.mcmaster.ca/cll/inquiry/inquiry.resources.htm

Reinvention Center at Stony Brook, New York <http://www.sunysb.edu/Reinventioncenter/index.html>

Richard Felder's Resources in Science and Engineering Education <http://www.ncsu.edu/felderpublic/>

University of New South Wales The Guidelines – engaging students in learning
<http://www.guidelinesonlearning.unsw.edu.au/guidelinesHome.cfm>