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# Teaching for Engagement:
# Part 3: Designing for Active Learning

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## Introduction

In the first two parts of this series, I sought to outline the theoretical rationale and research basis for such active learning methods as case-based teaching and problem learning, and then to describe ways in which contemporary technologies can facilitate teaching for active learning. Throughout, I have sought to keep a focus on practical questions and issues related to implementing active learning strategies in postsecondary classrooms. Nevertheless, there remains a lot to be said about designing and implementing active learning, especially for those whose prior teaching has been predominantly transmission-focused. In this article, I will seek to address practical questions regarding the design and implementation of teaching for active learning. Interested readers will find that the links provided in text and in the reference list will lead them not only to further detail about the ideas discussed in this series, but also to a wide variety of practical teaching resources.

## Designing Lessons

Instructors who are accustomed to lecturing may find it challenging to know how to plan for a lesson that uses another instructional method. For the lecturer, planning may consist almost entirely of preparing speaker's notes. Planning for case-based teaching or problem-based learning would generally involve

- defining the intended learning in some way (e.g., objectives, outcomes),
- Llaying out a series of activities intended to guide learners (specifying the case, noting any resources to be provided),
- structuring procedures for group inquiry,
- anticipating the kinds of guidance or scaffolding that will be needed, and
- indicating the method or methods to be used in assessing the success of the lesson.

In its Online Teaching Activity Index, the University of Illinois (nd) provides a detailed schematic for the kind of planning needed for a variety of different kinds of teaching. (A direct link to the case studies example is: http://www.ion.uillinois.edu/resources/otai/CaseStudies.asp .) At this site, the reader will find a planning template that goes well beyond the five points suggested above.

Instructors who would prefer a narrative to describe the design process may benefit more from Stanford University's "Speaking of Teaching" Newsletter's articles on teaching with case studies (Stanford University, Winter, 1994) and problem-based learning (Stanford University, Winter,

2001). Also, Sudzina (1999) provided a variety of examples of case studies being used in teacher education.

Looking specifically at online learning, Anderson (2007) succinctly stated the job of online course designers as being "… to choose, adapt, and perfect, through feedback, assessment, and reflection, educational activities that maximize the affordances of the Web (p. 68)." Given that the affordances of the web (for communication and collaboration, for information retrieval, for access to media—see, e.g., Conole & Dyke, 2004) now make it a useful resource in any educational setting, I think it would be wise to recognize that the tasks of course design are now quite similar to Anderson's description, even if delivery is face-to-face.

### Finding or Creating Cases/Problems

It would be considerably easier to provide advice on finding or creating case studies if there were some consensus about what constitutes a "case." As noted above, cases may appear in different forms/media, but there is also a considerable variation in the structures of cases and in the kinds of information cases provide. Some of this may be due to the differing needs of different disciplines (a legal case might include a lot of documentary evidence and perhaps some witness testimony; a science case may require field study or lab activity; a statistics case might consist largely of a data set and some questions), but it also seems that individual faculty (or teams) have their own conceptions of what a case should be. For example, cases used at the U.K. Centre for Materials Education (http://www.materials.ac.uk/guides/casestudies.asp) appear more like the problems of problem-based learning (though the authors distinguish beween the two) and seem also to proscribe the learning activities students will engage in much more than I would advise (because "student-directed learning" is key to the process). However, it may well be that the demands of materials science as a discipline define the case requirements for their 20 examples in ways that I am ill equipped to see.

Similarly, Ommundsen (2001) titles his web page "Problem-based learning in biology with 20 case examples" so it is not entirely clear which model (PBL or case-based teaching) he is using. However, in the absence of any standard definition, should that be a concern? For Ommundsen, the case is generally presented as a single sentence. For example, his first sample case reads "A 58-year-old woman experienced attacks of confusion: she would repeat the same question 30 times even though it was answered for her each time." The text that follows makes clear that there is more information known about the case (by the instructor) but it seems that learners only get this information if they ask the right questions —no doubt part of Ommundsen's teaching strategy. However, Ommundsen's cases are actually drawn from published studies—for the one mentioned above, he credits the New England Journal of Medicine 315:1209-19. This is why, although the initial case presented to learners is exceedingly brief, there is always a longer story "behind the curtain."

The above is just a small sample of the resources available for finding sample cases for use in a variety of disciplines. Some further examples can be found in:

Barnett-Clarke, C., Ramirez, A., Coggins, D., &

Alldredge, S. (2003). *Mathematics Teaching Cases. Number Sense and Operations in the Primary Grades: Hard to Teach and Hard to Learn? Casebook Facilitator's Guide*. Portsmouth, NH:Heinemann

Barnes, L. B. (1994). Teaching and the Case Method. Text, Cases, and Readings. Boston, MA: Harvard Business School Press.

Herreid, C. F. (2007). *Start with a story: The case study method of teaching college science*. National Science Teachers Association Press

Wassermann, S. (1994). *Introduction to Case Method Teaching. A Guide to the Galaxy*. New York: Teachers College Press, Teachers College, Columbia University

In addition, Solution Matrix (https://www.business-case-analysis.com/) is an example of a commercial firm that sells case creation services.

The Internet is also a valuable case-finding resource. For example, the Case Centre in the United Kingdom provides links to several international sites that provide free case studies for use in business education: http://www.thecasecentre.org/educators/casemethod/resources/freecasesoverview

Another good example from the United Kingdom is the following paper on using newspaper articles as the source of cases for teaching issues in economics: http://www.ocr.org.uk/Images/169934-case-study-template-teacher-resource-.pdf

I have personally found that newspaper graphics are an excellent source of cases that deal with statistics and data representation—an idea that occurred to me after reading Huff's (1993) How to Lie with Statistics many years ago.

The National Center for Case Study Teaching in Science at the University at Buffalo provides over 550 cases for use in teaching concepts in science and engineering in a searchable online database at http://sciencecases.lib.buffalo.edu/cs/collection/.

However, if the resources are available, creating a video case for a specific teaching purpose, as the Vanderbilt CTGV group did, would seem to be the gold standard. In a study of the development of argumentation skills in secondary science education of teacher candidates, van Oostveen, Hunter, Kay, & Muirhead (2007) provided evidence that adult learners enjoyed working with such a purpose-built video and that they felt they learned from it. These researchers also found that the research participants could be a source of valuable feedback for improvement of the case. Indeed, the possibility that student-created cases may be useful in teaching has been established by Hakkarainen (2009) and her colleagues (e.g., Hakkarainen et al., 2007)

On the other hand, creating self-made video-based cases requires time, money and some expertise. Once again, the Internet can be of assistance. I have found that the TeacherTube channel on YouTube can be a fruitful source; however, searching for "cases" or "teaching cases" or related terms is not terribly productive since the terms have diverse meanings. A better approach is to search for the content area and then

build your case around portions of the video that serve your purpose. For example,

> At https://www.youtube.com/watch?v=Mmw6ovp29rs a patient is portrayed as demanding that a doctor provide him with an unfamiliar drug.
>
> At https://www.youtube.com/watch?v=h6WJdsb0dfM there is an illustration of the “whole brain” approach to teaching a high school lesson.
>
> At https://www.youtube.com/watch?v=wD4FLB0Sp54 a graphic illustration reveals difficulties in understanding the diagonal of an object.
>
> At https://www.youtube.com/watch?v=5rredHTyKaQ there is a slightly romantic portrayal of Ellis Island immigration. Dozens of videos on this topic can easily be located—with a variety of perspectives.
>
> At https://www.youtube.com/watch?v=MzsORE0ae10 an intriguing demonstration raises the question “Does Coke float? The dialogue reveals a lot of nutrition education potential.

The process of identify and selecting videos in the public domain is a fairly labour-intensive activity, but Tiernan (2015) provided some useful advice and cautions about how to proceed and also provided links to the nine videos he used in his research on student responses to videos in a communications course at Dublin City University (Table 1, p. 80).

It seems clear that finding case studies or resources to help in the creation of case studies ought not be a barrier to anyone interested in case-based teaching. But having cases solves only part of the problem.

### Scaffolding

The general idea of scaffolding has been described as follows: “Scaffolded inquiry and problem-based environments present learners with opportunities to engage in complex tasks that would otherwise be beyond their current abilities (Hmelo-Silver, Duncan & Chinn, 2007, p. 100).” Hmelo-Silver et al. went on to say that scaffolding alters the learning tasks in ways that make them “accessible” and “manageable,” but understanding the origins of the concept may help us to understand better how that might be done.

Building on Vygotsky’s concept of the “Zone of Proximal Development” or ZPD (e.g., see Vygotsky, 1978), constructivist educators have argued that those who view learning as a process in which learners build conceptual understandings for themselves should provide those learners with “scaffolds.” Vygotsky’s ZPD can be thought of as the space between a child’s current independent problem-solving ability and what the child could accomplish with the assistance of a more competent individual. Vygotsky was writing about child development, so the more competent individual is generally meant to be a teacher or other adult; however, Fernández, Wegerif, Mercer, & Rojas-Drummond (2001) reframed the ZPD so that it might also apply to adult peer learning in collaborative groups. Although the participants in their research were school children, they found that the kinds of peer conversation the children engaged in during the process of problem solving performed the same functions that have historically been described

as scaffolding. By keeping each other focused and explaining their reasoning, peers were performing the functions of the “more competent other.”

More specifically, what Fernández et al. (2001) showed was that children who were engaged in a challenging problem solving[1] discussion carried out the following functions for one another:

1. orienting others’ attention to what they understand the task to be
2. simplifying the situation in ways that help the group to handle the task components
3. motivating one another to persist in problem solving
4. highlighting critical features of the task for the group
5. sharing responsibility and consequently reducing frustration
6. explaining how they reasoned in finding a successful solution to the problem.

These functions are similar to what have been described as scaffolding activities performed by adult tutors (Wood, Bruner & Ross, 1976). Interestingly, though, Fernández et al. (2001) point out that scaffolds are temporary structures (see also Oliver and Herrington, 2003) and, while that metaphor works for a tutoring relationship, the work their learners engaged in was more an ongoing part of normal peer problem solving. So, if we are willing to extrapolate these findings to adult collaborative problem solving in case-based teaching or PBL, we might not only agree with Hmelo-Silver, Duncan & Chinn (2007) when they say “We argue that IL (Inquiry Learning) and PBL approaches involve the learner, with appropriate scaffolding, in the practices and conceptualizations of the discipline and in this way promote the construction of knowledge we recognize as learning (Hmelo-Silver, Duncan & Chinn, 2007, p. 105, parenthetical added),” we might also see more clearly how collaborative problem solving activities contribute to learning since “mutual scaffolding” could be regarded as part of the group process.

What other forms of scaffolding might a college or university teacher offer to his or her learners while they are engaged in addressing a case or solving a problem? Here are a few possibilities:

- provide some form of collaborative writing venue (e.g., a blog or Google Docs or a wiki)
- provide an annotated bibliography of works that might be of value as starting points for learning about issues in the case or problem
- provide and monitor (or have student leaders monitor) a discussion forum, possibly inside a learning management system
- provide a set of social bookmarks (e.g., using delicious.com).

### Managing Group Processes

As noted in the first piece in this series, there is a rich literature on

cooperative learning. The resources included in that earlier paper provide extensive advice on how and why to use groups. Moreover, college and university teaching and learning centres often provide advice and support for faculty wanting to learn more about using groups. For example, the University of Waterloo has a document that includes all of the following suggestions (and many others) along with detailed rationales for each and/or references to related documentation:

> Designing the small group activity
>
> - Assign group tasks that encourage involvement, interdependence, and a fair division of labour.
> - Decide how you will divide students into groups.
> - Allow sufficient time for group work.
> - Design collaborative work in multiple constellations and forms: pairs, small groups, large groups, online synchronously, online asynchronously, etc.
>
> Introducing the group activity
>
> - Share your rationale for using group work.
> - Have students form groups before you give them instructions.
> - Facilitate some form of group cohesion. (e.g., ice-breaker activity).
> - Prepare written instructions for the students.
> - Set ground rules for group interaction.
>
> Monitoring the group task
>
> - Be slow to share what you know.
> - Clarify your role as facilitator.
>
> Ending the group task
>
> - Provide closure to the group activities (e.g., oral report or written report).
> - Connect the ideas raised to course content and objectives.
> - Avoid impromptu lectures.
> - Don’t provide too much closure.
>
> (University of Waterloo Centre for Teaching Excellence, nd)

Using groups effectively requires considerable forethought and preparation and the instructor needs to be involved in the group work—moving from one group to another, asking questions, encouraging creative thinking, suggesting directions when groups are blocked, listening and responding to group reports, and so on.

Some of my experience with case-based teaching has come in the form of education case competitions hosted at the University of Virginia (Hunter, 1999) which were modeled after the much more common business case competitions. In this environment, teams of teacher education students were given a text-based case on a Saturday morning and had eight hours to analyse the case and write a report with recommendations

for how to solve the problems that they saw in the case. This work had to be done independently, so my role was to coach them on working with cases before we got to the competition. Working with this kind of time pressure, I found it necessary to be really focused on the process of working with cases. While my teams built their own strategies during the preparation time leading up to the case, I coached them with some specific goals in mind.

An essential part of working with cases (or problems in PBL or real-life issues in situated learning) is analysis of the problem. Although the final written product is what the judges see, that product will be a consequence of the group's success in breaking the case down into it's component parts, deciding on the key issues to be addressed, proposing and evaluating solutions and developing a strong argument in support of their recommended action plan. I encouraged students to read the case multiple times and to try to find a way of characterising the issue(s) in the case, for example,

- Does the case pose a problem that requires a solution?
- Does the case present a decision that demands analysis and evaluation?
- Does the case describe a person whose behavior needs changing?

This list is by no means exhaustive and my intention was to encourage the students to find some description that they could agree stated the "demand characteristics" of the case—information that would shape the kind of solution it required. To get at that more concretely, I suggested they ask themselves questions like these:

- *What is the problem?* If it is not clear or evident (and it shouldn't be since the case writer's goal is to describe an "ill-defined problem"), what are some issues? Are there multiple problems and can they be prioritized? Would solving one problem solve others? Does the case come with guiding questions? What do those questions suggest is important?
- *What do we know?* What information in the case demands attention? Is there information that clearly does not relate to the problem or problems? (A good case should have red herrings.) Would it help to create a chronology of events?
- *What do we need to know?* What information is missing? How will we deal with missing information?
- *What is already known?* What sources of information can be brought to bear on the situation? In addressing this question, include academic resources (e.g., research databases, textbook resources, lecture content, suggested readings, Internet information, policy documents or curriculum guides, etc.)? Do you have useful information drawn from personal experience (e.g., from other jobs, from family members, from previous teaching experiences, etc.)?
- *Who are the stakeholders?* What are their perspectives?
- *What can we do?* What are the action possibilities? Note, at this point, it becomes necessary for the students adopt a role in the case--i.e., who are the "we" that will

take action?

- *What are the likely consequences of your preferred action choices?* Think in terms of the different stakeholder groups. What would be the consequence(s) of doing nothing?
- *How, in detail, should the problem be solved?* What actions must be taken by which characters and why? What new problems may emerge? What other problems might be incidentally solved if your plan were followed?
- *How might this problem have been averted* in the first place or prevented in the future?

I told them that they should not expect the case to be easy. If they could come up with an easy and obvious solution to the problem in a case, then either they have the wrong problem or it is a weak case. In trying to identify the central problem, I suggested that they look for:

- unusual behaviours
- conflicts between individuals or groups
- misrepresentations of fact
- misunderstandings
- sudden changes
- adamant resistance to change
- excessive demands on either fiscal or human resources
- disruptions in the social climate
- violations of ethics, the law or reasonable expectations.

The time spent in the analysis of the case is the time when learners will encounter opportunities for the kind of peer coaching and scaffolding described by Fernández (2001). This is where collaborative knowledge building occurs. The structures and guidance the instructor provides regarding the process are meant to insure that the work lead to meaningful learning rather than the “sharing of ignorance.”

However, all of this analysis depends on constructive engagement in the group discussions. Of course, this requires good will and cooperation. The recommendations regarding cooperative learning (above) will go a long way toward accomplishing these ends, but my competition experience also led me to provide additional guidance to my teams.

In the competition setting, time is a big factor limiting the case study analysis. Barring fatigue, interpersonal problems in a group or some sort of obsession with a red herring, it is fair to expect that more time spent in analysis of a case will result in a stronger final product. To this end I recommended that the groups plan their time and set a deadline for completing the analysis (so there is time for identifying solutions and writing a report). For serious students, time is always a consideration even if they aren’t competing, but I think it is wise to call their attention to the need to plan their time and respect the limits they set for themselves.

Early in the process, then, students should have a planning meeting in which they discuss what the case requires of them (see the questions above). A consensus is desirable, but let them know that they may need to yield to the majority. Each group member should identify any personal

strengths that apply to the case. They should outline the steps they will take, the additional meetings they will have and the amount of time they will allot to each activity.

As a buffer against conflict, I encouraged the teams to assign each member a role like one of the following:

1. moderator
2. analyst
3. recorder
4. timekeeper
5. synthesizer
6. skeptic
7. ombudsman
8. peacemaker

This allows people some grace to say “Sorry, but I am supposed to be a skeptic and…” or “Everyone, please, you know I have to keep track of time, we have 15 minutes left and…” Over time, learners should get experience with a variety of different roles--sometimes choosing to build on their strengths; sometimes focusing on improving their skills with one of the task-roles. The list above is, again, suggestive. I encouraged students to create roles of their own. “Jester” got added to my list on some occasions.

Unless you are working on a very tight time frame with a mini-case, I recommend allowing some time between meetings. Even in the competition setting, I encouraged the teams to plan breaks into the work so that they could get some air, some time alone, and a chance to think without having to listen to others.

In addition to separate roles, the team should assign tasks. Some common tasks for my teams were:

- consulting an expert
- reading specific documents (curriculum guides, textbooks, policy documents, ethics statements, etc.)
- conducting a search of ERIC and/or the Internet
- testing solution ideas with relevant stakeholders

Collaborative writing is also an important part of the learning process in case-based teaching and problem-based learning. The need to express the group’s decisions clearly and convincingly requires thought that is key knowledge construction. The final product may be in the form of a presentation or a paper or a panel discussion or a debate or some other format, but some written document should be a part of the process and its contents should be agreed upon.

### Assessing Student Learning in Case-Based Teaching

Clearly, if this process is taken seriously, learners will have invested time, energy, and reputation into this work. That will not happen if the assessment is taken lightly or done carelessly. Giving marks that reward the effort rather than the outcome will be perceived by some serious

students as “careless.” The instructor needs to be prepared to make some judgements about the quality of the work. My own experience would suggest that what matters most is not the letter or number that is assigned as a mark but rather the detailed critique that the instructor provides on the process and the written product(s). Part of what postsecondary students are paying for is a professional evaluation of their work.

With case-based teaching and PBL, the desire to have learners experience lifelike problem solving and to collaborate in the production of artifacts that document their learning (papers, videos, poster, presentations, etc.), the model of assessment that makes sense for the work is called authentic assessment. The ideas were developed in large measure by Wiggins (e.g., 1990). A succinct statement of the processes of authentic assessment has been provided by Brualdi Timmins (1998). A critical part of the authentic assessment process is the development and use of marking rubrics—clear and detailed statements of the type and level of performance judgements the instructor will make about a work. The Teacher Vision website includes a thorough description of the processes involved in creating and using rubrics (https://www.teachervision.com/teaching-methods-and-management/rubrics/4521.html).

In an earlier CQ article (Hunter, 2012), I discussed my use of a course wiki as a way of getting students to reset their thinking and to open themselves to new learning—the wiki as a disorienting dilemma, a lá Mezirow, 1997. What I have been suggesting in this series is that a commitment to active learning can provide instructors with a sort of ongoing disruption to their “usual” practices, a continuing call to be open to new approaches and new evidence. I think making that commitment is challenge worthy of a good teacher.

**References (for the series)**


Anderson, T. (2008). *The theory and practice of online learning*. Athabasca University Press.

Arendale, D. R. (2005). Postsecondary Peer Cooperative Learning Programs: Annotated Bibliography. *Online Submission*. Retrieved from: http://www.tc.umn.edu/~arend011/Peerbib03.pdf

Baker, E., & Wedman, J. (2000). Preservice Literacy Teachers, Digital Literacy Portfolios, and Multimedia Case-Based Instruction: Examining the Theoretical Basis for Case-Based Instruction. SITE Conference proceedings. Retrieved from: http://www.editlib.org/p/15903/

Barrows, H. S. (1996). Problem based learning in medicine and beyond: A brief overview. *New directions for teaching and learning, 1996(68)*, 3-12. . Retrieved from: http://onlinelibrary.wiley.com/doi/10.1002/tl.37219966804/epdf

Becker, H.J. (2000). The "exemplary teacher" paper—how it arose and how it changed its author’s research program. *Contemporary Issues in Technology and Teacher Education, 1* (2). Retrieved from: http://www.citejournal.org/vol1/iss2/seminal/article2.htm

Becker, H.J., & Riel, M.M. (1999). Teacher professionalism and the

emergence of constructivist-compatible pedagogies. Paper presented at the American Educational Researchers Association. . [On-line]. Retrieved from: http://www.crito.uci.edu/TLC/findings/special_report2/index.htm,/

Bell, R. L., Maeng, J. L., & Binns, I. C. (2013). Learning in context: Technology integration in a teacher preparation program informed by situated learning theory. *Journal of Research in Science Teaching, 50*(3), 348-37.

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18, pp. 32-41. Retrieved from: http://people.ucsc.edu/~gwells/Files/Courses_Folder/ED%20261%20Papers/Situated%20Cognition.pdf

Brualdi Timmins, Amy C. (1998). Implementing performance assessment in the classroom. *Practical Assessment, Research & Evaluation*, 6(2). Retrieved from: http://PAREonline.net/getvn.asp?v=6&n=2

Bruner, J. (1960). The Process of Education. Cambridge, MA: Harvard University Press

Cognition and Technology Group at Vanderbilt. (1990). Anchored instruction and its relationship to situated cognition. *Educational Researcher*, 19(6), 2-10. Retrieved from: http://calteach.ucsc.edu/aboutus/documents/AnchoredInstruction.pdf

Conole, G. and Dyke, M. 2004. What are the affordances of information and communication technologies? *ALT-J, Research in Learning Technology*. 12(2), 113-124. Available: http://repository.alt.ac.uk/596/1/ALT_J_Vol12_No2_2004_What%20are%20the%20affordances%20of%20in.pdf

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education, 59*(2), 661-686.

Cooperative Learning Institute (nd). Website: http://www.co-operation.org/

Cunningham, D., Duffy, T. M., & Knuth, R. (1993). Textbook of the Future. In C. McKnight (Ed.)

Deutsch, M. (1949). A theory of cooperation and competition. *Human Relations*, 2, 129-152.

Dewey, J. (1910). *How we think*. New York: D.C. Heath. Retrieved from: http://www.gutenberg.org/files/37423/37423-h/37423-h.htm

Durning, S. J., Artino, A. R., Boulet, J. R., Dorrance, K., van der Vleuten, C., & Schuwirth, L. (2012). The impact of selected contextual factors on experts' clinical reasoning performance (does context impact clinical reasoning performance in experts?). *Advances in health sciences education, 17*(1), 65-79.

Fernández, M., Wegerif, R., Mercer, N., & Rojas-Drummond, S. (2001). Re-conceptualizing "scaffolding" and the Zone of Proximal Development in the context of symmetrical collaborative learning. *Journal of Classroom Interaction, 36*(2), 40-54. Retrieved from

http://elac.ex.ac.uk/dialogiceducation/userfiles/JCI2_Fernandez.pdf

Field, D. E. (2004). Moving from novice to expert–the value of learning in clinical practice: a literature review. *Nurse Education Today, 24*(7), 560-565.

Hakkarainen, P. (2009). Designing and implementing a PBL course on educational digital video production: lessons learned from a design-based research. *Educational Technology Research and Development, 57*(2), 211-228.

Hakkarainen, P., Saarelainen, T., & Ruokamo, H. (2007). Towards meaningful learning through digital video supported, case based teaching. *Australasian Journal of Educational Technology, 23*(1).

Harvard Business Review Case Discussions. Website: https://cb.hbsp.harvard.edu/cbmp/pages/content/hbrcasestudy (Accessed 19 June, 2015).

Harvard Business School. Website. http://www.hbs.edu/about/facts-and-figures/Pages/history.aspx (Accessed 19 June, 2015).

Healey, M., Flint, A. & Harrington, K. (2014). *Engagement through partnership: students as partners in learning and teaching in higher education*. York, UK: Higher Education Academy. Retrieved from: https://www.heacademy.ac.uk/sites/default/files/resources/engagement_through_partnership.pdf

Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist, 42*(2), 99-107.

Huff, D. (1993). *How to lie with statistics*. WW Norton & Company. (NOTE: Book was originally published by Norton Publishing in 1954 but has been through many reprints; a 1973 edition published by Penguin is available online at: https://archive.org/details/HowToLieWithStatistics .)

Howard-Jones, P., Holmes, W., Demetriou, S., Jones, C., Tanimoto, E., Morgan, O. & Davies, N. (2015). Neuroeducational research in the design and use of a learning technology. *Learning, Media and Technology, 40*(2), 227-2

Hunter, W. J., (1999). Cases in educational computing. In Sudzina, M. R. (Ed.). (1999). Case study applications for teacher education: *Cases of teaching and learning in the content areas*. Allyn & Bacon. pp. 186-199.

Hunter, W. J. (2011). Use your head: Neuroscience research and teaching. *College Quarterly, 14*(3). Retrieved from: http://collegequarterly.ca/2011-vol14-num03-summer/hunter.html

Hunter, W. J. (2012). Collective disorienting dilemmas: A"Wikid" approach to fostering adult learning. *College Quarterly, 15*(2). Retrieved from: http://collegequarterly.ca/2012-vol15-num02-spring/hunter.html

Hwang, W-Y., Chen, H. S. L., Shadiev, R. Huang, R. Y-M. & Chen, C. Y. (2014). Improving English as a Foreign Language Writing in Elementary

Schools Using Mobile Devices in Familiar Situational Contexts. *Computer Assisted Language Learning. 27*(5), 359-378.

Jenson, J., Taylor, N., & de Castell, S. (2007). Shifting design values: A playful approach to serious content. *E-Learning and Digital Media, 4*(4), 497-507.

Jenson, J., Taylor, N., & de Castell, S. (2011). Epidemic: Learning games go viral. *Journal of the Canadian Association for Curriculum Studies, 8*(2), 28-49.

Johnson, D. W., & Johnson, R. (1999). Learning together and alone: Cooperative, competitive, and individualistic learning (5th Ed.). Boston: Allyn & Bacon.

Johnson, D. W., Johnson, R. & Smith, K. (1991). *Cooperative Learning: Increasing College Faculty Instructional Productivity. ASHE-ERIC Higher Education Report No. 4, 1991*. ASHE-ERIC Higher Education Reports, George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-1183. Retrieved from: http://files.eric.ed.gov/fulltext/ED343465.pdf

Jonassen, D.H. (2000). *Computers as mindtools for schools: Engaging critical thinking*. Columbus, OH: Prentice-Hall.

Karagiorgi, Y., & Symeou, L. (2005). Translating constructivism into instructional design: Potential and limitations. *Educational Technology & Society, 8*(1), 17-27. Retrieved from: http://www.ifets.info/journals/8_1/5.pdf

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41* (2) 75-86. Retrieved from: http://www.cogtech.usc.edu/publications/kirschner_Sweller_Clark.pdf

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.

Leow, F. T., & Neo, M. (2015). Redesigning for collaborative learning environment: Study on students' perception and interaction in Web 2.0 tools. *Procedia-Social and Behavioral Sciences, 176*, 186-193.

Loyens, S. M. M., Kirschner, P. & Paas, F. (2011). Problem-based Learning. In K. R. Harris, S. Graham & T. Urdan (Eds.), APA Educational Psychology Handbook: Vol 2 (p. a). Washington: American Psychological Association. Retrieved from: http://ro.uow.edu.au/edupapers/1235/

McFarlane, D. (2015). Guidelines for using case studies in the teaching-learning process. *College Quarterly, 18*(1). Retrieved from: http://www.senecac.on.ca/quarterly/2015-vol18-num01-winter/mcfarlane.html

McNeil, L. (2013). Exploring the relationship between situated activity and CALL learning in teacher education. *ReCALL 25(2)*, 215–232.

Mezirow, J. (1997). "Transformative learning: Theory to practice." In P.

Cranton (ed.), *Transformative Learning in Action: Insights from Practice*. San Francisco: Jossey-Bass.

Noel, L. (2015). Using blogs to create a constructivist learning environment. Procedia-Social and Behavioral Sciences, 174, 617-621.

Oliver, R. & Herrington, J. (2003). Exploring technology-mediated learning from a pedagogical perspective. *Journal of Interactive Learning Environments, 11*(2), 111-126.

Ommundsen, P. (2001). Problem-based learning in biology with 20 case examples. Website: http://capewest.ca/pbl.html

Papert, S. (1980). *Mindstorms: Children, computers and powerful ideas* New York: Basic Books.

Parker, K. & Chao, J. (2007). Wiki as a teaching tool. *Interdisciplinary Journal of Knowledge and Learning Objects*, 3, 57-71.

Pressey, S.L. (1926). A simple apparatus which gives tests and scores - and teaches. *School and Society, 23* (586), 373-376

Pressey, S.L. (1927). A machine for automatic teaching of drill material. School and Society, 25 (645), 549-552.

Rathnasiri Hewege, C., & Chamila Roshani Perera, L. (2013). Pedagogical significance of wikis: towards gaining effective learning outcomes. *Journal of International Education in Business, 6*(1), 51-70.

Rourke, L., Anderson, T., Garrison, D.R., & Archer. W. (2001). Methodological issues in the content analysis of computer conference transcripts. *International Journal of Artificial Intelligence in Education*, 12, pp.8-22. <hal-00197319> Retrieved from: https://telearn.archives-ouvertes.fr/hal-00197319/document

Salomon, G. (Ed.) (1993). *Distributed cognitions—psychological and educational considerations*. Cambridge, UK: Cambridge University Press.

Salomon, G. (Ed.) (1993). *Distributed cognitions—psychological and educational considerations*. Cambridge, UK: Cambridge University Press.

Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. *Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows, 5.*

Schwab, J. (1960). Inquiry, the science teacher, and the educator. *The School Review, 68*(2), 176-195.

Siemens, G., & Tittenberger, P. (2009). *Handbook of emerging technologies for learning*. Manitoba, Canada: University of Manitoba.

Shaffer, D. W. (2006). *How computer games help children learn*. New York: Macmillan.

Skliarenko, E. (2004). Case study: Bombardier Inc.: Competitive intelligence report (with special reference to aircraft exports). *College*

*Quarterly, 7*(3). Retrieved from: http://collegequarterly.ca/2004-vol07-num03-summer/skliarenko_bhardwaj.html

Stahl, R. (1994). The essential elements of cooperative learning in the classroom. ERIC Digest. Retrieved from ERIC Documents: (ED 370881): http://files.eric.ed.gov/fulltext/ED370881.pdf

Standal, Ø. F., & Jespersen, E. (2008). Peers as resources for learning: a situated learning approach to adapted physical activity in rehabilitation. *Adapted Physical Activity Quarterly, 25*, 208-227

Stanford University. (Winter, 1994). Teaching with case studies. *Speaking of Teaching, 5*(2). Retrieved from: http://web.stanford.edu/dept/CTL/cgi-bin/docs/newsletter/case_studies.pdf

Stanford University. (Winter, 1999). Cooperative learning: Students working in small groups. *Speaking of Teaching, 10*(2). Retrieved from: http://web.stanford.edu/dept/CTL/cgi-bin/docs/newsletter/cooperative.pdf

Stanford University. (Winter, 2001). Problem-based learning. *Speaking of Teaching, 11*(1). Retrieved from: http://web.stanford.edu/dept/CTL/cgi-bin/docs/newsletter/problem_based_learning.pdf

Sudzina, M. R. (1999). *Case study applications for teacher education: Cases of teaching and learning in the content areas*. Allyn & Bacon.

Tiernan, P. (2015). An inquiry into the current and future uses of digital video in University teaching. *Education and Information Technologies, 20*(1), 75-90.

University of Illinois (nd). Online Teaching Activity Index. Website: http://www.ion.uillinois.edu/resources/otai

University of Waterloo Centre for Teaching Excellence. (nd). Implementing group work in the classroom. https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/alternatives-lecturing/group-work/implementing-group-work-classroom

van Oostveen, R., Hunter, W., Kay, R. & Muirhead, W. (2007). Developing Argumentation Skills in High School Students: A Video-based Case Study in Science Education. In C. Montgomerie & J. Seale (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology 2007* (pp. 391-397). Association for the Advancement of Computing in Education (AACE). Retrieved July 7, 2015 from http://www.editlib.org.uproxy.library.dc-uoit.ca/p/25408.

Vázquez, A. V., McLoughlin, K., Sabbagh, M., Runkle, A. C., Simon, J., Coppola, B. P., & Pazicni, S. (2012). Writing-to-teach: A new pedagogical approach to elicit explanative writing from undergraduate chemistry students. *Journal of Chemical Education, 89*(8), 1025-1031

Venezky, R. L. (1991). The development of literacy in the industrialized nations of the West. *Handbook of reading research, 2*, 46-67.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Walker, R. A. (2013). Holograms as teaching agents. *Journal of Physics: Conference Series 415*(1), 1-5. Retrieved from: http://iopscience.iop.org/1742-6596/415/1/012076/pdf/1742-6596_415_1_012076.pdf

Waddington, D. I. (2015). Dewey and Video Games: From Education through Occupations to Education through Simulations. *Educational Theory, 65*(1), 1-20.

Wang, Z., Chen, L., & Anderson, T. (2014). A framework for interaction and cognitive engagement in connectivist learning contexts. *The International Review of Research in Open and Distributed Learning, 15*(2). Retrieved from: http://www.irrodl.org/index.php/irrodl/article/view/1709/2886

Wiggins, Grant (1990). The case for authentic assessment. *Practical Assessment, Research & Evaluation, 2*(2). Retrieved from: http://PAREonline.net/getvn.asp?v=2&n=2

Wilson, B. G. (1996). *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Wood, D., Bruner, J., & Ross, G. (1976). The role of tutoring in problem-solving. Journal of *Child Psychology and Child Psychiatry, 17,* 89-100.

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