Teaching Learning

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"It is a bad business that we cannot nowadays learn anything that will last a lifetime. Our forefathers stuck to the teaching they were given when they were young, but we have to unlearn everything every five years if we are not to go completely out of fashion." – Johann Wolfgang von Goethe, in *Elective Affinities*

How should our society organize its activities so as to promote the general success of our children and our contemporaries in activities of their choice that require the use of complex knowledge? Both experience and research have reinforced my belief in the importance and scope of this question, but have also given indications of the wide range of perspectives from which it is viewed and prescriptions with which it is answered. In particular, many questions are raised by the recurring theme of the appropriate relationship of school-based activity to the existing body of knowledge in an area: *Is this knowledge to be "transmitted" by a teacher, "constructed" by a student, or "overheard" by a peripheral participant? How important is understanding vis-a-vis immediate performance? Is the assertion of the validity of a standard body of knowledge oppressive, or (on the contrary) is the failure to promptly supply what is already known an irresponsible waste of students' time?*

While these and similar questions have some values-based components, they are mainly questions of fact about the nature of human learning and society. This paper gives a perspective on an elementary-science-classroom approach that illuminates this topic: "Distributed expertise in the classroom" (Brown *et al*, 1993). Although I see the model described in the article as having many virtues in addition to the "distributed expertise" of the article's title, I will refer to it as the "DE model" here for conciseness. Approaches similar to Brown's are attractive to me because they have an efficiency of organization and information-delivery capacity which make them credible candidates for widespread use as a predominate mode of instruction. They thus have a realistic connection (conspicuously lacking in approaches based on extensive use of unguided discovery) to the constraints under which most schools must operate.

Summary of the DE Model

The strategy of a DE school is to be a "*community of learners*" in which children "*learn to learn*". This rather nebulous goal is given reality by the tactics used (this short outline of course gives only a caricature of Brown's careful description):

[a] reciprocal reading groups in which roles of questioning, clarifying, summarizing, and predicting are differentiated but rotated.

[b] "jigsaw" topic-research projects in which each member of a subtopic group focuses on a particular sector, then provides a summary of findings (using materials developed by his/her group) to a rearranged group with single members from each subtopic group.

[c] support for student specialization (within the constraints of supporting the class's learning of a topic and attaining basic competence in all areas).

[d] student participation in structured critiques of student work (including one's own), and in critiques of group processes.

[e] extensive access and reference to external knowledge resources, including more advanced learners and people making professional use of knowledge of the same kind.

[f] well-engineered rituals to support and raise student consciousness of the learning

activities.

While flexible in specific student roles, the DE approach uses quite specific curricular learning goals for the whole class, and for each subtopic group. The teacher intervenes to whatever extent is required to ensure that each group prepares materials adequate for the presentation to the rest of the class. The teacher is also open about his or her own learning activities, gathering new material by explicit research or external advice, as well as by acknowledging novel information found by students.

Advantages of the DE Approach

I see the approach Brown describes as a masterly integration of multiple strands of theory and practice, successfully reconciling several apparently-conflicting goals: breadth with depth, guidance with invention, self-reliance with group participation, and critical ability with respect for accumulated knowledge. It contrasts favorably with both lecture-and-workbook methods (admittedly an easy target) and enjoyable but slow discovery methods. It reveals its origin in classroom practice by the comprehensiveness and articulation of its component mechanisms. Here are the points about the model that seem to me to cast the most light on other instructional approaches and general instructional issues:

[1] **Teachers need not be (or pretend to be) subject-domain experts**. It is hard to emphasize the importance of this aspect of the model strongly enough. It is, of course, essential to the scalability of the process, especially for lower-level math/science education. But its biggest contribution is that it turns the strong role-model effect that teachers provoke in the right direction. Currently, copying the teacher means to be a know-it-all (a tempting path for the best students, impossible for most others); in a DE classroom, the way to copy the teacher is by becoming a particularly-skilled learner. (If students also notice and copy the teacher's primary professional skill, inclusive educational-process management, that's all to the good.)

[2] **Teachers can provide leadership**. While this should not be so worthy of note, it is important that an instructional model promote rather than undermine the ability and responsibility of the teacher. In the DE approach, the teacher is clearly in charge and can act as needed to ensure that the class progresses. By making it clear that the biggest contribution of the teacher is his/her listening and class-management skills, rather than encyclopedic knowledge of all topics, the DE model avoids the teacher demoralization that is a frequent consequence of "reformed" curricula, especially in math and science.

[3] **The rituals simultaneously heighten consciousness and reduce self-consciousness**. The use of clear classroom rituals as the contexts for much of the group activity is a brilliant piece of instructional engineering. In addition to providing a level of dependable support for the teacher that no amount of teacher's-manual advice could supply, rituals give their participants a "distance" from the roles played which makes them easier both to undertake and to transcend.

[4] **Student roles are authentic and serious**. Students are not pretending to be scientists (or whatever), they are actually performing in their true school roles: apprentice learners. Since they know that they really will need to learn things, students can see that what they are doing is actual work: they are neither being indulged nor indulging the whims of their teachers. While the student activity can correctly be called "research", it clearly is not really "discovery" or "invention" (at least at the topic-knowledge level – there may be substantial invention in the production of presentations). This avoids the pretence permeating most discovery-based lessons.

[5] **Students are trained in critique**. What students need most is an ability to perceive errors in their thinking, not the ability to reproduce textbook segments on command. The DE approach takes advantage of our ability to perceive the errors of others as a way of eliciting criticism, and of our disinclination to accept correction from our peers as a way of ensuring that criticisms are authentically considered (rather than being unreflectively submitted to, a typical response to criticism from a teacher). This is an excellent example of the social learning Vygotsky identified, with the self-critical ability built by internalization of the group process.

[6] **Students get to really talk about the topics**. One of the more disheartening things for typical students is that they see most of what they are told in school as being simultaneously *true* and *unintelligible*. Because a statement wouldn't be in the books unless it was true, there is little reason to try to reconcile it with their current conflicting conceptions – better to just accept it and memorize it for the test. But in a DE classroom, students *get to see statements being modified to become true* as the group or class critiques the productions of various students. In this context, a student's personal perceptions are of actual value even if wrong, since the material presented is supposed to be *convincing*, not just correct. And it is actually plausible that a student may correct an error by the students presenting the material, so there is a strong incentive to join the conversation.

[7] **A balanced view of the dependability of knowledge is communicated**. Because most of the knowledge collected and arranged for presentation to other students is based on researched references and reflects a well-designed curricular agenda, core concepts and findings will come across as solidly established. The critical attention of the class is focused on correcting misunderstandings and on discussing areas where there are authentic current disputes. But knowledge of those misunderstandings and disputes, together with encounters with some mediocre reference materials (e.g., many web pages), will encourage a salutary caution in using sources, with doubts driving students to further reference-checking and expert-questioning.

[8] **Students are introduced to the community of practitioners**. Schools currently give students little exposure to individual adults who are making use of what the student is learning. This contrasts to the natural village situation, in which the work of the adult world is visible to all, so the relevance of learning is easier to establish. In Brown *et al*'s pilot study, students were provided email access to graduate students and other experts in their topics of study. While successful in that instance, and a valuable component of the DE approach, some modification to avoid overload will be required if this methodology becomes common. The most plausible adaptation would be to use either students at intermediate levels who are veterans of the approach or to enroll "lay" enthusiasts to spread the load (they could keep in touch with higher-level experts, and could help students identify authoritative web sites). But, in general, the rapidly-expanding use of the web for professional purposes should make it easy to provide any number of DE classrooms with windows into the world of adult practice.

[9] **Specialization is encouraged**. To my mind, this is the soul of the DE process, the idea that anchors it motivationally and makes it a correct apprenticeship model for successful adult activity. The one-dimensional concept of excellence that permeates traditional school thinking is both socially destructive and grossly inaccurate. The natural development of specializations in DE classrooms in the context of producing work results gives students real experience in how to become specially useful, with the concomitant respect and authority, in a way that is multicentric rather than hierarchical: *everyone* can be experts, even though there can be only one valedictorian.

[10] **The great extent of the body of accumulated knowledge is implied**. Another advantage to specialization is that it helps reveal that the world involves much more informational detail, and many more skills, than any single person can master. Since no student is being asked to do or learn everything (although all are getting the "executive summaries" which give them an overall picture), this revelation of the size of the world is reassuring and exciting rather than oppressive and demoralizing. It won't all be on the test, and you won't need to be good at everything to be successful – but the world is big enough that individualized niches abound.

One final note: In several places, Brown *et al* imply that the DE model has special relevance to science, with the rituals being modeled on scientific discourse and the activities being modeled on scientific research. That limitation seems inaccurate to me, reflecting a false distinction between science and other knowledge-based activities. History, for example, would be eminently well-suited for the same technique. Exaggerating the differences between science and other areas could discourage people from applying the methods of research, observation, and critical discussion to those areas: not at all the lesson we want people to learn.

Reference: Brown, A., Ash, D., Rutherford, M., Nakagawa, K., Gordon, A., and Campione, J. (1993). Distributed expertise in the classroom. *Distributed Cognitions*, (Chapter 7), 188-229. Cambridge, UK: Cambridge University Press.