



# INNOVATION ABSTRACTS

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## REACHING

Recently, I encountered a new educational challenge. Students work through an exercise, get an initial answer, but fail to go on and reach for more explanatory, insightful, or useful answers. This phenomenon occurs in several disciplines, has some common characteristics, and perhaps shares some common relevant strategies. For example, a student prepares a paper comparing World War I and II. Two books used for the research are represented well in the paper. However, while the paper shows some interesting insights into the technology and its importance in War I, technology is not mentioned at all with respect to War II, not even so much as to say whether it was important, reflecting poorly on the book used for information about War II as much as on the student. As a result, the paper is very unbalanced, incomplete, and unsatisfactory. Something is missing; more needs to be said.

Examples in other disciplines come to mind. In a series of mathematical exercises, students arrive at an answer expressed, at least partially, in terms of  $\cos(180-x) + \cos(x)$ . Most students left the result as they found it. It was correct; however, when asked in the next question to use this answer in further analysis, they could not. Their answer was too complicated; they got lost, made errors, and achieved no result. Students were aware that something was incomplete about their result and were frustrated but still left it as it was. However, in this math class, the equality simplification the second question sought was discussed both in class and in the text, and explained in multiple ways:  $\cos(180-x) = -\cos(x)$ . The troublesome part of the student answer,  $\cos(180-x) + \cos(x) = -\cos(x) + \cos(x) = 0$ , simplifies the problem before them. Even in an open-book environment, the students did not reach for a readily available simplifying equality.

In another discipline, a student translates a passage into English, looking up the unfamiliar words, but in the end submitting a translation which makes no sense. The student realizes this, but goes no further. The teacher sees the problem immediately. The student is using a dictionary that does not contain the idioms and cultural

associations needed to make the proper translation. The student was aware that the purpose of translation is to communicate meaning but left the work in less than a satisfactory state and did not reach for the real meaning.

Some educators would want to describe this as lack of completeness in the student work or as a failure to meet a desired format. These are useful points of view and perhaps tools to get students to reach further, but they may sometimes misdirect them. Completeness suggests that there is an answer for which the student should be searching and that, once attained, nothing more can be done. In a history paper, for example, there is no such useful notion as to exactly how much should be done, even if there is a strong sense that something is missing. The research and the analysis could go on and on. There is no final sense of completion, but an alarm goes off when the analysis does not go far enough. On the other hand, giving assignments where a measure of completion can be defined is an excellent way to teach students when their analysis or papers have not reached far enough.

In the translation example, there is no format to be emulated, but the result must make sense. Wherever possible, suggesting some appropriate formats is an excellent technique for helping students attain a minimum satisfactory level in their work. As with all pedagogic techniques, they carry some risks. They suggest that if the work meets the format, it is automatically satisfactory. We know this is not the case, and we must require students to reach for more.

The common theme in these experiences is that the students can see that there is more that can be done, a higher standard they can meet. There are aspects of "critical thinking," as some educators use the term, which would lead a student to reach in productive directions. The shared objective is helping students provide as full a picture of their topic as possible. Reaching, however, is both a formal and a subjective challenge.

Trying to understand why I see so clearly what a student could reach for and a student chooses not to, led me to think of *reaching* in its several steps, each of which might be approached independently. Here are the steps as I analyzed them.



1. Realizing when to reach, that there could be more analysis to do
2. Being motivated to do more work
3. Understanding the kind of additional work that could be done
4. Knowing how and where to find additional information or insights
5. Getting that information or insight
6. Incorporating it

As previously mentioned, discussion about when an assignment is complete is a good technique for helping students realize when to reach. Requiring a pre-approved outline will introduce the danger that comes from a student's believing that an analysis has a point at which our understanding is complete, and that we know everything we can about our subject. It helps students know when they have to reach for more—more understanding, analysis, and presentation. Similarly, required formats help. In mathematics, the format for the result, as in the "simplified form of a fraction," is sometimes required; and this helps students know when they have to reach further, even though their answers may already be correct without "simplification." Some students observe, unhappily, that the simplified form sometimes does not look simpler, and they are right; an agreed-upon standard form is useful, however, to help students know they can go on from the answer they may have at first.

Motivating students to reach challenges general motivation—e.g., grades, standards, and tests. For example, require the student to read a translation aloud to another student and pass the test of its making sense. In the history paper example, a simple standard would be that any topic discussed regarding one war should be discussed, even if briefly, regarding the other.

Understanding how to reach—i.e., determining what kind of additional work can and should be done—is perhaps the most difficult task. Formats and standards can help where they can be applied. A good exercise, in this regard, is to have students, when they think they are done with an assignment, make a list of additional work they could do on their project, even if they do not intend to do it, and attach that list as an addendum to the assignment. The teacher could make comments about the list and perhaps add to it.

Knowing where to find additional information or insights is less difficult. The teacher or facilitator generally would be able to tell students where to do that. Many students cannot use the indexes in their texts or scan the text well. It can be useful to stop during a discussion of course material and ask students individually, or as a class, to find a certain discussion in the text. Teachers may, as a matter of organization when working from a

text, write on the board the number of the page which contains the material. Or if they are discussing something that was covered in a previous session, then it is especially useful to stop and ask the class to find that earlier discussion in their notes. It helps everyone learn to find material that may not come quickly to mind and helps students review.

Getting the information or completing the additional analysis is a different hurdle altogether. Students are fond of saying they ran out of time; because so many of them work, it is often an honest excuse. They may have motivation, but not quite enough to do the hard research. Having a series of questions from which students can work is useful here, since students who do not reach far enough on one exercise may find they cannot do the next. This technique leaves some students behind and, in that regard, is dangerous. It should be used with the option that if a student did not get the necessary result in one part of the assignment, she can admit it, take the grade, but ask about what might have been collected or achieved if she had reached far enough. This means the student will embark on the next question in the series, knowing she did not reach far enough, but also what she might have reached for and why it is important. If students are unable to get an answer (or the additional material) on their own, they can get it from the teacher and be able to proceed.

Incorporating material reached for is perhaps the simplest and most satisfying part of this process. It is worthwhile getting all students to that place where they learn to reach and do it regularly, and it often has its own lessons to share. How does new material finally fit in with old material? How does reaching give us additional insights? Developing students' reaching skills, as a class or in small groups, helps every student understand that the ultimate and best outcomes of taking some important extra steps are better products, better analyses, better essays, and more interesting results.

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