Why Asset-Based Approach to Teaching Is More Effective than the Usual Deficit-Based Approach, and Why The New Approach Is Not Easy to Implement: A Simple Geometric Explanation

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\textbf{From deficit-based to asset-based approach.} Traditional approach to teaching is based on uncovering deficiencies in students’ learning. Based on the results of pre-test or a midterm exam, the instructors learns about the topics that the students have not yet fully mastered, and concentrates on these topics.

For example, a graduate computational science program usually attracts both computer science students who want to work on applications of computing, and science and engineering students, who would like to improve their computational skills so that they will be able to solve important problems from science and engineering. In the usual deficit-based approach, when we teach a computer science course to all these students, we take into account that students from science and engineering background are less knowledgeable in computer-related topics, so we spend extra time explaining these topics to non-computer science students.

This process can be made more efficient if we take into account that, while these students may lack some programming skills, they usually have a much better understanding of the corresponding physical situations and problems. This understanding often helps them get a good idea of what all the intermediate computational results should be – and thus, catch possible mistakes at an early stage.

In general, this asset-based approach – looking for (and using) advantages that individual students have – is known to be very helpful in education.

\textbf{Asset-based approach sounds reasonable, but it is not easy to implement.} At first glance, the asset-based approach sounds reasonable, but it is not yet as widely spread as it should be. And the main reason for this slow spread is that experience shows that this approach is not easy to implement. In this talk, we provide a simple geometric explanation for this difficulty.