Preparing Learners to be Flexibly Adaptive in Novel Situations

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A major goal for our instruction revolves around developing learners who are capable of effectively *adapting* to novel situations. Achieving this goal requires instruction that provides multiple opportunities for learners to discover new knowledge in multiple contexts. The learning activities that guide their discovery are designed to develop learners metacognitive skills related to inquiry, their conceptual understanding of basic principles and their development of identity for that domain. Many new instructional models based on inquiry learning share this goal and method. The VaNTH Engineering Research Center has been developing a cognitive model of adaptive expertise to help guide our exploration for how to inform our understanding of how these instructional methods work and how we can improve them. Prior studies in problem solving instruction observe that concentrating on general problem solving strategies is insufficient and that content knowledge is necessary to develop effective problem solving outcomes. We believe students will develop the knowledge structures they need to adapt to novel situations if they engage in learning activities that simultaneously engage both general cognitive skills (e.g. problem solving or inquiry skills) and basic skills within context rich situations. For example, anchored inquiry learning environments, like challenge based instruction, have lead to increases in students' ability to identify and formulate problems. In addition, learners can begin to identify questions they need to answer so they can generate alternative solutions to the challenge. There is strong evidence that this co-development of cognitive skills and content knowledge can also develop a learner's sense of identity for the domain they are learning and/or the context of the problem solving activity. Therefore, well designed challenge based instruction can lead to the development of *adaptive expertise* in our students. This paper describes the dimensions of adaptive expertise model and potential methods for measuring these dimensions. This summary highlights the potential importance of a learners' academic experience on their ability to solve novel problems, their persistence to engage in problem solving in novel situations and their interest in a particular career.