I have been involved in teaching programming to adults for the past several decades, first in industry (in-house education for Boeing and train-the-trainer for Microsoft) and more recently, academia (North Seattle Community College). Unlike the reports that I hear from those involved in public primary and secondary education, the students I teach are generally highly interested and engaged in the topic. Their future, that is, employment or admission into a given academic program, depends on successfully “learning” the material. Even given this attitudinal “buy-in,” student success seems to vary rather greatly. I don’t believe that this is due to innate ability or raw intelligence, but rather the development of a “something” that enables some people to address programming problems more successfully than others. I’m not talking about developing expertise, *qua* expertise, in programming, but a reasonable level of proficiency. Whatever this “something” is, it seems to be also shared by the successful programmers whom I know. Clearly, there is a shared “culture” there, speaking here of the workplace culture that often marks groups of programmers. And, this commonality may well be enhanced and fostered by cultural influences, but I think there’s more, something fundamental or foundational … a point of view, a mental approach, a processing strategy … that lies at the core. And, I believe this could well be fostered, developed in students.

Current educational theory would likely categorize this as some form of metacognition.

The question I hope to explore in my graduate work in the College of Education is the content and structure of that “appropriate abstraction” that leads to success in programming. I’m not sure there is any work that has been done to identify what this mental model is.

It “feels” like the “appropriate abstraction” mentioned above lies within the realm of metacognition, in some form, at some level. So, this topic area seems like it would be a fruitful one to explore. I’m not sure that there will be a large body of research in the specifics of programming, but it seems that there is a relatively high degree of correlation, at least among American students, between problem solving skills in mathematics and problem solving skills in programming. Clearly, there is significantly more literature in the development of problem solving skills in mathematics, though much of this is in younger students, it seems more often elementary students. So, it may be possible to leverage the work done in those studies.

On the other hand, work in second language acquisition has shown that adult learners can take advantage of cognitive strategies and techniques to improve / enhance their learning. Often these are not available to younger learners. So, it may be profitable to engage in the development of mathematical problem solving skills among adult learners, for example, students in developmental mathematics classes in our community colleges. Data gleaned from work with adults learning how to solve mathematical problems may provide more useful information to apply to the question of problem solving in a programming domain.

Ultimately, I think I’d like to research adult learners acquisition of programming skills. However, as noted in the prospectus, there seems to be relatively little literature about this. Great for future research, but it makes the literature review for the dissertation a bit skinny.

However, there does seem to be reasonable correlation (anecdotal, though) between success in programming and success in mathematical problem solving. So, examining the development of adult learners’ problem solving skills in mathematics may be a more reasonable course for the dissertation work. There are several likely advantages that I see at this point.

\* Scanning the literature, it looks like most of the adult math learner literature looks at math anxiety and test anxiety, rather than skill development as such. So, the area seems to be relatively under-studied.

\* There is a reasonable body of literature dealing with adult second-language / foreign-language learners. First language acquisition and second-language acquisition in children seems to be a relatively “automatic” process, one of the pieces of evidence for the “language acquisition device” (LAD). This led to the total immersion fad in language teaching of the 70s and 80s. However, the LAD seems to be “dismantled” during later childhood. So, a good bit of the more recent literature points to leveraging adult cognitive abilities in second-language instruction.

\* There does seem to be reasonable amount of literature on developing problem solving skills in school-age children. Some of this may be applicable / transferable to adult learners.

\* So, the proposed research would merge these two threads of research.

\* As a STEM area of research, it should be relatively publishable, and possibly even fundable.

\* I anticipate that I’ll continue teaching programming and related topics at the NSCC while completing the proposed degree in CoE. There is a larger body of students who are taking pre-college math than programming classes. So, there’s a ready population to study and they are likely to be willing participants if it will help them complete their required math classes. Also, since I won’t be the instructor for the math class, it should be much easier to get things approved through the IRB. And, if history is any indication, once UW IRB approves a request, NSCC IRB approval is just about certain.

So, it’s a minor redirect from what I put in the prospectus, but still largely the same. Part of the change came from an informational interview with Kara Jackson, the new faculty member in EDC&I.