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Thinking about Numeracy Instruction

by Lynda Ginsburg National Center on Adult Literacy, University of Pennsylvania

One popular way to think about any instruction is to think of an equilateral triangle with teacher, learner and content at the corners, and with the interactions between each of the pairs forming the sides of the triangle. (The teacher is only coincidently on the "top.")

Recognizing that the teacher and learner both interact with the content and each other during the teaching and learning process sounds clean and simple; however, an exploration of what it means to be a teacher or learner in adult education and even an examination of "content" raises questions about what adult numeracy instruction is, could be, or should be.

This short "think paper" places the teachers, the learners, and the content within the complexity that is adult numeracy education and points to implications that must inform and balance how we go about helping adult learners improve their numeracy.

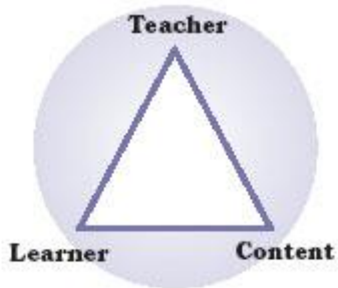
The Teachers

Adult numeracy teachers are a varied group. One U.S. national survey of full time adult educators (regardless of teaching assignment) determined that 64% of the responding teachers felt "prepared" or" "very prepared" to teach math. More than half, regardless of the number of years teaching, indicated that they would most want to know more about "number sense" to improve their math teaching (Sabatini, et al., 2000). An earlier survey of adult education programs in the United States showed that 80% of adult learners receive some mathematics-related instruction but only 5% of the instructors in the programs are certified to teach mathematics (Gal & Schuh, 1994).

Adult educators also vary according to the way they see their role as adult educators. In a study based on interviews with 250 teachers of adults, Pratt (1998) identified five perspectives teachers take in defining their educational role:

- transmission, where the primary purpose is the delivery of content;
- apprenticeship, in which the teacher models ways of being;
- developmental, which cultivates ways of thinking;
- nurturing, which focuses on facilitating self efficacy; and
- social reform, which encourages seeking a better society (pp. xiii).

These categories could similarly apply to teachers at any level, including K-12. However, unlike many other teaching environments, adult educators have high levels of control over what happens in their classes and few imposed structures. Thus they are relatively free to design classroom activities in accordance with their own perspective and their own vision of the impact instruction will have on learners.



The Learners

Adult learners come to instruction with their own reasons for wanting to study numeracy, their own goals for numeracy learning and life, and their own experiences. Their unique sets of experiences related to numerancy encompass

1. memories of previous schooling (often frustrating and demoralizing);
2. affective responses to numeracy learning (reflective of school experience as well as cultural and familial biases);
3. numeracy knowledge, skills and strategies that were learned or individually developed and that may be meaning-ful or meaning-less, complete or fragmentary, usable or misconceived.

In addition, the learners also may have diagnosed or undiagnosed disabilities or at least learning styles that may erect barriers to particular modes of instruction. Learner goals and expectations impact their willingness to engage in certain activities and the levels of frustration and/or ambiguity they may be willing to tolerate. Indeed, many learners are comfortable with endless workbook exercises, familiar and well-defined tasks, even if they don't understand why they are doing what they are doing and will forget the ostensibly arbitrary algorithm that is guiding their work.

The Content

One might suppose that the content of adult numeracy instruction is fixed and reflective of traditional elementary, middle and secondary school mathematics curricula. However, in recent years, numerous international documents and taskforces (ANN, ALL, EFF, British and Australian national documents, etc.) have expanded the universe of adult numeracy to include real world tasks, representations, behaviors, dispositions, and so forth.

The introduction of technology has also had an impact on determining what content should be the focus of instruction. Long division may no longer be considered appropriate content for adult numeracy instruction with the proliferation of calculators. However, algebra for use with spreadsheets and statistical representations has become more and more useful in work and community settings.

While there is certainly overlap between school math and "numeracy," and perhaps mounting evidence that school math has been gradually moving in the direction of numeracy (as defined by the ALL team), the definition of what the content is continues to be more of a moving target than textbooks or workbooks might suggest.

Add in Time Constraints

All of these conflicting goals, priorities and approaches might not be all that important if learners had time to address multiple goals of their own, to encounter multiple teachers and to participate in in-depth investigations, conversations and reflections. Such is certainly the case for children who have approximately 12 years during which their primary task is to learn. But, adults generally do not have extended time to devote to adult basic education; they may have to simultaneously balance work and family, and are often erratic in their attendance and participation due to personal and other factors.

This means that at every juncture, teachers and learners make choices about how to spend limited instructional time. These decisions may be made with input from both teachers and learners or, more commonly are made by teachers and are accepted or not by learners. When learners do not feel that the decisions about content and instructional process are appropriate, they may stop participation.

Conflicting Implications for Instruction

In *Chart 1* there are some examples of implications that might derive from the numeracy-related goals of learners, the instructional priorities of teachers, and the view of numeracy content. Of course these are pretty much caricatures, but they are meant to show the extremes. (I'm sure you can fill in better implications than these; please share improvements with me - it's a “think paper.”) Of most concern to me is that perhaps many teachers and learners do not recognize that instructional decisions are being made, by teachers and by learners, some that are overt and others that are less apparent. As they said in the sixties, "Not to decide is to decide."

Questions to think about

Do learners need to develop understanding of the "why" of what they are doing, or does that come for many people after they have mastered the "how" and attained some level of automaticity? Or, does much of the "why" only come when one has to teach someone else (probably true for many teachers)? Should we bend to learners who say, "I don't care why, just show me how to do it"?

Does instruction need to start at the beginning and follow a ladder or can people find meaning in "just in time” models that start with the need and work backwards as needed ?

Does everyone need to learn the same content? In the same order?

So how does one make good instructional decisions? On what basis? Representing whose priorities?

How does one balance competing priorities, in light of limited time? Is there one right way, or even a bunch of "best ways?"

What does efficiency in learning look like?

Are there strategies that invite and enable further study, either within the class setting or independently, leading to a commitment to lifelong learning?

Do all teachers have the ability to create appropriate learning activities?

Are numeracy-rich extended projects viable in open entry/open exit settings?

References

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CHART 1 SCENARIOS FOR NUMERACY INSTRUCTIONS		
If the Learners' goal is to:	**Then:**	**At a cost of:**
Pass a general high stakes test (i.e., GED, TABE, other standardized assessment)	An ILS (Integrated Learning System) geared to practice for the test is efficient and effective	Integrating instruction with real life applications
Solve actual problems in a particular work setting	Using such problems should drive instruction with just-in-time numeracy content and emphasizing numeracy in context	Developing concepts sequentially that might enhance meaning (i.e., the "ladder"). Transferrability to other settings
Be better able to help children with school math	A curriculum based on mastering the school math that children might encounter	Transferrability to real life applications

If the Teachers' priority is to:	**Then:**	**At a cost of:**
Transmit content	The teacher will tell the learners everything of importance	Learners becoming passive ‘receivers" with no active learning or integration of content
Model problem-solving	The teacher will focus on imparting strategies for solving problems, focus on situated learning and provide coaching	Learners will not develop their own strategies or learn to deal with false starts; transferrability to other contexts
Develop understanding	Few ideas will be studied, but in great depth	Many topics will never be encountered due to lack of time
Nurture self-image and feelings of empowerment	Provide tasks for which learners only have to reach a little beyond their comfort zones.	Challenging learners by allowing them to become frustrated with false starts and have to search for new strategies and be independent. Perhaps proceed so slowly that they see little progress, but feel good
Promote social reform	Focus on particular social problems with just-in-time math content - perhaps emphasizing statistics; learning what is necessary to address particular problems	Learners may not establish a coherent, interrelated mathematics structure; content may be limited due to time spent in other ways
If the content is seen as:	**Then:**	**At a cost of:**
A sequence of numerical computation skills	Following text books, work books, or an ILS is an organized approach	Applications and "messy problem-solving"
Mathematical "Big Ideas"	Identify the big ideas and focus on rich conceptual understanding	Developing computational skills and perhaps making connections between and among big ideas
Problem-solving	Focus on actual examples and developing problem-solving strategies	Seeing connections between problems and the mathematical structures