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Novice Teachers Reflect on Their Instructional Practices While Teaching Adults Math

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Abstract

Over three years, eighty-two teachers in their first or second year of teaching participated in orientation programs for new adult educators. During the programs, they reflected on their own instructional practices when teaching mathematics to adults. The teachers identified the practice they were likely to overemphasize and explained why they were likely to do so, posting their responses to online course discussion boards. Almost half of the respondents reported they "primarily emphasize calculation skills" and shared various reasons for doing so. The remaining respondents reported emphasizing one of four other instructional practices. Teachers put forth a variety of justifications for the instructional practices they have been using. Professional development efforts will need to recognize and take account of the teachers' beliefs, assumptions and current practices.

Key words: instructional practices, teaching, mathematics, adults

Introduction

Every adult education teacher was once a novice teacher. In the U.S., most states do not have a certification system requiring a formal educational program to prepare teachers for instructing adult learners who have returned to study to complete their high school education. Existing research on novice teachers has generally focused on those who are completing a university-based teacher education program for those planning to teach in elementary, middle or high schools (e.g., Horn & Campbell, 2015). However, two studies conducted outside of the U.S. have specifically focused on the perspectives of adult educators.

For adult and higher education teachers, Pratt (1998) developed and tested (Collins & Pratt, 2011) a framework of five teaching perspectives that reflect the beliefs and intentions of teachers. These include Transmission (delivering content), Apprenticeship (modelling ways of being), Developmental (ways of thinking), Nurturing (personal agency), and Social Reform (bettering society). While this framework is applicable to adult education, it is not specifically geared to teaching mathematics to adults or to novice teachers who are just beginning their adult education careers.

Beeli-Zimmermann (2015) examined the mathematical beliefs of five adult teachers in Switzerland who completed an intensive 8-day training and who are integrating numeracy instruction into their second language (German) instruction. She found that the teachers' own school experiences influenced their beliefs about mathematics and their teaching preference.

The current study complements the work of Pratt and Beeli-Zimmermann by focusing on a relatively large sample of novice teachers who have had limited professional development but who are making their own decisions about how they are approaching adult numeracy instruction. In explaining the rationales for their decisions, they reveal their influences and intentions.

Methodology

Context of the Study

In one state in the United States, all new adult education teachers are required to complete a semester-long online orientation course during their first or second year of teaching. This course is delivered asynchronously and addresses multiple topics of relevance to adult educators including adult learning theory, career pathways, learning disabilities, reading and literacy, family literacy, assessment, English as a second language, as well as numeracy.

Each topic is addressed during two weeks of the course with relevant activities and discussion topics designed by a practitioner or researcher with expertise in that content area. Each topic segment includes an initial activity or assignment, a pre-taped webinar that participating teachers are expected to watch, followed by a second assignment related to the content of the webinar. During each implementation of the course, the same practitioners or researchers facilitated the topical online discussions.

Full-time teachers are expected to complete assignments for all topics while part-time teachers choose and complete assignments from a subset of the topics. At the end of the course, participating teachers develop and complete a culminating assignment for which they investigate some aspect of their practice. Some participants choose to focus on numeracy, though these investigations are not addressed in this paper.

The Task

This paper reports on the novice teachers' responses to the initial activity for the Mathematics segment of the course. The assignment states:

1. Read the article: "Designing Instruction with the Components of Numeracy in Mind, *Focus on Basics,* v.9 (a), 14-20.
2. Reflect on your own teaching and consider whether you frequently find yourself in one of the "risk categories" as described in the article.
3. Explain why you find yourself there and what you may try to do differently.

The assigned article was written by the author of this article to complement a 2006 commissioned paper on the Components of Numeracy (Ginsburg, Manly, & Schmitt) and appeared in a journal produced for practitioners by NCSALL, a research centre funded from 1996 to 2007 to focus on adult basic education. In the article, five practices are described and identified as "risk categories" in that their overemphasis during instruction might limit the broader learning opportunities for adult learners. By the term "risks," the author meant preferences, priorities, or maybe even ruts. In hindsight, the term "risks" was not the best term to use as it implies a level of danger that might be misconstrued. The list of practices was not meant to be comprehensive but rather a group of commonly seen instructional practices in U.S. classrooms and/or reflecting issues that have been explored in research relevant to adult learners, such as mathematics anxiety (e.g., Beilock& Willingham, 2014; Chinn, 2012; Evans, 2000) or embedding mathematics instruction within real-life contexts (Casey, Cara, Eldred et al, 2006; Stone, Alfeld& Pearson, 2008). In the article, each practice is described and the relevant challenges from its overemphasis are explained.

The instructional practices described in the article are:

1. Primarily emphasizing calculation skills (procedures).
2. Focusing on the language aspects of word problems (key words).
3. Attempting to dissipate math anxiety.
4. Primarily dividing math content into distinct, non-overlapping topics.

5. Only embedding instruction within real-life contexts

Each participant selected one risk category as his/her primary instructional practice. As the participants read the entire article before responding to the questions, the position advocated in the article (that ideal instruction would balance competing priorities and demands in order to enhance and enrich learning opportunities) may have influenced their responses. We have no way to judge if this is so, but it would be interesting for future research to explore any impact reading about or discussing ideal instruction may have on teachers' descriptions of their own practices.

The Subjects

Between October 2012 and January 2015, seven cohorts of novice adult education teachers completed the orientation course. All full time teachers completed the mathematics topic and some part-time teachers chose the mathematics topic as one of their optional topics. Across the seven cohorts, there were a total of 82 teachers who completed the mathematics assignments. A few additional teachers self identified as "I don't teach math" so they were excluded from this study. Only a few of the teachers were primarily mathematics teachers; the majority of the teachers were teaching multiple subjects which may have included literacy, science and social studies as well as mathematics.

Findings

As shown in Table 1, each of the instructional practices was identified by some of the participating novice adult education mathematics teachers as their primary instructional practice or goal. However, almost half of the teachers saw themselves as "primarily emphasizing calculation skills" in their instruction.

Table 1
Primary instructional practices identified

Practice	Number (n=82)	Percentage (rounded)
1. Primarily emphasizing calculation skills	37	45%
2. Focusing on language aspects of word problems	9	11%
3. Attempting to dissipate math anxiety	15	18%
4. Dividing math content into distinct, non-overlapping topics	10	12%
5. Only embedding instruction within real-life contexts	11	13%

Each participating teacher explained why he or she primarily uses a particular instructional practice. The explanations they provided for their choices are described for each practice. For the first practice (primarily emphasizing calculation skills), the large number of responses could be categorized into five categories. Since there were fewer participating novice teachers that identified each of the other four practices, their responses could not be as meaningfully categorized.

Practice #1. Primarily emphasizing calculation skills

Thirty-seven participating novice teachers (~45%) said that they "primarily emphasize calculation skills." Their reasons for doing so fall into five categories of responses. The categories are listed here with one or more examples of teachers' reasons.

1. Meeting my learners' wishes

   My students say, "Teach me how to do it. I don't care why."

2. Using the available workbooks

   I tend to focus heavily on workbooks that focus strictly on fractions, decimals, or percent. These seem like easy solutions to the larger problem, that students have either forgotten or never fully understood the fundamentals of math.

3. Efficient classroom management, especially given multi-level classes

   I have many students at low levels, yet in the same classroom I have those who score at 11^{th} and 12^{th} grade level. In order to offer individual attention where needed, students need something to work on when I am helping others.

4. Belief that mastery of computation must precede problem-solving

   The majority of my students lack the basic arithmetic calculation skills….I start off with this method and then move on to other methods such as word problems and real-life contexts. If a student does not have the basic skills they will not be able to move on to the higher level of mathematical reasoning.

5. Teacher's personal comfort, ability and satisfaction

   It is very easy to get caught up in only focusing on the easily measurable, teachable, and observable, especially with learners who are lacking these skills.

   It's easy to simply teach calculations – teach the steps, do examples, assign some worksheets, and voila! Now my students can do operations with fractions!

   That is the way I was taught. I find it just plain easier to talk about math in terms of calculations and operations. Admittedly, I don't always understand the meaning of the procedures myself and thus find it difficult, if not impossible, to articulate meaning for my students.

   There is a comfort level there for me, and getting the right answer validates to me that I am doing a good job of conveying the material to my students.

Practice #2. Focusing on language aspects of word problems

This practice was identified by 9 of the novice teachers (~11%). It is often described by teachers as attending to the "key words" in word problems that ostensibly provide clues to which operation is required to solve the problem. Examples of such key words are: 'in all' (addition), 'difference' (subtraction), and 'of' (multiplication, particularly with fractions or percentages).

Among the reasons put forth by the teachers for emphasizing the key word strategy were that the strategy was perceived as efficient or that the strategy was presented in a textbook. A few of the teachers noted that their own strength was in literacy instruction, and thus they were less comfortable teaching mathematical problem solving by focusing on the mathematics. For example, two teachers commented:

> We try to use the language to help reason through the math. If the words present themselves, why not use them?
>
> I would like to explore the complex and messy nature of solving meaningful math problems; however, because of time restraints I often feel the need to simply teach language clues within word problems as an overall strategy.

Practice #3. Attempting to dissipate math anxiety

Many adult learners announce to their teachers that they are afraid of studying mathematics, have had prior negative experiences studying mathematics in school or have been told by parents or teachers that they are just not mathematically capable. All adult education teachers want to alleviate their students' suffering and make it possible for them to learn the mathematics they need to learn. The fifteen teachers (~18%) who identified this practice as their primary instructional goal focused on creating a safe environment for their learners. However, upon reflection, the teachers note they may have been helping them too much for fear of adding to their struggles but may not have been actually helping them to learn the mathematics. Two teachers reported:

> I have a tendency to take a difficult math problem and break it into such small pieces that the bigger problem becomes lost. This may lead to frustration in some students because they still can't grasp the bigger problem. I catch myself saying it's only adding, subtracting, multiplying, and dividing, you just need to know when to do what. Well, if you don't know when to do what, that's probably not much help and could be frustrating.

> I think that sometimes they have learned through the years to become learned helpless. They feel that someone needs to help them. Sometimes when working with them I will take their pencil and show them the mistake, instead of letting them think out the problem for themselves and using a strategy to solve the problem.

Practice #4. Dividing math content into distinct, non-overlapping topics

Ideally, learners should come to see the connections across mathematical content, such as recognizing connections among fractions, decimals and percentages. But often the topics are taught in isolation. Ten teachers (~12%) identified with this practice, justifying their instructional practice by stating that their textbooks divide the topics and rarely mention any connections or that they divide the content into discrete topics because "it seems organized and simpler." Among the teachers' comments were:

> I'm short on time. I try to introduce concepts in small chunks because I feel there is so much to cover, and I don't want to overwhelm students.

> I felt since I know what students need to know for the test, I could provide them with a map. We would cover one topic at a time and move forward as they understood and grasped the concepts.

Practice #5. Only embedding instruction within real-life contexts

Eleven novice teachers (~13%) chose this practice. Some of the teachers identified themselves as primarily teachers of English as a Second Language (ESL) and thus did not really address mathematics at all unless it came up in discussions of real-life situations. Others in this group suggested that they focused primarily on real-life contexts because the contexts provide authenticity, learner interest and engagement is high, or because they believe research has shown that this approach is desirable and recommended. Among their comments:

> When I was hired, I was told that my instruction should be relevant and rigorous.

> I find that students are more interested and eager to learn when they can relate the math to something they may encounter in a real life situation.

> Relating to real life math experiences is how I can best relate to the student because it's what I know. One benefit of doing this is that the adults all take part in the teaching process [pooling knowledge].

What might you do differently?

As part of the assignment, the novice teachers had been asked to consider what they might do differently in the future. Almost all indicated they would try to incorporate a broader range of practices and priorities into their instruction. There were few comments that went beyond suggestions provided in the article. Since the participants were novice teachers only just

becoming accustomed to teaching mathematics to adults, they may not yet have been ready or prepared to modify their instructional practices without a support community. Further research on the process of teacher change, particularly among novice adult educators, could inform the development of useful supportive programs and environments.

Conclusions

Many novice adult mathematics teachers focus primarily on computation practice in their instruction even though many of them recognize the limitations of this practice. Their rationales indicate this is what they know and are familiar and comfortable with. Further, since so many adult education teachers have limited mathematics content backgrounds (Gal &Schuh, 1994), they may not have the deep content knowledge to go beyond computational instruction.

Some of the novice teachers' beliefs and instructional approaches seem to be informed by their own experiences in school and they are choosing to teach as they remember themselves being taught. They may have difficulty picturing approaches that emphasize the development of conceptual understanding or the ability to apply mathematics in situations because they have never seen or experienced such practices in classroom instruction.

Further, some novice teachers' instructional practices seem to be reinforced by the environments of the adult education programs in which they work. They mention relying on the resources that are available and the instructional practices implemented by colleagues. Programs are required to assess and report learners' progress using standardized tests that require computational competence.

Some teachers believe they are actively aligning their instruction with their learners' expectations and desires. Learners are hoping their time in adult basic education will be short so they are pleased to move quickly from one topic to another, in effect crossing off the items on the content checklist, encouraging the instructional practice of teaching content as distinct, non-overlapping topics. Most learners' goals focus on achieving a High School Equivalency certificate. These assessments allow the use of calculators for almost all questions and require conceptual understanding since all questions are applications (word problem situations). Thus, some teachers emphasize key word strategies for dealing with these problems.

The development and implementation of effective professional development for novice adult mathematics educators requires recognition of the teachers' various assumptions, current practices and rationales for those practices. Just as adult learners return to study with their own experiences in and out of school, their teachers bring their own sets of experiences, mathematical content knowledge and beliefs.

For the novice teachers in this study, the practices they identified were recognized during the second week of the mathematics component of the course, with the goal of considering how their preferred practices could be enriched by attending to other priorities. Surely, in an extended professional development course focused on teaching mathematics to adults, it would be valuable to engage in a deeper exploration of how teachers' own experiences, beliefs and content knowledge guide their instructional practices and decisions. This study showed that different teachers rely on different instructional practices; during professional development, teachers can examine and discuss each others' instructional strategies with a goal of developing a balanced approach that includes a variety of practices and priorities.

References

Beeli-Zimmermann, S. (2015). From teaching literacy to teaching numeracy: How numeracy teacher's previous experiences shape their teaching beliefs. *Literacy & Numeracy Studies*, 23(1), 20–49.

Beilock, S.L., &Willingham, D.T. (2014). Math anxiety: Can teachers help students reduce it? *American Educator*, Summer 2014, 28–32, 43.

Casey, H., Cara, O., Eldred, J., Grief, S., Hodge, R., Ivanic, R., Jupp, T., Lopez, D., & McNeil, B. (2006).*"You wouldn't expect a maths teacher to teach plastering…": Embedding literacy, language and numeracy in post-16 vocational programmes – the impact on learning and achievement*. National Research and Development Centre for Adult Literacy and Numeracy. London: Institute of Education, University of London.

Chinn, S. (2012).Beliefs, anxiety, and avoiding failure in mathematics.*Child Development Research* (Hindawi Publishing Corporation), 2012 (396071), 8 pages.

Collins, J.B., & Pratt, D.D. (2011). The Teaching Perspective Inventory at 10 years and 100,000 respondents: Reliability and validity of a teacher self-report inventory. *Adult Education Quarterly*, 61(4), 358-375.

Evans, J. (2000). *Adults' mathematical thinking and emotions: A study of numerate practices*. New York: RoutledgeFalmer.

Gal, I., &Schuh, A. (1994). Who counts in adult literacy programs? A national survey of numeracy education.[NCAL Technical Report 94-9]. Philadelphia, PA: National Center on Adult Literacy. Available at http://files.eric.ed.gov/fulltext/ED377382.pdf

Ginsburg, L. (2008). Designing Instruction with the Components of Numeracy in Mind, *Focus on Basics,* 9(a), 14–20. Available at http://www.ncsall.net/fileadmin/resources/fob/2008/fob_9a.pdf

Ginsburg, L., Manly, M., & Schmitt, M.J. (2006).The components of numeracy [NCSALL Occasional Paper]. Cambridge, MA: National Center for the Study of Adult Learning and Literacy. Available at http://www.ncsall.net/fileadmin/resources/research/op_numeracy.pdf

Horn, I.S., & Campbell, S.S. (2015). Developing pedagogical judgment in novice teachers: Mediated field experience as a pedagogy for teacher education. *Pedagogies: An International Journal*, 10(2), 149–176.

Pratt, D.D., & Associates. (1998). Five perspectives on teaching in adult and higher education. Malabar, FL: Krieger Publishing Company.

Stone, J. R. III, Alfeld, C., & Pearson, D. (2008). Rigor and relevance: Testing a model of enhanced math learning in career and technical education. *AmericanEducation Research Journal*, *45*(3), 767–795.