## TRANSFORMATIVE LEARNING THEORY: A LENS TO LOOK AT MATHEMATICS COURSES FOR PREPARING FUTURE TEACHERS

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We suggest a 4-step cycle for helping prospective teachers transform their mathematical understandings from procedurally-based to more conceptually-based understandings. We use Mezirow's (1991) idea of Transformative Learning Theory (TLT), which is an application of androgogy, or the methods of teaching adults. In this poster, we share our model of a TLT cycle and illustrate it using an example of a proportional reasoning problem for prospective teachers.

Key Words: Learning Theory, Teacher Education-Preservice, Andragogy

Research has shown that prospective teachers (PTs) enter their mathematics content courses with procedural understandings of mathematics (e.g. Thanheiser et al., 2014). However, they will be required to know and understand more than just *how* to solve mathematics problems (AMTE, 2017). We believe that it is our job as mathematics teacher educators to help PTs develop the conceptual understandings and specialized mathematics content knowledge that they will need in their work as teachers. In studying how to help PTs transform their understandings of mathematics, we look at what makes PTs' relearning of mathematics different from children learning mathematics for the first time. We begin by studying the concept of andragogy, which involves methods of teaching adults. (This contrasts with pedagogy, which are methods for teaching children.) Malcolm Knowles (1984) researched the concept of andragogy in the 1980's and proposed four assumptions about adult learners. Self-concept relates to the idea that adults are more responsible for their own learning than children. The role of experience encourages instructors who work with adult learners to take the experiences they bring into account when planning and implementing instruction. Adults are often motivated by how the content they are learning applies to them and their future careers. An adult's readiness to learn and orientation to *learning* are tied to their internal appreciation of how the information applies to their lives.

Transformative learning theory (TLT) is an application of andragogy that attempts to establish and clarify a learner's prior assumptions and then transform these assumptions (Mezirow, 1991). The theory claims that only after learners are aware of their assumptions can they develop strategies to transform these assumptions. We present a 4-step implementation cycle based on TLT to help university instructors plan and implement lessons to help their students deepen their mathematical knowledge. In the first step the instructor presents the learner with a disorienting dilemma where his/her preconceived ideas are challenged and perturbed, or where the procedures that they already believe they know are not enough to solve the problem. In the second step students are asked to work through the dilemma while *reflecting on their* previous assumptions. The third step focuses on justifying and explaining their proposed solutions with peers in order to reach an equilibrium between their prior assumptions and the disorientation presented by the task. The fourth and final step involves making connections between the procedural fluency and the conceptual understanding, helping students to see how the procedures they learned (their prior assumptions) are related to their new knowledge (their transformed understanding). We suggest that TLT can be a valuable resource for helping PTs and other undergraduate students to expand and transform their mathematical understandings.

## References

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