

## PCC Quantitative Literacy Course Pilot 2013-2014 Summary of Findings

- **79% of the 193 students who remained enrolled in QL1 the entire semester during the pilot 2013-14 academic year passed the class.** *The comparable course of Math 402 had a 69% pass rate during this same period.*
- **87% of the 229 students who remained enrolled in QL2 the entire semester during the 2013-14 academic year passed the class.** *The comparable course of Math 125 and Math 131 had pass rates of 55% and 58%, respectively.*
- **The 40-item Attitudes Towards Math Inventory (ATMI), administered to 148 students (64 QL1 students and 84 QL2 students) indicated statistically significant, positive changes in student attitudes towards math between the beginning and end of Spring Semester classes.**
  - The ATMI results showed significant improvement on 14 of the 15 items pertaining to *self-confidence in math* and on 8 of the 10 items pertaining to *enjoyment of math* in the total sample of 148 students.
  - The ATMI results showed no significant changes on the 5 items pertaining to *students' motivation* in the QL1 group, however there were significant changes on 3 out of 5 items pertaining to motivation in the QL2 group.
  - The ATMI results did not show significant improvement on 7 of the 10 items pertaining to *students' valuing of math* in the total sample of 148 students. However, these items did show the highest pre and post-mean scores (generally 3's and 4's on a scale of 1-5) when compared to the self-confidence, enjoyment, and motivation items.
- **Successful classroom strategies and activities, from the faculty perspective, included:**
  - *Hands-on and tactile activities* in which students used manipulatives to scaffold learning and build conceptual understanding.
  - *Peer work and group work* in which students collaborated to solve a problem, explained a concept in their own words, or checked their work against each other.
  - *Contextualization* examples in which the real-world applications of mathematical concepts engaged students and motivated them to learn the material.
  - *Utilizing data collected from the class* and capitalizing on students' personal experiences on assignments.
  - Course-wide *emphasis on affective concepts such as growth mindset and productive struggle* which instructors invoked to encourage and reassure students when they faced a challenge.
- **Weekly faculty meetings and reflection documents served as valuable resources** for SLAM faculty throughout the year. Both exercises **encouraged professional learning and collaboration by:**
  - Serving a practical function of *lesson-plan coordination*.
  - Allowing colleagues to *appraise one another of their progression through the curriculum*.

- Offering *spaces for instructors to share strategies* that worked and *express their frustrations*.
- Supporting *engagement in “course correction”* throughout the school year and the *development of actionable plans to address challenges*.
- *Reinforcing a sense of community* among SLAM faculty.
- Creating *documentation* of project evolution and challenges.
- ***Areas for improvement in curriculum and practice, from the faculty perspective, included:***
  - Many themes that could be grouped together under the heading of “*scaffolding*”, i.e., efforts to deliberately structure learning experiences in a way that enables students to reach higher levels of understanding and independence, usually through incremental steps that solidify, reinforce, and build upon prior knowledge.
  - *Pacing* of activities and lesson plans.
  - *Content revisions* concerning the removal, addition, or modification of material in the course textbook in response to perceived student needs, as well corrections of *technical errors* (typos, misprints).
  - Identification of places in which it may be beneficial to *start with more basic concepts before introducing a more complex one*, or start with applying a concept to an “easy” problem before asking students to apply the same concept to a “hard” problem.
  - *More built-in practice with skills and/or review of previous material* than anticipated.
  - *Managing group work* through explicit articulations of expectations for group projects as well as expectations for individual contributions and responsibilities to their group.
  - Reflecting upon ways in which instructors could *provide more structure* to activities in order to stimulate the kind of thinking they hoped students would engage in. Improvements that came out of this approach included discussion guides for videos and more detailed instructions for labs and other activities.
  - Rectifying *disconnects between content that had been covered and knowledge necessary* for completing a problem.
- ***Findings pertaining to the QL sequence emphasis on developing students’ critical thinking skills included:***
  - Faculty agreement that it was *challenging to write questions that activated critical thinking skills and to grade assignments* based on the extent to which students demonstrated these skills.
  - Faculty agreement that while critical thinking may have been nominally mentioned throughout the course, instructors could make *a more concerted effort in the future* to develop techniques and materials that would encourage students to engage in critical thinking processes.

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- *Wariness towards formalizing a definition of critical thinking* for QL purposes. At the same time, multiple comments indicated that QL faculty members were increasingly *operationalizing critical thinking as “number sense.”* The language of number sense provided a shared vocabulary in which instructors could reference the type of progress they felt students were making and brainstorm ways in which the course could be improved to address this area
  
- ***Logistical challenges to course implementation included:***
  - Instructors’ *struggles to stay on schedule* so they could adequately cover the curriculum.
  
  - *Technology issues* with computers, Microsoft Excel, Canvas, and other classroom technologies.
  
  - Awareness that the level of *faculty commitment to the QL courses presents a potential sustainability and scalability issue* insofar as teaching a QL course places more demands on instructors’ time when compared to other courses in the math department.
  
  - Awareness that despite the development of “shell” courses, templates, and other structural improvements, *it may be difficult for new faculty to just “step into” teaching QL courses* without significant training, professional development, and philosophical “buy-in.”
  
  - Concerns that it will be *more difficult to maintain the sense of community, closeness, and beneficial dialogue* that current instructors depend on for motivation and support *as the course is scaled up.*