INQUIRY AS AN ACCESS POINT TO EQUITY IN THE CLASSROOM

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MOTIVATION

- Vana: I feel like all of us, you know there was some strong students in the class that kept coming up, but then I saw the quieter ones also get their voice during the semester (Latina)
- Ahn Pan: because of the nature of how the course was uh conducted, it encourages questions. It encourages um, questioning. It sounds very revolution type, you know question authority and don't take anything for granted and, you know fight back. (male, Asian/White)

MOTIVATION

- Peyton: because of the nature of this course, but when I did finally understand something, I did feel like I had a way stronger, I had much more confidence in it than I do generally and I retained the information a lot more. Like I barely even reviewed anything and I still remembered it by the end of the year. (White, female)

‘Most members of the mathematics education research community would agree that equity is a valued goal…However, much less consensus arises when the question is raised: how do you think we should address equity?’

[Gutiérrez, 2007, p.2].

STUDENTS PRESENTED AND EVALUATED EACH OTHER'S WORK

- Cargo: "I think just having my classmates just go up and share their work and their thought process helped me like see things I, I didn't notice. Like even when I was up presenting, there was always one guy that would always just keep asking like 'How did you get that?' And like, because he kept asking that, I kept like figuring out like 'OK. I think I should probably put more details into my proofs so like they know like where I'm getting these things'."

(Latino)

STUDENTS ENGAGED IN GROUP AND WHOLE CLASS DISCUSSIONS ON INSTRUCTOR-ASSIGNED TASKS

- Alice: "[the instructor] would assign homework and then we'd always discuss them in class…being able to have those class discussions as well as like our individual group discussions that we had in class." (Latina)

INSTRUCTOR HAD MODIFIED ROLE FROM TRADITIONAL LECTURER

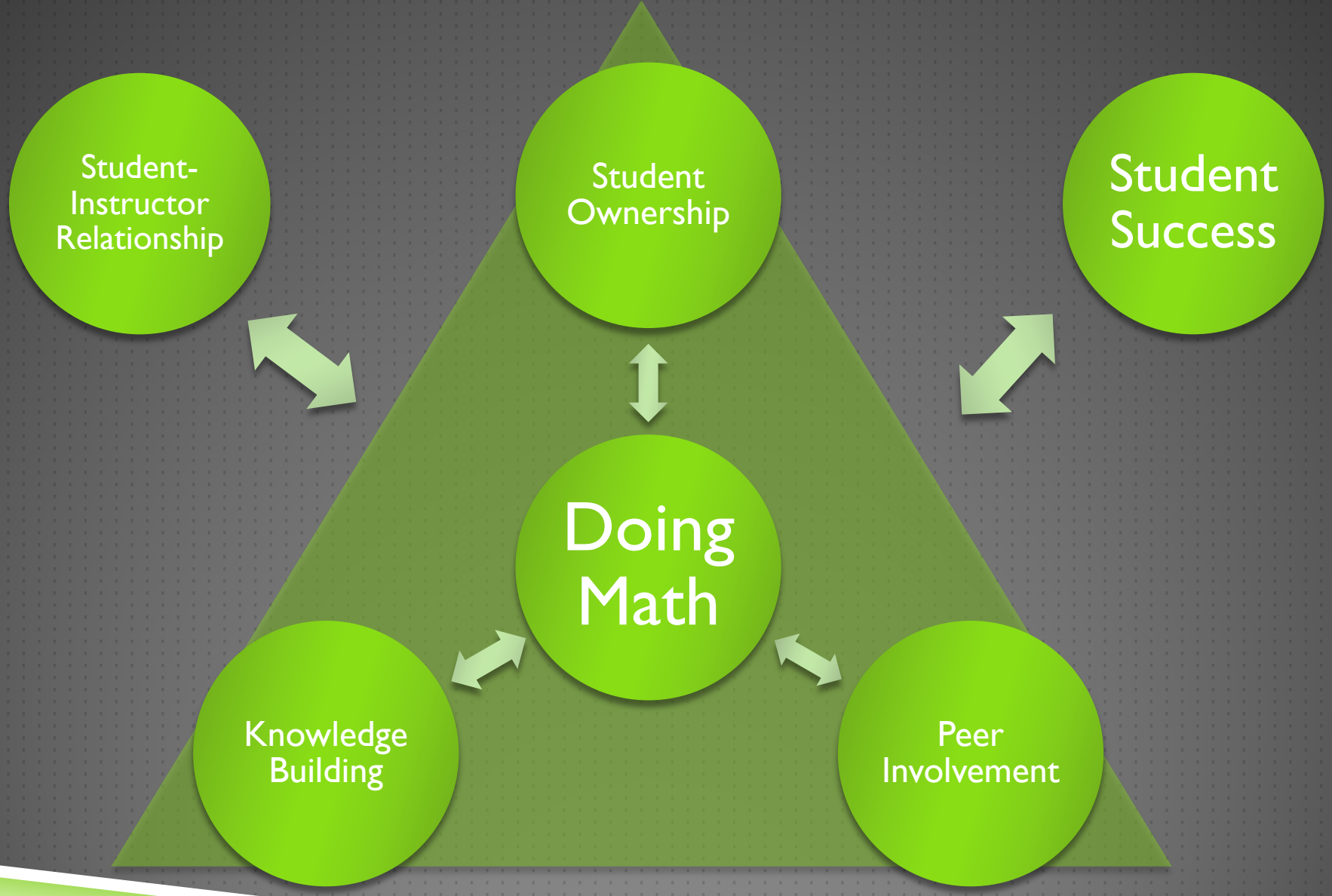
- Vana: "the instructor was very, um, uh, I don't know if limited is the right word in terms of her involvement in class…[she] kind of sat at the table and more was a **listener and a mediator**, like **a facilitator of our discussions** but she never really led the discussion. So it was a lot of you know **bouncing ideas off of students** and um kind of **evaluating each other's work** in that sense. (Latina)

INQUIRY-BASED LEARNING OR INQUIRY-ORIENTED INSTRUCTION

- "deeply engage [students] in rich mathematical tasks, [give students] ample opportunities to collaborate with peers (where collaboration is defined broadly)" (Academy of Inquiry-Based Learning, n.d.),
- "enable students to learn new mathematics through engagement in genuine argumentation, … empower learners to see themselves as capable of reinventing mathematics, and to see mathematics itself as a human activity" (Rasmussen and Kwon, 2007, p. 190).

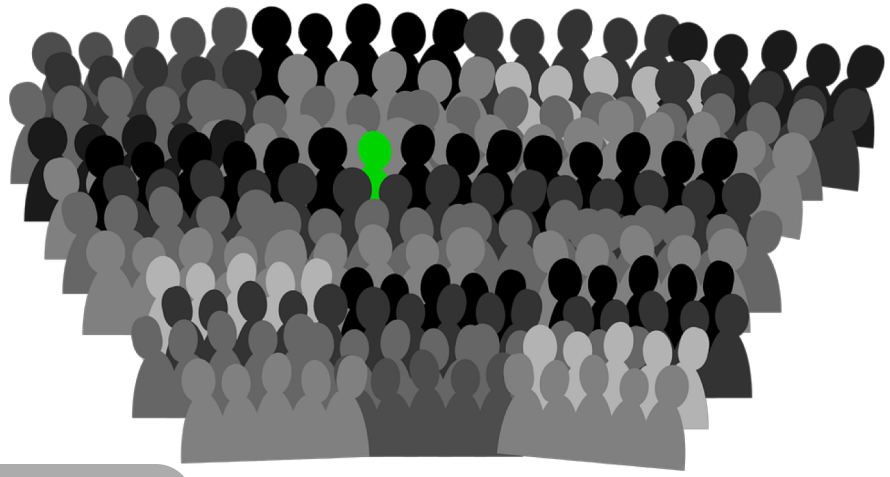
SIX MAIN THEMES
COOK, MURPHY & FUKAWA-CONNELLY (2016)

- Student-Instructor Relationship
- Doing Math
- Student Ownership
- Knowledge Building
- Peer Involvement
- Student Success

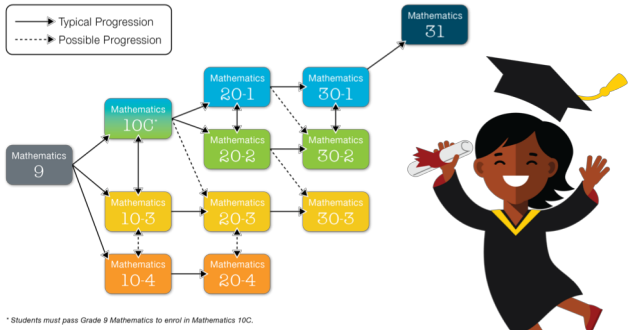

Student-Instructor Relationship
Student Ownership
Student Success
Doing Math
Knowledge Building
Peer Involvement

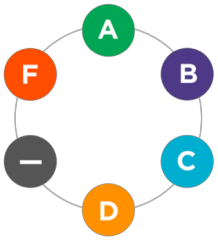
Access

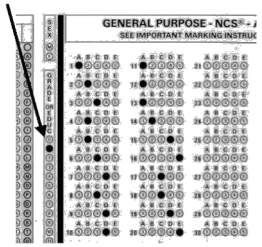
Identity



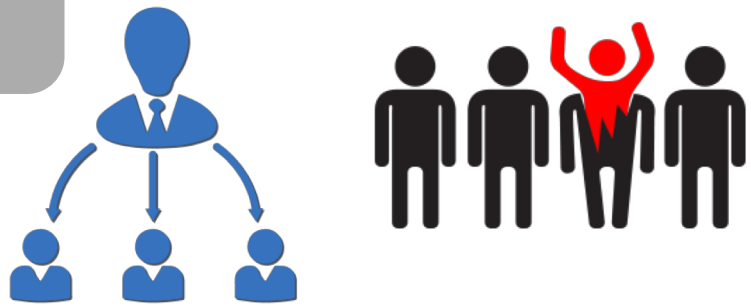
EQUITY
(Gutiérrez)







Achievement



Power

ALIGNMENT TABLE

	Access	Achievement	Identity	Power
Student–Teacher Relationship When instructors are enabled to have a deeper understanding of student thinking …	…students are given an access point to learn because this helps instructors identify and address student concerns.	…students' learning, confidence, enjoyment of mathematics and participation in class may be positively affected.	…they may see students as mathematical learners, which may impact how students see themselves as mathematical learners.	…the power dynamic in the classroom changes since the instructor is concerned with student thinking and not just covering material.
Doing Math When all students are invited to participate in the mathematical classroom community …	…there is an access point to learn since they are given the chance to do, discuss and present mathematics.	…students may retain more content by participating and building on others' contributions.	…students can reflect on their own mathematical identities as a member of the community.	…power shifts from instructor as the only source of knowledge to students as producers and users of knowledge.

ALIGNMENT TABLE

	Access	Achievement	Identity	Power
Student Ownership When all students are encouraged to create, generate and develop their own knowledge …	…there is an access point to learn because they can work in a way that is different from a prescribed manner.	…there may be gains in learning, confidence, mathematics enjoyment and class participation.	…students can reflect on their experiences to deepen how they see themselves as mathematical learners.	…power shifts because students shape traditionally instructor-led components (pacing and content delivery).
Knowledge-Building When all students are encouraged to use prior knowledge to build new knowledge …	…instructors honour what students already know, encouraging an asset perspective instead of a deficit perspective.	…they add to their own understanding, which may lead to gains in learning, confidence, mathematics enjoyment and class participation.	…students can reflect on their mathematical experiences because they can see the progression in their construction of knowledge.	…power shifts since the classroom is guided by what they already know as opposed to what instructors assume they know.

ALIGNMENT TABLE

	Access	Achievement	Identity	Power
Peer Involvement When all students provide justifications while others listen and attempt to understand …	…students are given an access point to learn because they are exposed to other ways of thinking.	…students may achieve together and carry that style of group learning to subsequent courses.	…students' perceptions of their abilities are heightened as they observe how others react to their ideas.	…the power dynamic changes as students lead the class and ask each other questions, as well as asking the instructor.
Student Success Since IBL/IOI can lead to increased student success …	… there is broader access to learning for women, men, low-achieving and first year students.	…students' career choice and course-taking patterns may be affected.	…students may identify themselves as more of a mathematician or enjoy mathematics more.	…distribution of power in the global society may change with a more diversified STEM force.

ALIGNMENT OF EQUITY AND INQUIRY

- Access
  - Inquiry invites and encourages all students' participation in doing, discussing, and presenting mathematics (*Peer Involvement*)
  - When all students are given opportunities to be active participants in the classroom (*Doing Math*), students are given an additional access point to learn
  - Others then listen and attempt to understand the ideas being discussed or presented, which can allow them to build their own mathematical knowledge (*Knowledge Building*).

ALIGNMENT OF EQUITY AND INQUIRY

- Achievement
  - not only in the classroom, but in future math courses and career decisions
  - "how well students can play the game called mathematics" [Gutiérrez, 2009; p.6]
- Laursen et al. (2014) found participation in IBL courses does increase student performance
  - gains in confidence, persistence and enjoyment of mathematics
  - enrollment in more math courses

ALIGNMENT OF EQUITY AND INQUIRY

- Identity
  - When students are actively engaged with each other and each other's thinking (*Peer-Involvement*), it can lead to a shift in mathematical identity.
    - Hassi (2009) found self-esteem or self-confidence affected by IBL

ALIGNMENT OF EQUITY AND INQUIRY

- Power
  - *Peer Involvement* lets power shift to the students because they decide on "what counts as acceptable knowledge" (Adiredja et al., 2015, p. 66)
  - The instructor is the primary architect of the problems worked on (Laursen et al., 2011), and when the tasks assigned include problem-posing, students create and solve their own problems (Doing Math).
  - Instructor as expert participant that guides students to generate, create and develop their own knowledge (*Student Ownership*).

ACHIEVEMENT & STUDENT SUCCESS

- Vana "I would say that [the class] impacted me or influenced me to continue on to get a complete minor in math…which was pretty important and kinda neat cause I don't know if I would've considered it before… And it made me wanna develop more of an understanding instead of just taking a class to get it over with for prereq to satisfy a prerequisite…I was able to develop a relationship with math if that makes any sense, … and actually start enjoying it…[The class] built up my confidence and that I felt like, "yeah I can get a minor in math, why not?" and "Let's do it" (Latina, female)

STUDENT OWNERSHIP & ACCESS

- Luna: ``[W]ell I'm a really shy person so I don't really like talking in class and this class I was actually forced to like, get up. ... Like my group would know like, ``do you understand something'' ... and then I kinda wanna say no and like, ``I'm actually kinda confused on this''. And they would, like, taught me like ``oh, you would do this'' and ... we'd go up on, on the white boards and they'd let me, like, okay like try this. And like, I was able to understand it cause I was actually doing at the same time.'' (Latina, female)

POWER & PEER INVOLVEMENT

- Luna: "We were kinda like the professors themselves at the same time, like we were all professors in there cause we would help each other figure out whatever it was." (Latina, female)

POWER & DOING MATH

- Stephanie: "Sometimes [the problems] came from questions the students asked or conjectures that the class made, and then we had to either prove or disprove the conjectures from our classmates." (White, female)

FUTURE WORK

- Corroborate the proposed alignments through empirical studies
- Examine possible inequities or environments in which inequities do and do not reveal themselves (Esmonde, 2009)
  - Group dynamics
- Refine the Inquiry themes

THANK YOU!

Questions & Discussion

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