



Creating Pathways to Math Success at a Liberal Arts College

Maria Belk and Lauren Rose
Bard College

Bard College

- Small Liberal Arts college
- About 2000 students
- All students required to take a math or computer science course.



Bard College

Mathematics at Bard

- Math Sequence: Precalculus, Calc I, II, III
- 12 to 19 math majors each year



Bard College

Mathematics at Bard

- Approximately:
 - Calculus 1: 140 students each year
 - Calculus 2: 80 students each year
 - Calculus 3: 60 students each year

Bard College

Five years ago

- No method to determine student placement.
- Wide range of math abilities in Calculus courses.
- Weak students had trouble majoring in math or science.

Bard College

Our Goals

- Increase the quantitative support available to students.
- Create a pathway for students entering with a weak background to take calculus and to potentially major in math, science or economics.

Bard College

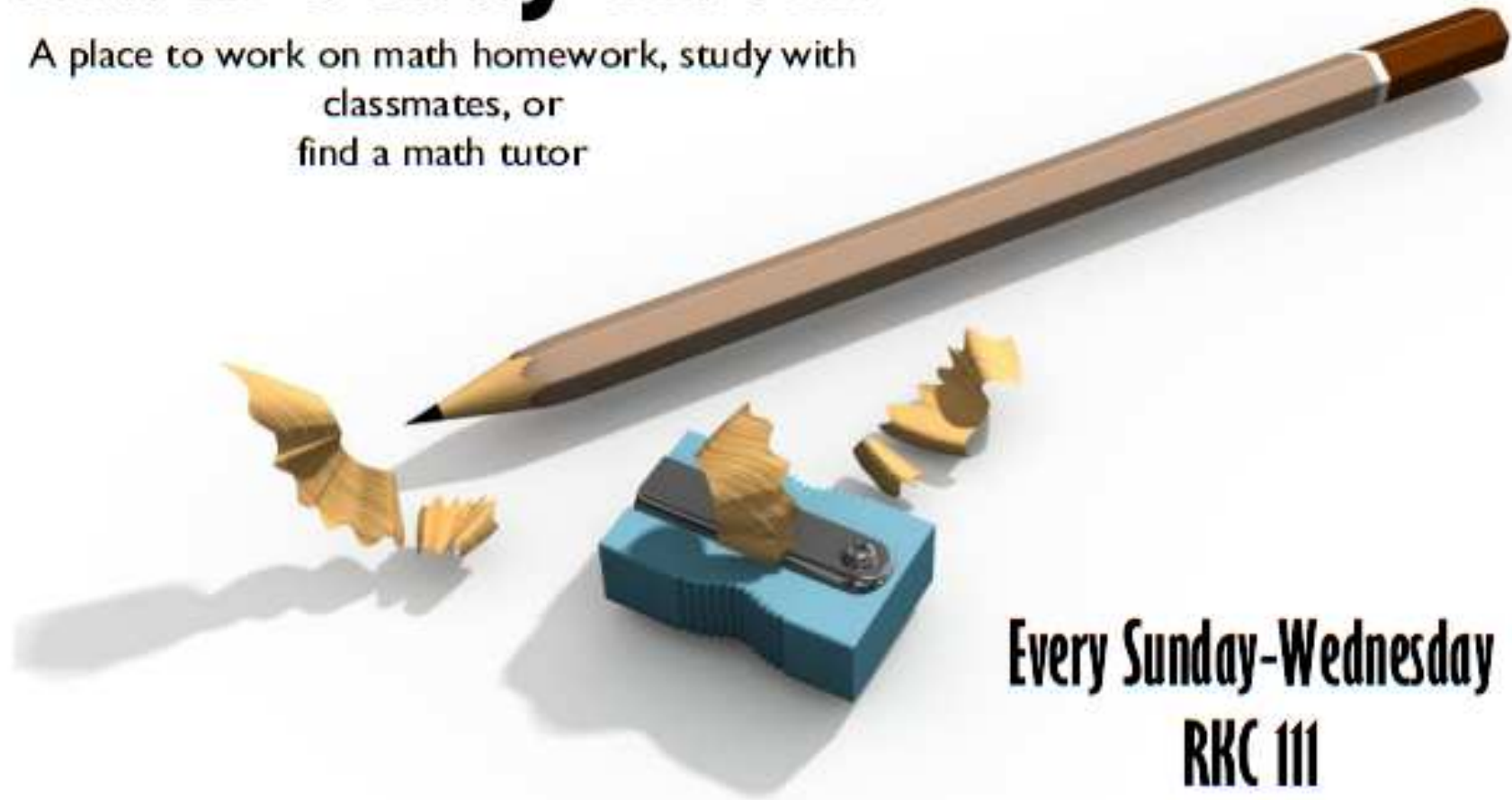
Recent Changes

- Math Study Room and Increased Tutoring
- Math Placement Diagnostic
- Algebra and Precalculus Workshops

Tutoring

Math Study Room

A place to work on math homework, study with
classmates, or
find a math tutor



*Sponsored by the Mathematics program &
the Academic Resources Center*

**Every Sunday-Wednesday
RKC 111
7-10 p.m.**

Math Study Room

- Evenings 7 – 10pm, Sunday – Thursday
- Provides Drop-In Peer Tutoring
- 2 or 3 Peer Tutors every night
- Occurs in a classroom
- Started 5 years ago, since then has expanded tutoring hours and numbers of tutors.
- Currently, about 400 tutoring sessions per semester

Math Study Room

Quotes from Students

- “The math study room is awesome! The tutors provided wonderful assistance, and helped me learn any concepts that were still foreign to me after class.”
- “I would go to do my math even if I didn't need help. It's just a good place to work.”

Math Study Room

Quotes from Students

- “They were very good about asking if I needed help. Whenever I had a question they were always helpful. They often helped me reason through a problem rather than simply explaining what needed to be done, which was useful.”

Math Study Room

Difficulties

- “It was pretty helpful. Although sometimes the tutors were stumped... .”
- “Very helpful, although sometimes on busier nights it's hard to get the attention of a tutor.”

Tutoring

Dedicated Tutors

- Each math course has an assigned tutor.
- The tutor is available to meet individually with students.
- Some tutors hold an office hour each week.
- Tutors keep in touch with the professor for the course.

Dedicated Tutors

Quotes from Students

- “[The tutor] was very helpful. She gave me enough information to be able to figure out the problems with her help without `giving me the answer’.”
- “It’s awesome to work with the designated tutor for the course, because he is in touch with the professor for my specific course and knows what to prepare for, and thus is more competent in the material and helping me.”

Math Placement Diagnostic

Math Placement Diagnostic

- Started 3 years ago
- Taken by incoming students over the summer
- Online using Moodle
- Determines placement into:
 - Precalculus
 - Calculus I, II, or III
- Students who don't place into Precalculus must take the Algebra Workshop

Math Placement Diagnostic

Placement:

- Algebra Workshop: 5% (not ready for Precalc)
- Precalculus: 30%
- Calculus I: 31%
- Calculus II: 19%
- Calculus III: 14%

Math Placement Diagnostic

Correlations

- Part 1 (determines placement into Precalculus)
 - Correlation 0.84 with grade in Precalculus (11 students)
- Part 2 (determines placement into Calculus I)
 - Correlation 0.38 with grade in Calculus I (70 students)

Math Placement Diagnostic

Advantages

- Classes are more uniform.
- We can identify which students may need extra help in their classes and benefit from taking a review course.

Algebra Workshop

Algebra Workshop

- 2 credits, 10 weeks, 2 hours/week
- Required of students who fail the first part of the Math Diagnostic.
- Also taken by:
 - Students who are taking Precalculus and want more algebra practice.
 - Students studying for the GRE's or similar tests.

Algebra Workshop

Previously

- Students would retake the math diagnostic test until they passed.
- This was discouraging for students, and also required a lot of time from faculty and tutors to help these students pass the math diagnostic.

Algebra Workshop

Now

- They take the Algebra Workshop.
- They learn more from the course than from simply retaking a test.
- It is less discouraging, because they interact with other students who also have difficulty with math.
- Students work together during class.

Algebra Workshop

Algebra Workshop

Enrollment (Fall 2009 to Fall 2011)

- 16 to 23 students each semester
- Average: 19 students each semester

Algebra Workshop

Course Format

- Course is two hours long:
 - **First Hour:** Lecture
 - **Second Hour:** Worksheets
- Tutor available during the second hour to help answer questions.

Course Webpage:

<http://math.bard.edu/mbelk/arc150Fall2011/>

Algebra Workshop

Quotes from Students

- “This class was definitely a great class for refreshing my math skills and helping me remember the things I had forgotten.”
- “Please offer this course regularly — for a non-Math person, it saved my life.”

Precalculus Workshop

Precalculus Workshop

This course reviews precalculus and is intended for students currently taking Calculus I.

One of the problems in Calculus I:

- Students have trouble with algebra and precalculus and don't realize that this is the reason for their difficulty in calculus.

Precalculus Workshop

- 2 credits, 10 weeks, 2 hours/week
- Taken by students in Calculus I.
- Also taken by:
 - Students who plan to take Calculus I in a later semester.
 - Students who already took Calculus I and did poorly.
 - Students who want algebra review for GRE's.

Precalculus Workshop

Precalculus Workshop

Enrollment (Fall 2009 to Fall 2011)

- 11 to 17 students each semester
- Average: 15 students each semester

Precalculus Workshop

Course Format

- Course is two hours long:
 - **First Hour:** Lecture
 - **Second Hour:** Worksheets

Course Webpage

<http://math.bard.edu/mbelk/arc190Fall2011/>

Precalculus Workshop

Quotes from Students

- “This class really prepares you for Calculus.”
- “The set up of the class was very helpful. Learning new material, then working on it independently, then working on it again on our own time really made the material sink in.”

Conclusions

Conclusions

- Tutoring:
 - The tutoring has been very successful, and we hope to continue to increase the amount of tutoring.
- Math Placement Diagnostic:
 - Made the classes more uniform
 - Helped us identify which students would benefit from the Algebra Workshop or Precalculus Workshop

Conclusions

- Algebra and Precalculus Workshop
 - These courses are helping students to succeed in their math courses.
- Is there a pathway?
 - Two students who started in the Algebra Workshop will be taking Calculus I next semester.
 - A few students who took the Precalculus Workshop along with Calculus I are now majoring in math, science, or economics.

