Optimizing Developmental Math Through Divergent Curriculum Paths
FVCC Demographics

FALL 2016
FTE = 1,396
Head Count = 2,262
Developmental Math Students Enrolled ≈ 320
Course Offerings 2016/2017

- M065 (Pre-algebra) x 6
- M090 (Intro Algebra) x 3
- M094 (Quant Reasoning) x 10
- M095 (Intm Algebra) x 3
- M114 (Tech Math) x 2
- M120 (Health Care Math) x 3
- M123 (Surveying Math) x 1
- M115 (Prob & Linear Math) x 4
- STAT216 (Intro to Stats) x 2
- M132 (Math for K-8 I) x 1
- M145 (Liberal Arts Math) x 1
- M152 (Pre-calculus Alg) x 2
- M153 (Pre-calculus Trig) x 1
- M162 (Applied Calc) x 1
- M171 (Calculus I) x 2
- M172 (Calculus II) x 2
- M234 (Math for K-8 III) x 1
- M273 (Multivariable Calc) x 1
Developmental Math Re-design – Why?

• Approximately 75% of our students place at the dev math level (543 out of 725 tested for Fall 2016)

• Improve student success and retention rates

• Standardize the curriculum

• Provide opportunities to shorten the dev math sequence

• Create a dev math community for both students & faculty – provide support & encouragement!
The Foundational Math Program was born!

• Implemented full-scale Fall 2013

• Physical structure:
  • 2 classrooms for all sections of Foundational Math (≈ 20 sections per semester)
  • Classrooms contain computers and interactive boards
  • Foundational Math Center (FMC) – provides testing and individualized instruction
The Math hallway – FMC on the left, both classrooms down the hall on the right (and yes, that’s Pi wallpaper!)
The classrooms (one is a mirror image of the other)
Inside the FMC

Sign-in station as you enter

Individual Instruction Side
Inside the FMC

Testing Side

looking towards the individual instruction side
The Foundation Math Program – con’t

- Curriculum/Scheduling structure:
  - 1 credit of every course is spent in the FMC
    - 50 min/week required
    - Flexible schedule
  - Standardized curriculum & schedule for all sections
    - Same HW/Quiz/Test assignments
    - Same policies (grading, late assignments, etc)
  - Material presented by faculty in their own teaching style
  - Faculty spends 1 hr/week in the FMC for each course taught
    - Proctoring quizzes/tests & providing individualized instruction
  - Full-time coordinator for the FMC
  - Designated FT faculty (Erin) coordinating all of the Foundational courses
Results, so far...

DFW rates (prior to implementation of the new Foundational Math Program is left of the purple line):
Why change to a Divergent Path format?

• FVCC initial/traditional Foundational Math sequence:
  • Non-STEM : STEM (starting class)
    • 112 : 31 (≈ 7 : 2) Spring 2016  184 : 48 (≈7.5 : 2) Fall 2016
  • STEM students struggling in Pre-calculus
  • Non-STEM students getting more Algebra than necessary for their Math Gen Ed courses
FVCC Foundational Math Sequence

- Pre-Algebra (M065)
- Introductory Algebra (M090)
- Quantitative Reasoning (M094)
- Intermediate Algebra (M095)
- Pre-Calculus Algebra (M152)
- Probability & Linear Math (M115)
- Math for K-8 Teachers (M132/133)
- Math for the Liberal Arts (M145)
- Technical Math (M111/114)
- Math with Health Care Applications (M120)
Quantitative Reasoning
A New Course for our Divergent Curriculum Path
Initial Step: established a small, core math faculty group

- Identified prerequisite core skills necessary for non-STEM students
- Reviewed existing courses across the state of Montana
- Evaluated textbooks within our current online HW platform
- Developed initial curriculum
- Formed two Program Improvement Teams (STEM & non-STEM)
Program Improvement Teams

• Each team met twice – Spring 2016 semester
• Participants comprised of FT and adjunct faculty
• First Meeting
  • Preliminary curriculum presented
  • Participants tasked with reviewing & providing feedback
• Second Meeting
  • Participants shared feedback in small groups
  • Feedback compiled by the Core Math Faculty team
  • Participants given access to online HW & Assessments to review & provide feedback through an online form
CH 1
Clearly identify what function values mean
- units
- units

CH 2
Cumbersome formulas, in CH 1 (cursive)
- intent is to show spreadsheets
- will it scare off students?
- emphasis on intervals, bar graphs, how it changes.

CH 3
Graphs of empirical relationships
- interpretation with meaning
- financial literacy
- relationship between input and output

CH 4
CH 5
Bond prices
- CTV not needed
- stocks straight
- within syllabus

CH 6
Tests
- CH 1-2
- CH 3
- CH 4
- CH 5
- CH 6, 7, 9

Projects
- CH 1-2: like the spreadsheet proj.
- CH 3: buy a car/lease? Do the vs.
- CH 4: buy vs. rent?
- CH 5: student loans/credit cards
- CH 6: debt
- CH 7: like the memory curve
- CH 8: mostly individual
- CH 9: groups to discuss individually
- CH 10: groups to discuss individually

CH 11
- CH 12: add project here
- CH 13: as part of
- CH 14: potentially use the topics of projects rather than as a stand-alone chapter
Quantitative Reasoning – M094

• Course Learning Outcomes – *the student should be able to:*
  • Create, solve, and graph linear equations.
  • Use percents, ratios, and proportions to solve complex problems, including dimensional analysis.
  • Represent, analyze, and interpret data for single and multiple variables.
  • Analyze data through measures of central tendency and variation.
  • Choose appropriate models to represent data, including simple linear regression and exponential & logarithmic equations.
  • Solve linear system of equations graphically and algebraically.
  • Apply basic probability concepts to solve problems.
Quantitative Reasoning – M094 con’t

Catalog Description:
This course is designed for students as the alternative to the traditional algebraic math sequence and to prepare them for college-level math courses emphasizing quantitative methods. Emphasis will be placed on using data and appropriate mathematical models to make decisions, while developing logical reasoning and critical thinking skills. Topics include proportional reasoning, utilizing various graphical representations, linear equations (including systems of linear equations), and basic probability & statistics.
Getting Adjuncts Involved

• Typically 60 – 80% of Foundational courses are taught by adjuncts
  • Fall 2016 only 45% taught by adjuncts due to divergent paths & new course curriculum

• Foster buy-in/ownership amongst adjunct instructors
  • Adjuncts served on the Program Improvement Teams
  • Provide Teacher Training Sessions on Friday afternoons
  • Provide opportunities for feedback
Summer Pilot

• 14 students, 13 completed successfully
  • Higher than Intro & Intm Algebra pass rates, which averaged 79% & 70% respectively over the past 7 years

• Curriculum Refinement - Erin
  • Developed 3 initial projects
  • Created additional teaching materials to supplement text
  • Created teacher’s edition of the student notebook (answers & teaching tips)

• Prep for fall
  • Erin edited the online & notebook content between Summer & Fall semesters and created the course shells
Fall 2016 Rollout

- 10 sections being taught by 10 different instructors
  - 40% FT Faculty, 60% Adjunct Faculty
- Teacher Training sessions offered most Fridays
  - Google Sheets training
  - Curriculum Specifics (especially projects)
  - Provides a forum for Q & A
- Currently collecting feedback from instructors
  - Via e-mail & Teacher Training sessions
  - Collecting feedback on notebook content and online HW & assessment content
Challenges

• Chosen text does not fit our needs exactly
• Online HW & assessment questions need to be supplemented from other textbooks
• Technology issues
  • Additional training needed for most faculty (mostly Google Sheets)
  • Online HW platform not always functioning properly
• Advising students properly – making sure they’re on the right path
• Finding time to review the curriculum analytically
Successes

• Students are really enjoying the material and diverse applications
• Students are being exposed to additional technology applications that are applicable life skills
• Renewed teaching excitement
• Current test scores look good!
  • 144 student’s scores analyzed
  • Individual test averages (excluding zeros): Test 1 – 85%, Test 2 – 79%, Test 3 – 88%
  • Overall test average (including zeros) is 83%