

Accelerate and Improve
Developmental Mathematics:
The New Life Model

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AMATYC 2014 session 163

This session ...

- Identifies specific problems with the “old”
- Describes a new model to solve the problem
- Explores math paths within the model
- Shows how to accelerate using these courses
- Describes courses which emphasize good mathematics from the first day

What Dev Math has Been: The OLD

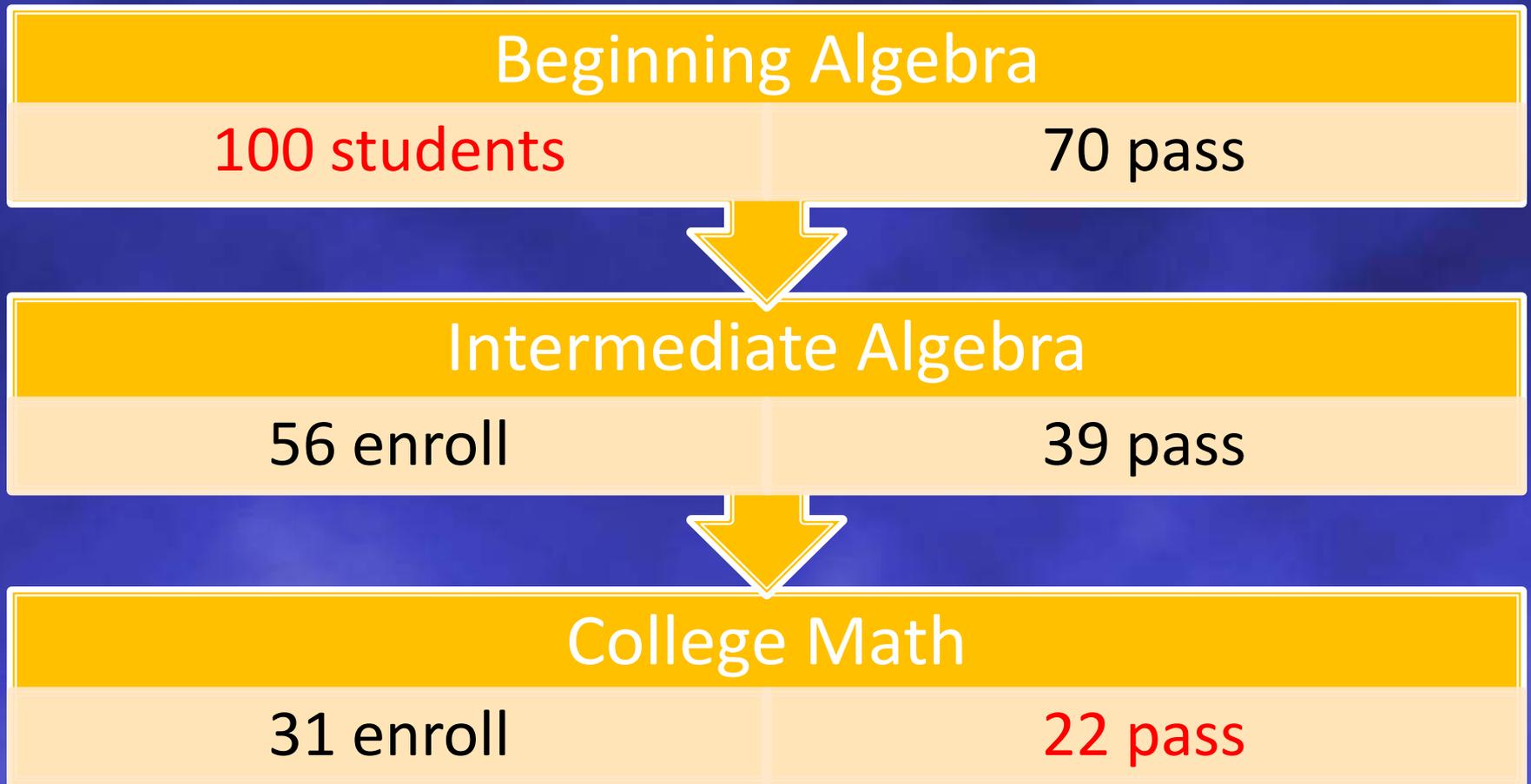
- 3 common courses (sometimes 4)
 - Pre-algebra
 - Beginning Algebra
 - Intermediate Algebra
 - and perhaps Basic Math
- Presumption of appropriateness
- Origins? It was “found in a box” back in 1968

Leaving the System Behind

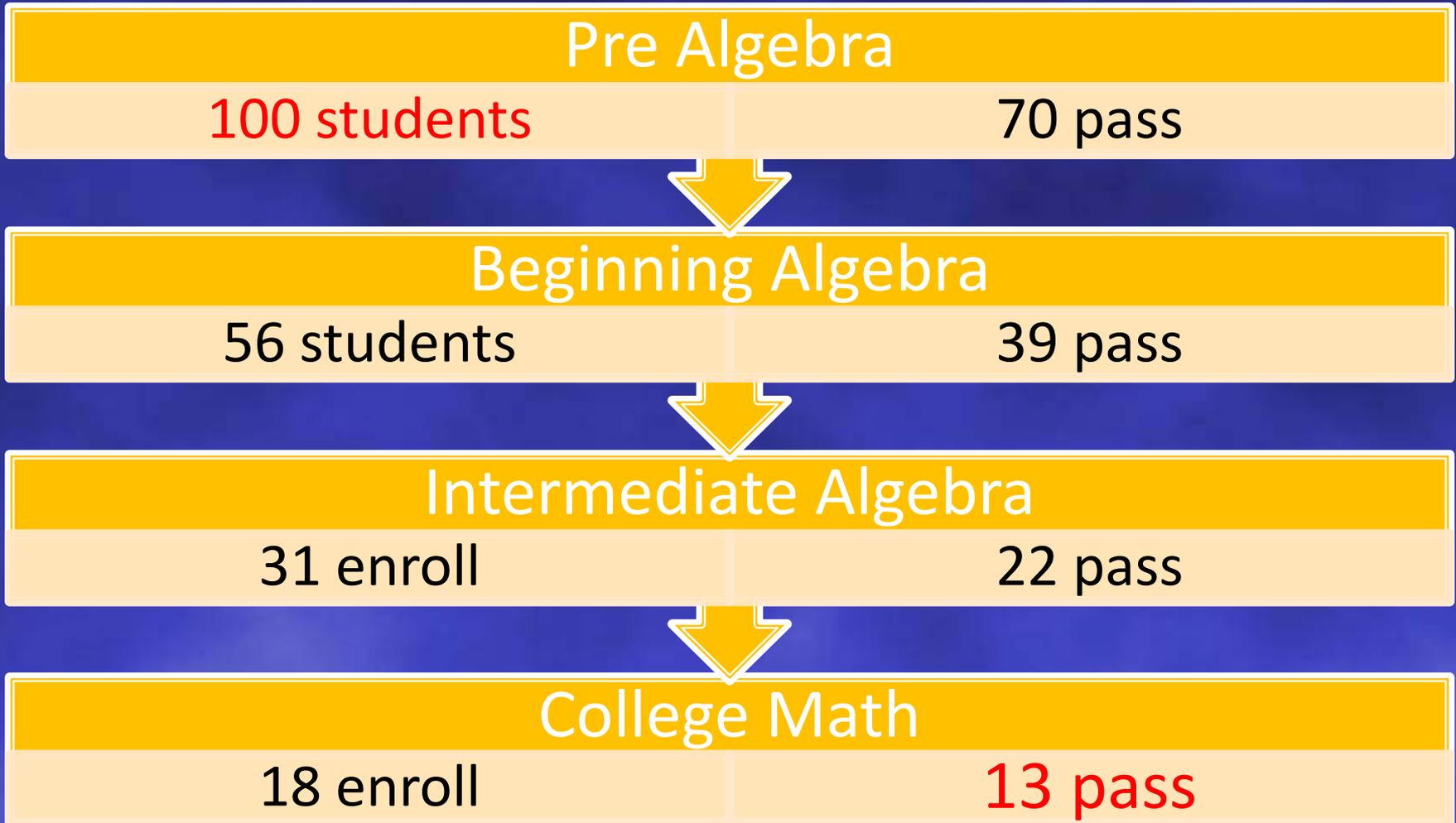
- Existing system was not designed – it was copied from a different context
- A given student might be accidentally well-served by portions of the old system (or not)
- A 3-course sequence guarantees general failure of the design
- Even a 2-course sequence presents huge challenges

The Risk of a Longer Sequence: 2 Dev Courses

Assume 70% pass rate, 80% retention



The Risks: Three Dev Math courses (70% pass, 80% retention)



The System has Fatal Flaws

- Too many courses: Exponential Attrition
- Content is not designed to serve a purpose

The shock is not that the system does not work

The shock is that the system has survived this long

The Path Forward

- Good solutions are not likely to resemble our old system (can not use pieces)
- Deliberate design needed
- Identification of basic goals for dev math
- Creativity based on good mathematics
- Professional development and networking

Where the New Life Project came from

- AMATYC Developmental Math Committee
- Teams used professional sources (MAA, AMS, AMATYC, etc)
- Learning outcomes identified ... 2008 & 2009
- 3-Day workshop organized outcomes into two courses (Seattle; 2009)
- Outcomes for “Math Lit” were vetted (Carnegie Foundation, Dana Center)
- Our work is closely related to Pathways and Mathways.

Goals Addressed by New Life Model

- Prepare students for college mathematics (traditional and modern)
- Prepare students for science and technology
- Prepare students for college and life success

- Content and pedagogy designed to serve all three goals

Where is the New Life Project today?

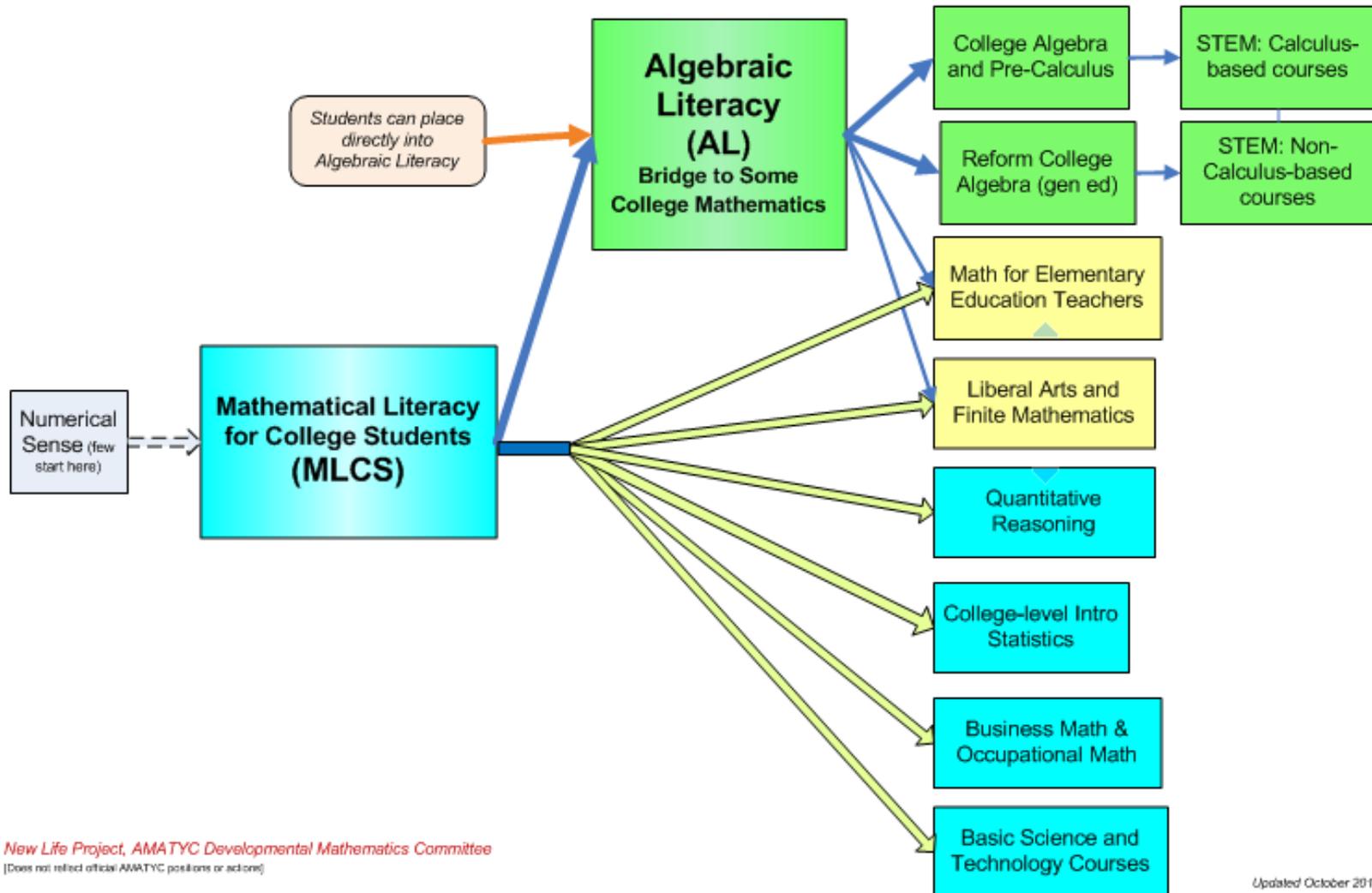
- Most implementations of New Life courses are initiated by math faculty
- Commercial textbooks are generally used
- Current implementations (as of Oct 2014):
 - Over 75 colleges,
26 states,
Over 550 sections this semester,
>10,000 students
- Results: Preliminary 50 to 55% complete
Math Lit → College Math in 2 semesters

A Design: The New Life Model

~handout~

New Vision of Mathematics Pathways: Fewer non-credit math courses for most students

from the New Life Project



~~ handout ~~

- One side has the New Life Model
- The other side has references and links
- Links include details on the courses
- We will look at the Model in detail
- We will also sketch the content of the courses

A Two-Course Model

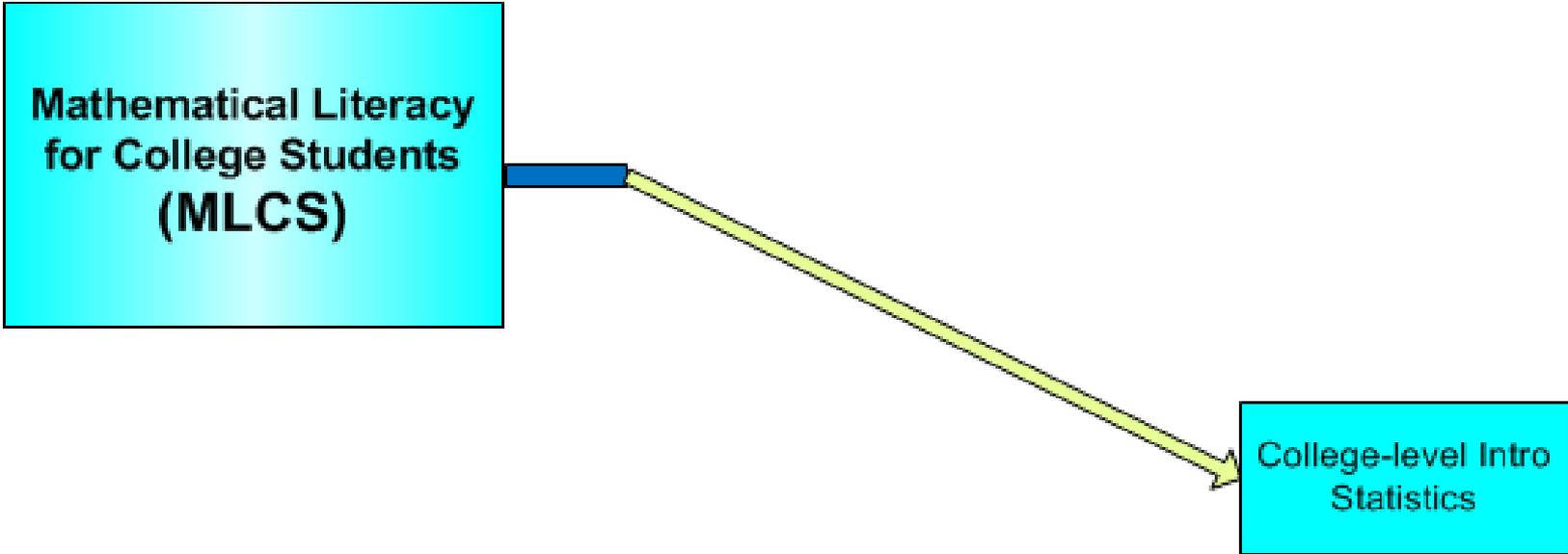
- One and done: MLCS (Math Lit) prepares students for some college math, science & technology (basic)
- One and done: AL (Algebraic Lit) prepares students for 'STEM' college math, biology & high-tech
- Smaller population needs both courses
- No pre-algebra or basic math course (consider a workshop or boot camp for this need ... or 'just in time remediation')

MLCS – Stat Path

MLCS → Statistics Path

from the New Life Project

Mathematical Literacy
for College Students
(MLCS)

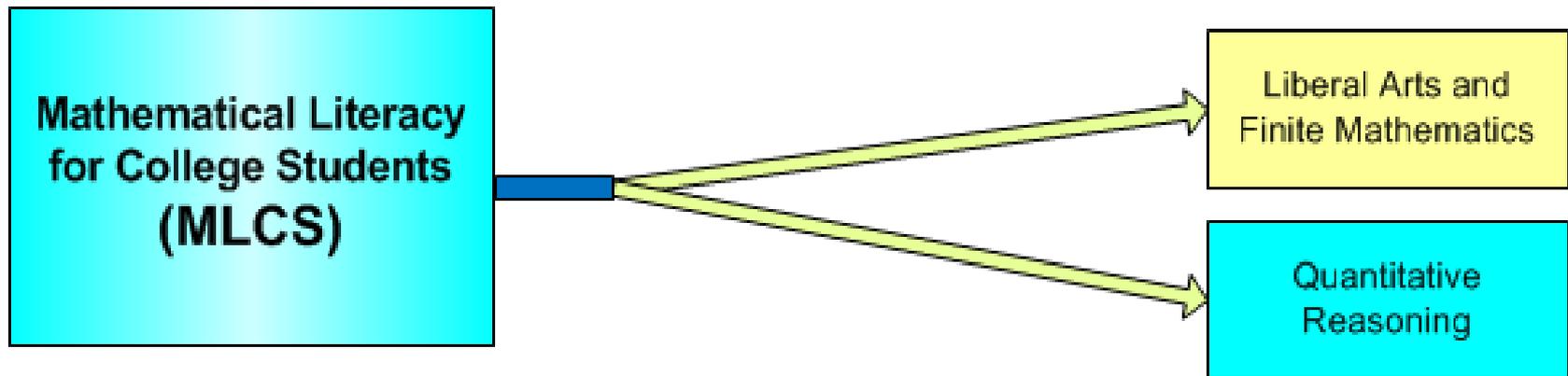


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graph LR; A[Mathematical Literacy for College Students (MLCS)] --> B[College-level Intro Statistics]
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College-level Intro
Statistics

MCLS – Quantitative Reasoning Paths

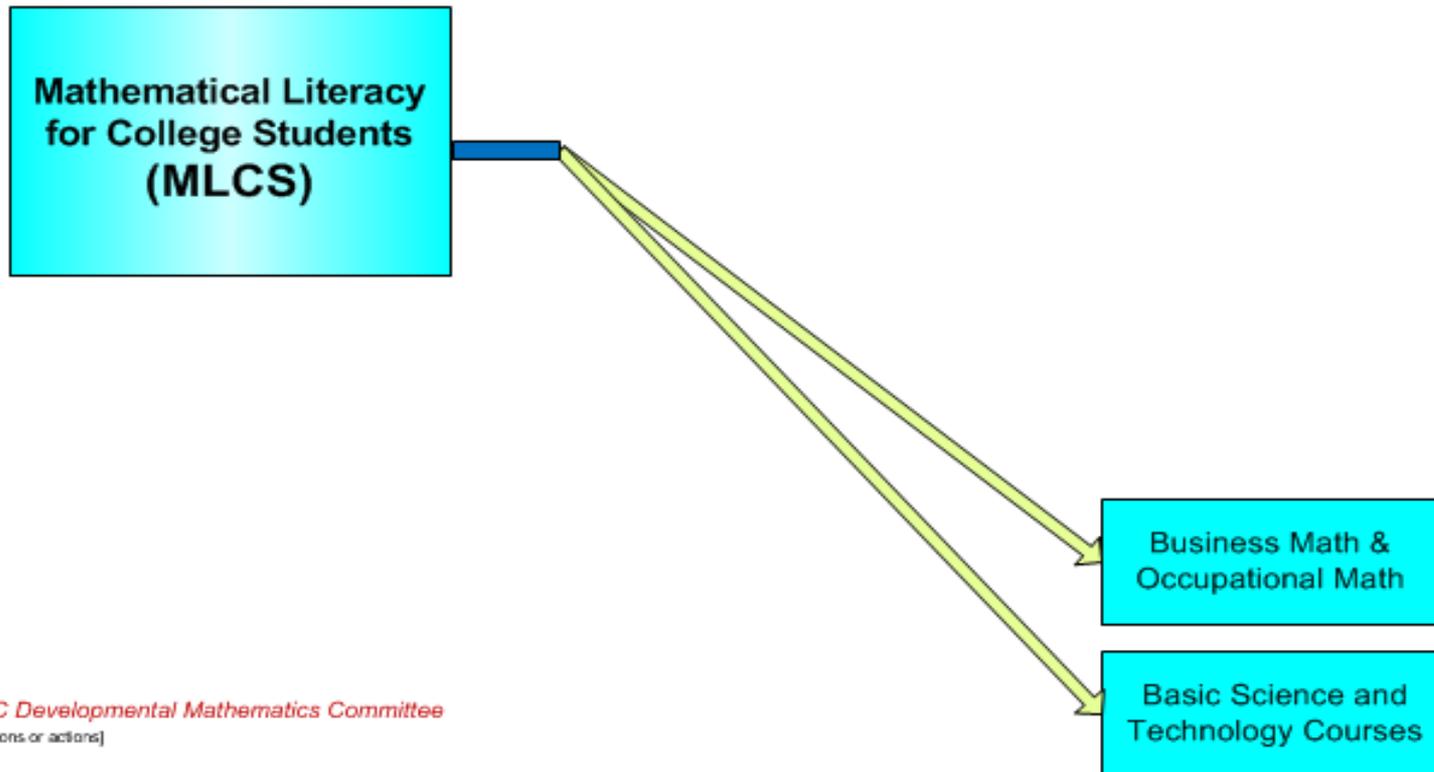
MLCS → Quantitative Reasoning Paths



Note: Mathematical Literacy is not a college-level quantitative reasoning course.

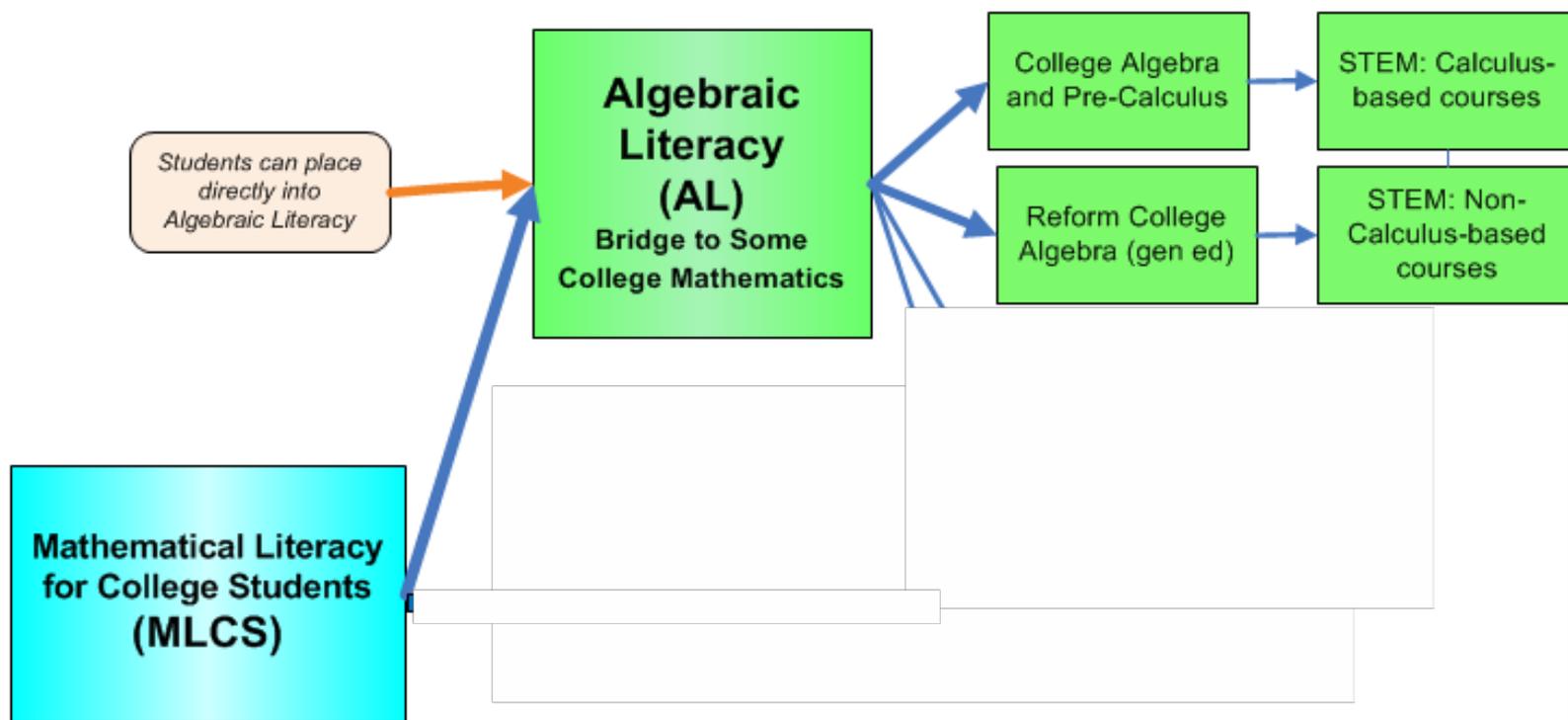
MLCS – Occupational, Science, Tech

MLCS → Occupational, Science, and Technology Paths



MLCS – STEM related paths

MLCS – Algebraic Lit → STEM Related Paths



How it works ...

- Math Lit (MLCS) focuses on learning outcomes commonly needed (all three goals)
- Algebraic Lit (AL) focuses on preparation for “STEM-Like” courses and programs
- Each course is more accessible than old courses: fewer semesters in remediation
- **More students will be done with one developmental math course**

The Idea of Math Lit (MLCS)

- Good mathematics from the beginning
- Focus on central ideas and reasoning
- Symbolism and technology included
- Fewer prerequisite skills (primarily basic numeracy)
- Designed to prepare all students; helps STEM students

Content Goals of Math Lit

- Numeracy
- Proportional Reasoning
- Algebraic Reasoning
- Functions

- Symbolic statements, communication, some procedures in symbolic form

Math Lit: Example Topics

- Quantities and measurements
- Intro to dimensional analysis
- Paired data
- Rate of change
- Equations in two variables
- Linear relationships
- Exponential relationships

Math Lit: Appropriate Instruction

- Discussion, verbal work
- Active
- Blended with direct instruction
- Applications (not puzzles)
- Deliberate connections
- Emphasis on reasoning ... and communication

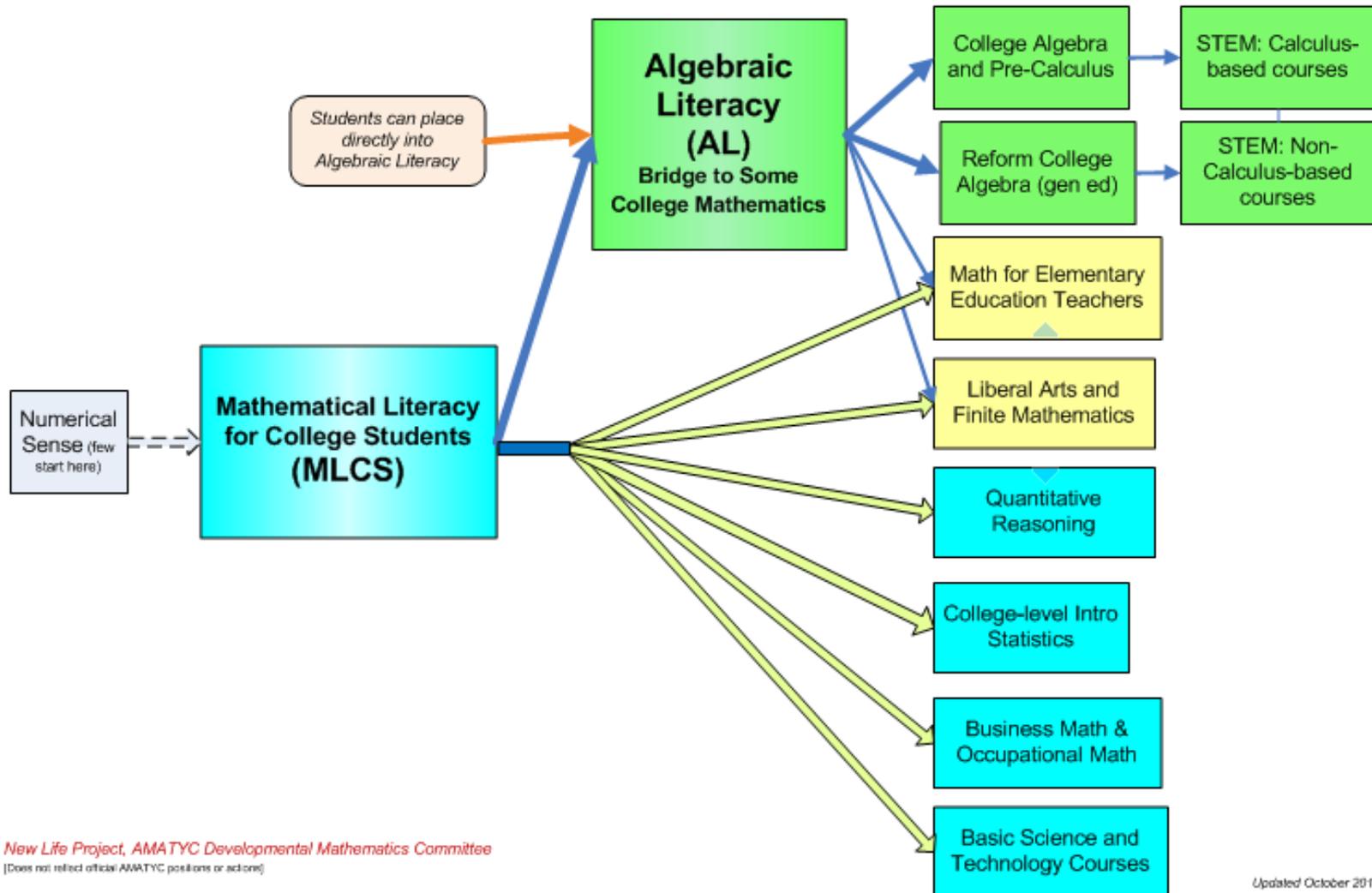
Math Lit – is Getting Ready For ...

- STEM paths (heading towards calculus)
- Quantitative Reasoning/Liberal Arts Math
- Introductory Statistics
- Basic Science
- Technology courses

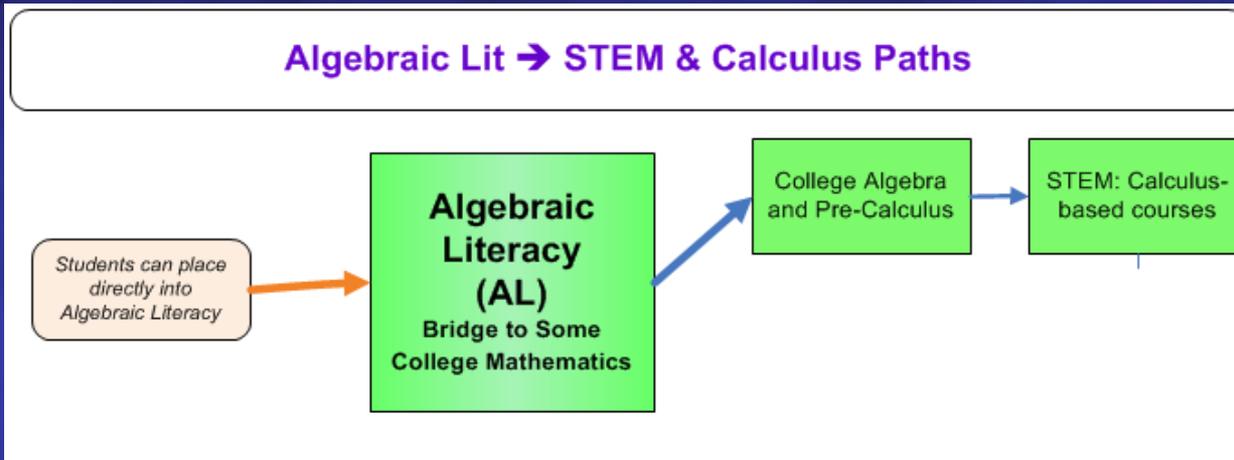
A Design: The New Life Model

New Vision of Mathematics Pathways: Fewer non-credit math courses for most students

from the New Life Project

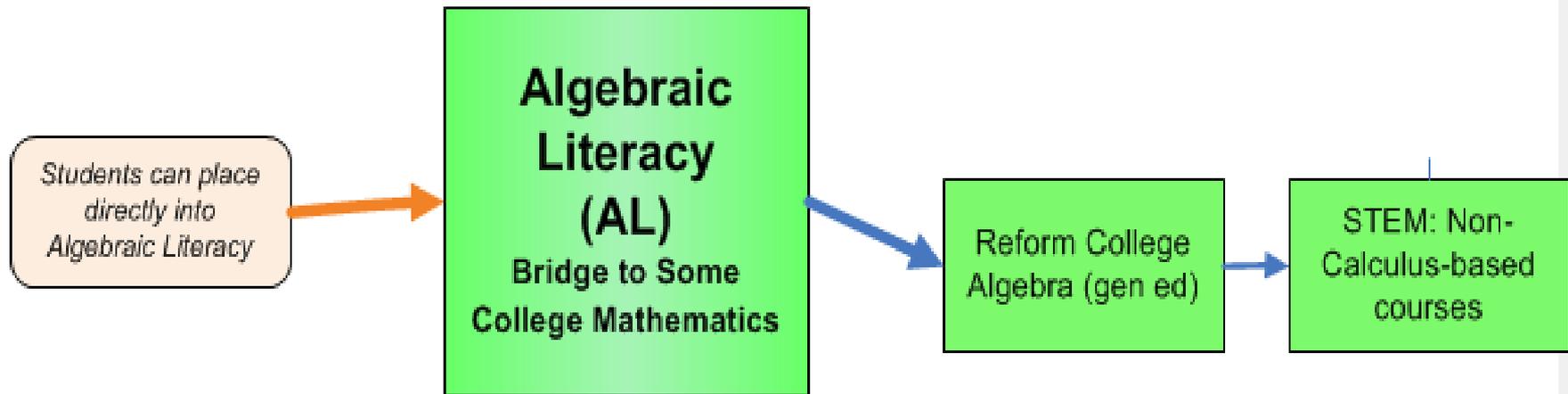


Algebraic Lit – STEM & Calculus Paths



Algebraic Lit – STEM Related Paths

Algebraic Lit – STEM Related (including biology and technology)



The Idea of Algebraic Literacy (AL)

- Good mathematics from the beginning
- Focus on central ideas and reasoning
- Procedures and applications in balance
- Designed to prepare students and even inspire students
- “STEM boosting” outcomes identified (needed for pre-calculus)

Content Goals of Algebraic Literacy

- Numbers and Polynomials
- Functions
- Geometry and Trigonometry
- Modeling and Statistics

- Symbolic and numeric methods; focus on reasoning and connections

Algebraic Literacy – is Getting Ready For ...

- STEM paths (pre-calculus)
- College Algebra (reform or old-fashioned)
- Other college math (Finite Math, elementary teacher's math)
- Biology (i.e., taken by health careers students)
- Technology programs (emerging technologies)

Algebraic Lit: Example Topics

- Properties and equivalent polynomials
- Numeric methods to solve exponential equations
- Symbolic and numeric methods for systems
- Connecting rate of change and the function
- Right triangles and 3 basic trig functions
- Models as approximations
- Correlation

Optional Handouts

- Goals and Outcomes for Math Lit
- Goals and Outcomes for Algebraic Lit
- Comparison of Three Models
(AMATYC New Life; Carnegie Pathways; Dana Center Mathways)

Implementing “New Life” Courses

- MLCS replaces pre-algebra AND beginning algebra for some students ... or for all students
- MLCS is typically 4 credits
- MLCS has two available textbooks

- Algebraic Literacy replaces intermediate algebra (& beginning algebra) for some or all students
- Algebraic Literacy is typically 4 to 6 credits

More on Implementing ...

- Faculty-centered: propose the course, get approval, design course, pilot the course
- Professional development: send email through the “dm-live” wiki (or contact the publisher)
- Grants are not normally needed for implementing New Life courses
- Implementations have been done from small scale to state-wide

Finishing Up ...

session 163

- The New Life Model:
 - * **Purposes of Dev Math** *
 - * **Math Paths** *
 - * **Broad Acceleration** *
- Optional Handouts available
- Other questions?

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