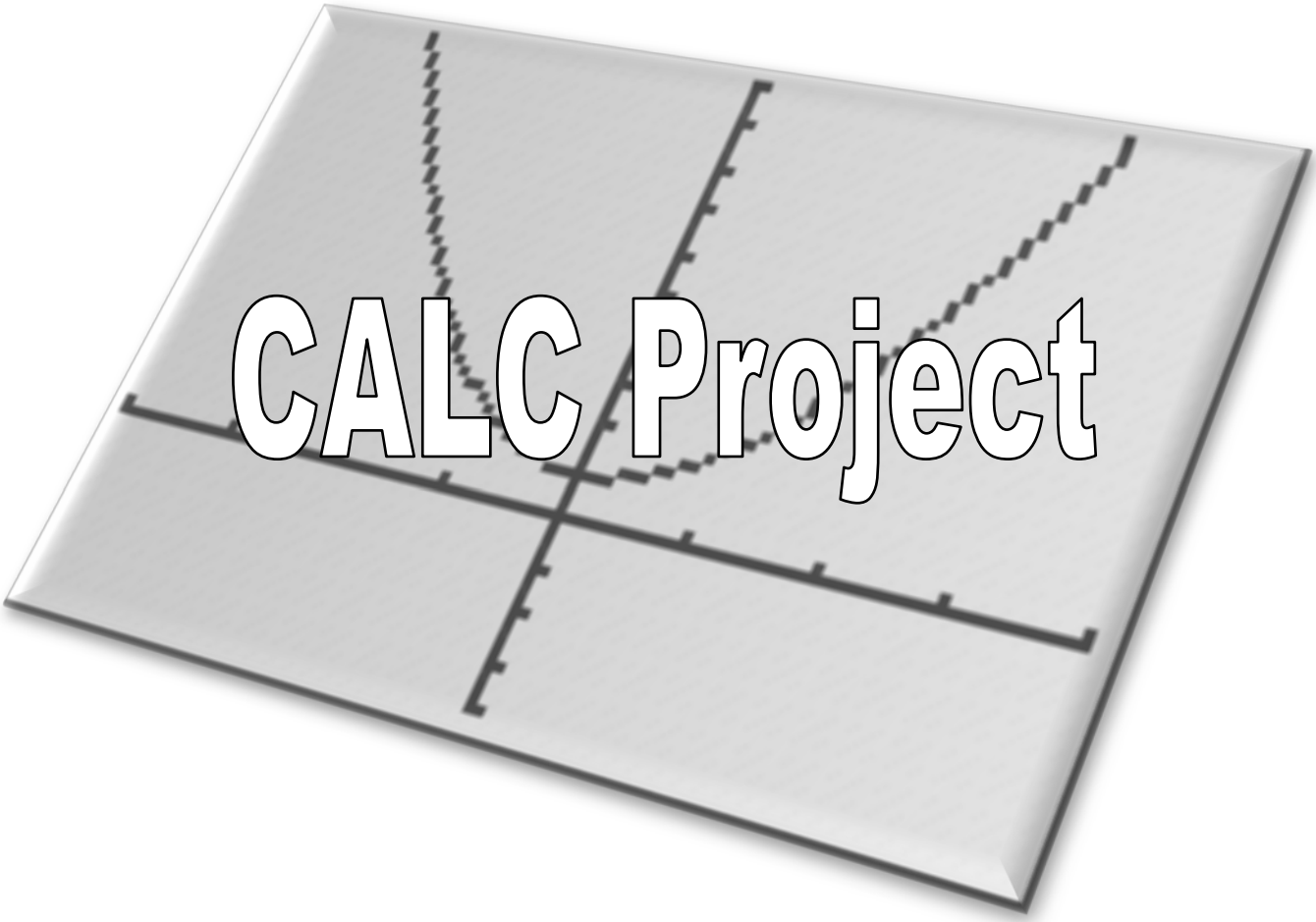
COLLEGE ALGEBRA LEARNING COMMUNITY

Tulsa Community College, West Campus



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The Problem

Oklahoma only requires three credits of mathematics for high school graduation, so the majority of the students will complete Algebra I, Geometry, and Algebra II by the end of their sophomore or junior year. The students who choose not to progress through the traditional trigonometry/calculus path often decide not to take a math class during their junior and/or senior year(s). When this same population of students decides to attend college, they often delay their mathematics requirements until later in their college career. This time gap in mathematics education makes it nearly impossible for students to maintain the appropriate skill level required to be successful in a college algebra class.

It is then no surprise that college algebra, a "gate-keeper" class, has a very low success rate. The Tulsa Community College Achieving the Dream data (2004 – 2008) confirmed this situation and showed several other areas of concern. For first-time, first-semester freshman, 68.9% of the students tested into various levels of developmental math courses. Of the 30.2% of students who tested into a college-level math course, only 60.9% successfully passed the college algebra course (Success = A, B or C). The data also supports the fact that students who test into developmental math are less likely to graduate with a degree. From 2004 to 2006, an average of 8.8% of students who started in a developmental math course earned a TCC degree.

The problem with college algebra having low success rates and the developmental math path leading to low graduation rates is considerable and far reaching. Due to the various issues associated with different student populations, it is impossible to solve this problem with only one method. However, in an effort to find a solution for at least one student population, the following high school target group was developed:

- Students who can score a 21 or above on the math sub-score of the ACT.
  (TCC requirement for college algebra.)
- Students in their senior year of high school.
- Students who express a desire to attend college.
- Students who will need college algebra for their degree plan.
- Students whose major will not require mathematics higher than college algebra.

The CALC Project

During the spring 2008 semester, a TCC mathematics professor, along with high school administrators and a mathematics teacher began working together on the CALC (College Algebra Learning Community) project. The TCC professor shared college algebra course objectives, and the group developed the college algebra preparatory curriculum to be implemented at the high school level. Two documents were also developed, the CALC Information Sheet and the Parent/Student Commitment Letter. To date, all participating school districts have made modifications to certain parts of these documents to meet their individual needs.

(See the attached CALC Information Sheet and Commitment Letter for a more detailed list of responsibilities.)

The project basics are as follows:

- During the spring semester prior to the CALC project school year, the high school identifies and recruits 10-25 students per class for the project. These students must meet the Tulsa Community College requirements for dual enrollment and have the appropriate ACT math sub-score. *(See the attached Dual Enrollment Policy.)*

- During the fall semester of the CALC project school year, the high school students attend a dedicated high school class period for the college algebra preparatory curriculum taught by a qualified high school teacher. This curriculum targets specific objectives that TCC college algebra faculty identified as difficult concepts for students. (*See the attached Intermediate and College Algebra Content.)*

- Before the fall semester is over, the students complete enrollment in a dedicated TCC 16-week Internet college algebra course for the spring semester. They also begin working through curriculum in the College Algebra Preparatory course on the MyMathLab website. This allows students to become familiar with the website prior to beginning the TCC college algebra course in the spring.

- During the spring semester of the CALC project school year, the students continue to attend the dedicated class period at the high school. Within the classroom, the students work through the Internet college algebra course. The high school teacher transitions into a tutor role, providing supplemental instruction and monitoring student progress through the college algebra course. The TCC professor communicates weekly with the high school teacher as to the progress of each student. This allows for early interventions and consistent support. *(All students participating in the CALC project complete a FERPA Student Records Release Form to allow communication between TCC and the high school.)*

The Results

School Year	Number of Schools Participating	Number of Students Enrolled	Number of Withdraws (W, AU, I)	Final Grades					Student Success Rate	Success Rate Minus Withdraws
				A's	B's	C's	D's	F's		
2008-2009	1	9	0	2	7	0	0	0	100%	100%
2009-2010	2	10	0	4	1	3	2	0	80%	80%
2010-2011	3	96	6	11	44	31	4	0	89.6%	95.6%
3-Year Totals	4	115	6	17	52	34	6	0	89.6%	94.5%
2008 - 2011	All TCC college algebra courses	11,731	2,676	2,514	2,489	2,032	790	1230	60.0%	77.7%

The original goal of this project focused only on creating an environment in which students could successfully complete college algebra. In reality, the CALC project has provided students with an enriching college mathematics experience. Not only did students earn college credit, but they gained other valuable experiences that will be beneficial to their future college coursework.

- Students experienced the online learning format, enabling them to choose the instructional format (online or face-to-face) that best fits their individual learning style.

- Students discovered the importance of time management skills as a key to successfully completing a college-level course.

- Students learned to ask for help and to communicate appropriately with their instructor.

- Students noticed the importance and benefits of persistence with college coursework. *(The withdrawal rate for the CALC Project was 5.2% compared to the TCC average for college algebra of 22.8%.)*

- Students gained confidence to continue on with other college courses.

CALC Project – Information Sheet

Your child has been identified as a possible candidate for a College Algebra Learning Community Project to be offered by Tulsa Community College in cooperation with the high school mathematics department. The goal of this project is for all students involved to successfully complete a TCC college algebra course during the spring semester of the next school year. Please review the project information below:

Tulsa Community College responsibilities:

- The TCC professor will provide the high school with college algebra preparatory curriculum and objectives, which will be used during the fall semester to prepare students for the college algebra course.
  (Each high school instructor is given a MyMathLab code and access to a pre-designed college algebra prep class.)
- In December, the TCC professor will conduct an on-site student orientation session.
- During the spring semester, TCC will offer a dedicated 16-week Internet college algebra course for the high school's students.
- The TCC professor will keep the high school instructor updated as to the weekly progress of the students throughout the spring semester.

High School responsibilities:

- The high school will provide a dedicated class period and qualified instructor for the project.
- The high school will provide students with computers and Internet access during the dedicated class period.
- The high school will identify and recruit 10-25 seniors per class for the project.
- The high school instructor will teach the college algebra preparatory curriculum during the fall semester.
- During the spring semester, the high school instructor will provide supplemental instruction and will monitor student progress through the college algebra course.

Student responsibilities:

- Students must take the February, April, or June ACT exam. *(If the student's ACT exam score does not meet the acceptance or enrollment criteria, the student may take the Residual ACT at TCC's Northeast campus. Call 595-7594 for more information.)*
- Students must successfully complete (grade of C or above) the college algebra preparatory curriculum during the fall semester.
- By the beginning of November, students must **qualify for and enroll in** the Tulsa Community College Attend College Early (ACE) program and the dedicated Internet college algebra course. Acceptance into the ACE program and college algebra course requires:
  - ACT composite of 19 or above, or H.S. GPA of 3.0 or above
  - ACT math score of 21 or above
- Students must purchase the MyMathLab Student Access Kit. (Approx: $80)
- Students must pay the appropriate TCC fees. (Approx: $100)
- Students must continue to attend the high school's dedicated class period throughout the entire spring semester.
- Students must make arrangements to take the midterm and final exam at a Tulsa Community College Testing Center.
- Students and their parents must sign a project commitment letter.
- Students will complete a FERPA Student Records Release Form to allow communication between TCC and the high school instructor.

CALC Project – Commitment Letter

As a parent of a child in the CALC Project, I understand and agree to the following:

1. If my child does not abide by the rules or meet the qualifications *(appropriate TCC admissions/ACT score requirements*) of the project, they will be enrolled in an alternative high school course, possibly for no credit.
2. If my child does not successfully complete (grade of C or above) the college algebra preparatory curriculum, they will be withdrawn from the project and enrolled in an alternative high school course for the spring semester.
3. I am responsible for paying all fees associated with enrollment into the Tulsa Community College ACE program and college algebra course. (Approximate fees include: enrollment fees - $100, MML Student Access Kit - $80, TI-84 calculator - $120, tuition - $0)
4. Due to the FERPA regulations, I will not be allowed to discuss my child's college algebra grade with the TCC professor or high school instructor.

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(Parent Signature)

As a student in the CALC Project, I understand and agree to the following:

1. Even though I am a TCC concurrent enrollment student during the spring semester, I will continue to attend the dedicated class at my high school.
2. I will sign a waiver giving my high school instructor and administrators the right to communicate with the TCC professor about my grade in the college algebra course.
3. I will purchase the MyMathLab Student Access Kit ($80), before the end of November.
4. I must make arrangements to take the midterm and final exam at a Tulsa Community College Testing Center.
5. If problems occur with the high school's computer lab or my personal computer, I will take advantage of the computers at TCC to complete my assignments.
6. If I am keeping up with my assignments and maintaining a B or above average in the college algebra course, I will not have to attend the dedicated class at my high school on Tuesdays & Thursdays.

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(Student Signature)

CALC Project – TCC Dual Enrollment Policy

Admission & Enrollment Requirements for students interested in enrolling concurrently at their high school and Tulsa Community College are as follows:

- Students must be juniors or seniors. Students who are home schooled or attending unaccredited high schools must be at least 16 years of age as a junior and 17 years of age as a senior.
- Students must have participated in the ACT and made the following composite scores: juniors 21 (ACT) and seniors 19 (ACT).
  or
- Those who have participated in the ACT and did not meet the score requirements may be considered for admission purposes based on their high school GPA (grade point average). Juniors must have a 3.5 GPA and seniors must have a 3.0 GPA on a 4.0 scale ***and***
- Both juniors and seniors must be proficient in the area in which they wish to enroll.
- Students must have a 19 (ACT) subject score in English and/or Science Reasoning to enroll in those courses.
- Tulsa Community College requires that a student score a 21 (ACT) in Math in order to enroll in MATH 1513 (College Algebra).
- Students must have a 19 (ACT) in Reading to enroll in any other collegiate course.
- TCC's Computerized Placement Test (COMPASS) may not be used to meet the proficiency requirements.

Students must complete an Application for Admission online at **www.tulsacc.edu** at least two business days prior to enrollment and provide the following documents to the Director of Enrollment Services on the campus offering the class:

- Concurrent Enrollment Application*
- Current official high school transcript
- Official ACT

All documents must be received in advance of intended enrollment to allow time for processing.

ACE Tuition Waiver Scholarships are awarded on a "First come-first served basis" as funds are available. Students must be enrolled in a minimum of three (3) and a maximum of six (6) credit hours per semester and must follow the policy regulations. See *Attend College Early* (ACE) brochure for high school concurrent enrollment details.

High school students who have provided the appropriate documents and meet score requirements must follow the criteria below:

- Enrollment will not exceed 19 credit hours per long semester or 9 credit hours in the summer.
- Students may not enroll in zero-level courses designed to remove deficiencies.
- Re-enrollment is contingent upon the student achieving a 2.0 GPA at TCC.

All other students not qualified by grade level may be considered for enrollment under the Opportunity Admissions category. A detailed explanation of the Oklahoma State Regents' policy on concurrent enrollment is available from any TCC Admission/Enrollment Services Office.

Note: Questions regarding admissions or enrollment should be directed to the Admission/Enrollment Services Office on the campus the student plans to attend. Admission to the institution does not guarantee eligibility for course placement.

**The High School Concurrent Application may be obtained from your principal, counselor, or the Admissions/Enrollment Services Office on any TCC campus.*

REVIEW

- Order of Operations
- Real Number and Subsets of the Real Numbers
- Real Numbers, Properties, Operations, Absolute Value
- Simplifying Algebraic Expressions
- Exponent Properties
- Scientific Notation
- Polynomials: Definition, Addition, Subtraction, Multiplication, Division by a Monomial and Polynomial
- Factoring (GCF, grouping, trinomials, perfect square trinomials, differ. of 2 squares, sum & differ. of 2 cubes)
- Linear Equations: Solving, Graphing
- Solve Quadratic Equations by Factoring
- Formulas
- Inequalities: Properties, Linear Inequalities
- Rectangular Coordinate System, Ordered Pairs
- Intercepts
- Slope
- Slopes of Parallel and Perpendicular Lines
- Equation of a line: Slope-Intercept Form, Point-slope Form, Standard Form
- Graph using the slope and y-intercepts
- Linear Inequalities in two Variables

CORE

- Operations with Sets
- Applications
- Compound Inequalities
- Absolute Value Equations and Inequalities
- Functions: Domain & Range, Function Maps, Functions as Ordered Pairs
- Function Notation
- Relations
- Graphing Relations and Functions
- Vertical Line Test
- Variation: Direct, Inverse, Joint Variation, and Other Variation Combinations
- Rational Expressions: Simplifying, Multiplying, dividing, Adding, Subtracting
- Equation Applications
- Complex Fractions
- Rational Functions, Domain of Rational Functions
- Roots, Square roots, Cube roots, nth roots
- Rational Numbers as Exponents
- Radicals: Properties, Simplifying, Adding, Subtracting, Multiplying, Dividing
- Rationalizing the Denominator
- Complex Numbers: Definition, Adding, Subtracting, Multiplying, Dividing
- Solving Quadratic Equations: Square Root Property, Completing the Square, The quadratic Formula
- Discriminant
- Solving Equations with Complex Solutions
- Equations quadratic in Form
- Systems of Linear Equations in Two Variables (graphical, substitution, and elimination methods)

The highlighted objectives were identified by TCC faculty as areas of weakness for college algebra students. These objectives should be covered in the fall semester college algebra preparatory curriculum.

REVIEW

- Linear functions: slope, intercepts, graph equations and applications
- Complex numbers: simplify, add, subtract, multiply, and divide
- Solve quadratic equations: completing the square, and quadratic formula
- Solve equations quadratic in form
- Find the discriminant
- Solving systems of 2 equations by graphing, substitution and elimination

CORE

- Functions: definition, domain, range, graphs, vertical line test, applications
- Functions: zeros, increasing, etc., and piecewise functions
- Linear regression
- Distance, midpoints & circles
- Symmetry including odd and even
- Basic graph shapes: quadratic, cubic, absolute value, roots, reciprocal
- Transformations of functions: vertical and horizontal shifts, stretching and shrinking, reflecting
- Algebra of functions: add, subtract, multiply, divide, composite, domain and range
- Vocabulary for polynomial functions: leading coefficient, degree
- Find: vertex, line of symmetry, maximums and minimums
- Graph quadratic functions
- Polynomial and rational equations
- Polynomial and rational inequalities

CORE Continued

- Polynomial division including synthetic, remainder and factor theorems
- Building equations from their solutions.
- Fundamental Theorem of Algebra
- Interpreting graphs including zeros and multiplicity
- Rational functions: domain, graph
- Asymptotes: vertical, horizontal and oblique
- Inverse function: one-to-one, find, test with composite
- Exponential functions: graphs, e , applications
- Logarithmic functions: graphs, convert between logs and exponents, change of base, applications
- Properties of logs: product rule, power rule, and quotient rule
- Solving exponential and logarithmic equations
- Systems of equations: 3 or more variables
- Matrices: size, entries, equal matrices, add, subtract, multiply by a scalar, and multiply
- Conic Sections: parabolas (focus and directrix), circles
- Sequences and series including arithmetic and geometric

ENRICHMENT

- Greatest Integer functions
- Polynomial models and curve fitting
- Matrix inverses
- Determinants and Cramer's Rule
- Systems of inequalities
- Linear programming
- Nonlinear systems of equations
- Gauss-Jordan, row operations
- Conic Sections: ellipses, hyperbolas
- Eccentricity of conic sections
- Combinations and permutations
- Binomial theorem
- Probability