STRATEGIES FOR DUAL CREDIT SUCCESS:
BUILDING CONNECTIONS, RIGOR, AND QUALITY

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Topics

- Dual Credit Math @ TAMU – C
- Challenges
- Strategies
  - University Standards and Course Content
  - Collaboration and Coordination
  - Student Success
- Conclusions
Dual Credit Math @ TAMU - C

- Offered at five high schools
  - Commerce ISD
  - Boles ISD
  - Caddo Mills ISD
  - Royse City ISD
  - Melissa ISD

- Embedded Teachers/Adjuncts at Two Schools

- Full Time Faculty for Three Schools
Courses offered (availability varies by school)
  - College Algebra
  - Pre-Calculus
  - Calculus I

Class size ranges from low teens up to 30

High school juniors and seniors who are TSI complete

Taught on site during their class periods (approx. 45 min.)

Depending on teacher availability, classes held two to five days per week.
Dual Credit Math @ TAMU - C

- Administrative Structure
  - Associate Provost
    - Oversees most aspects of dual credit administration
  - Math Department
    - Coordinator of College Algebra (Associate Professor)
    - Subject specific curriculum and standards (Department Head)
Full Time Dual Credit Instructor

- Established in 2015 in order to teach 4 – 5 dual credit classes per semester
- Up to 3 schools visited per semester
- Classes scheduled for either 2 or 3 days a week depending on location
- As the number of schools has increased, a component of coordination has been added
CHALLENGES
Challenges

■ Scheduling
  - School Schedule vs. University Schedule
    ■ Furthermore, 45min vs. 50min periods
  - Limited number of teaching days per week
  - Extra curricular activities
  - School events (drills, assemblies, etc.)
  - Time for office hours / tutoring

■ Coordination
  - Collaboration with instructors at other schools

■ Keeping to university standards of rigor and testing
Scheduling

- Standard university time frame:
  50 minutes / 3 days a week / 16 weeks
  - *Curriculum designed for this time frame*
- School closures still observed
  - *Often more days off than the university*
- School may start earlier than university
  - *This may offset some missed days*
- Class ends with the university finals week
  - *Often earlier than school ends for Christmas or Summer*
STRATEGIES

Videos
Videos

- Useful for students who are absent or would like further help
- Section Videos
  - Some sections recorded from scratch for later review by students
- Review Videos
  - Posted along with paper review several days before exams
- Class Recordings
  - Often for days several students are absent.
- Remote Teaching
Videos – Section Video

PreCalc: Section 8.1
6 videos • 87 views • Last updated on Apr 9, 2017

1. PreCal ~ Section 8.1: Example 1 - Intro to Polar Coordinates
   4:57
   Adam Bowden

2. PreCal ~ Section 8.1: Example 2 - More Polar Coordinate Plotting
   4:20
   Adam Bowden

3. PreCal ~ Section 8.1: Example 3 - Converting to Rect Coordinates
   3:58
   Adam Bowden

4. PreCal ~ Section 8.1: Example 4 - Converting to Polar Coordinates
   3:56
   Adam Bowden

5. PreCal ~ Section 8.1: Example 5 - Converting Equations into Polar Form
   2:10
   Adam Bowden

Click image to open playlist
Videos – Review Videos

Click image to open playlist
Videos – Class Recordings

Click image to open video
Videos – Student Participation

![Graph showing video watch time and views from Nov 23, 2017 to Mar 25, 2018. The graph includes data for watch time and views, with peaks and troughs indicating times of higher and lower engagement. The watch time is 5,873 minutes and the views are 2,918.]
Remote Teaching

\[ \alpha. \cos(t) + \tan(t)\sin(t) \]

\[ = \cos(t) + \left( \frac{\sin(t)}{\cos(t)} \right)\sin(t) \]

Multiply

\[ \cos^2 t = \cos t + \frac{\sin^2 t}{\cos t} \]

Common denominator

\[ = \frac{\cos^2 t + \sin^2 t}{\cos t} \]

Add numerators

\[ = \cos^2 t + \sin^2 t \]

Pythagorean Identity: \( \cos^2 t + \sin^2 t = 1 \)
Videos – Equipment & Software

- USB Document Camera
- Touch Screen Laptop with Active Stylus
- External Hard Drive (1 TB)
- USB Headset
- Microsoft OneNote
- Camtasia Video Editing Software
- Adobe Connect (Free for limited use)
Observations

- Students have indicated that videos help for reviewing and catching up on missed content
- Often, review videos are watched in the days leading up to and just before an exam
- Remote teaching is useful for extra examples and Q and A for days when physical presence is not possible
- Technology is a good supplement, but not replacement, for face to face time
  - However, can help add additional contact time
STRATEGIES

University Standards and Course Content
University Standards

■ Setting Expectations
  - Dual credit students are made aware that they are in college from the first class day
  - Treat the classroom as a university classroom, regardless of location
  - Communication with instructor via the standard university measures (for instance, university email)

■ Testing held to university criteria
  - No make ups, retakes, or starting and completing exams later without an university approved excuse
University Standards

- **Course Content**
  - *Important to compare methods and content with what is standard within the university / department*
  - *Collaborate with university instructors and/or professors as to appropriate homework and exam rigor*
  - *Departmental textbooks are often a good place to start*
Course Content

Handouts provided in order to streamline lessons.

*Lists common definitions, formulas, and the particular examples chosen for each section.*

Section 7.3: Double-Angle Formulas

\[
\begin{align*}
\sin 2x &= 2 \sin x \cos x \\
\cos 2x &= \cos^2 x - \sin^2 x \\
       &= 1 - 2 \sin^2 x \\
       &= 2 \cos^2 x - 1 \\
1: \text{ If } \cos x &= \frac{-2}{3} \text{ and } x \text{ is in Quadrant II, find } \cos 2x, \sin 2x. \\
2: \text{ Simplify the expressions } 2 \sin 6^\circ \cos 6^\circ \text{ and } 2 \sin 15^\circ \cos 15^\circ. \\
3: \text{ Write } \cos 3x \text{ in terms of } \cos x. \\
4: \text{ Verify the identity } \sin 8x &= 2 \sin 4x \cos 4x. \\
5: \text{ Verify the identity } \frac{\sin 3x}{\sin x \cos x} &= 4 \cos x - \sec x. \\
\end{align*}
\]

Formulas for Lowering Powers (Power Reduction Formulas)

\[
\begin{align*}
\sin^2 x &= \frac{1 - \cos 2x}{2} \\
\cos^2 x &= \frac{1 + \cos 2x}{2} \\
6: \text{ Express } \sin^2 x \cos^2 x \text{ in terms of the first power of cosine.} \\
\end{align*}
\]

Half-Angle Formulas

\[
\begin{align*}
\sin \frac{u}{2} &= \pm \sqrt{\frac{1 - \cos u}{2}} \\
\cos \frac{u}{2} &= \pm \sqrt{\frac{1 + \cos u}{2}} \\
7: \text{ Find the exact value of } \sin 22.5^\circ \text{ and } \sin 112.5^\circ. \\
\end{align*}
\]
Course Content

Handouts provided in order to streamline lessons

Helps to set standards, notetaking, and save class time

Section 7.3: Double-Angle Formulas

\[
\sin 2x = 2\sin x \cos x
\]

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\begin{align*}
\cos 2x &= \cos^2 x - \sin^2 x \\
&= 1 - 2\sin^2 x \\
&= 2\cos^2 x - 1
\end{align*}
\]

1: If \( \cos x = -\frac{2}{3} \) and \( x \) is in Quadrant II, find \( \cos 2x \), \( \sin 2x \), \( \sin 3x \), \( \cos 3x \).

2: Simplify the expressions \( 2\sin 6^\circ \cos 6^\circ \) and \( 2\sin 15\theta \cos 15\theta \).

3: Write \( \cos 3x \) in terms of \( \cos x \).

4: Verify the identity \( \sin 8x = 2\sin 4x \cos 4x \).

5: Verify the identity \( \frac{\sin 3x}{\sin x \cos x} = 4\cos x - \sec x \).

Formulas for Lowering Powers (Power Reduction Formulas)

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Half-Angle Formulas

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7: Find the exact value of \( \sin 22.5^\circ \) and \( \sin 112.5^\circ \).
STRATEGIES

Collaboration and Coordination
Collaboration and Coordination

■ Maintaining consistency across high schools
  – Some university math class are coordinated beforehand
  – For those that are not, materials are provided to help maintain consistency in content and rigor

### Required Objectives

**College Algebra**

1. Binomial Multiplication
2. Factoring
3. Rational Expressions
4. Inequalities
5. Slope of Lines
6. Exponents
7. Simplifying Radicals
8. Graphing Linear Equations
9. Solving Quadratic Equations (quadratic formula and factoring)

**2.1: Functions**

1. Define and identify domain, range, and function

### Chapters 1 and 2

1. Review the $xy$ (Coordinate) Plane. Label the four quadrants and work.
2. Sketch regions of the $xy$ plane given by sets.
3. Introduce the Distance Formula. Work examples where the distance formula.
4. Introduce the Midpoint Formula and work examples which using that a shape is a parallelogram given its four vertices.
5. Give $xy$ the definition of the circle. Then introduce the Equation
6. Work circle examples including:
Collaboration and Coordination

- Maintaining consistency across high schools
  - Objectives intended as guidelines
  - Collaborate on syllabi, exams, homework, and any other aspects of the class
Collaboration and Coordination

- In-service during the Summer before Fall classes
  - *Meet with university administration and discuss dual credit issues and requirements*

- Communication
  - *Weekly and/or continuous communication throughout semester*
  - *Observations for instructors teaching a class first time. For others at least once a semester*
  - *Meeting at least once during semester to discuss classes*
Collaboration and Coordination

- Building a sense of connection and collaboration
  - Awareness of university standards
  - Connection to the university and each other
  - Sharing handouts, reviews, and projects
  - Willingness to assist if issues arise
STRATEGIES

Student Success
Student Success

■ Motivation
  - *Frequent emails and online announcements*
  - *Students can view progress and grades online*
  - *Scheduled office hours on location. Students encouraged to attend.*
  - *Special study sessions scheduled as needed*
Student Success

Handouts and Test Reviews

Posted online along with handouts

Review handed out at least a week before exam.

In some cases, limited extra credit given for turning in worked out review

142 Exam 2 Review

Solve the triangle (Section 6.5 - 6.8).

15. a = 6, b = 4, \angle C = 80°
16. a = 3, b = 15°, \angle C = 105°
17. b = 3, \angle C = 35°, \angle B = 70°
18. a = 6, \angle B = 35°, \angle C = 70°

Solve for \theta, \phi, \alpha, \beta, \gamma, \delta.

\sin(\theta) = \frac{\sqrt{2}}{2}
\tan^{-1}(\sqrt{3})
\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)
\tan^{-1}(-1)
\cos^{-1}\left(\frac{1}{2}\right)

Solve the trig equations (6.4).

\cos x = \frac{1}{2} \text{ for } x \text{ between } 90° \text{ and } 180°
\sin x = -0.2 \text{ for } x \text{ between } 180° \text{ and } 270°

\sin \phi = \sin \frac{3\pi}{4}
\cos \alpha = \cos \frac{7\pi}{6}

\sin \beta = \sin \frac{3\pi}{4}
\cos \gamma = \cos \frac{7\pi}{6}

\sin \delta = \sin \frac{3\pi}{4}
\cos \epsilon = \cos \frac{7\pi}{6}
Student Success

■ Communication
  - Maintain communication with high school councilors
  - Flexible availability for students through office hours, email, or online office arrangements
  - Videos also aid in communicating information outside the classroom

■ Interventions
  - At risk student are identified at various times in the semester for tutoring or other ways to help
  - Councilors also important in reaching students at risk
Student Success

- Pass Rates for the last two years
  - 93.5% in Fall 2015 (108 Students)
  - 97.9% in Spring 2016 (91 Students)
  - 95.8% in Fall 2016 (199 Students)
  - 99.3% in Spring 2017 (143 Students)
  - 97.7% in Fall 2017 (171 Students)
Conclusion

- Efforts for insuring student success has helped maintain good pass rates over the last five semesters
  - This covers students in up to five schools in the region
- Improving student access to content appears successful for helping understanding and managing contact time
- Coordination between schools has maintained a sense of cohesion and collaboration
Contact

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Thank you for your participation!