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| **MALT 603 Multiple Subject Methods I: STEM Methods** | | |
| **Term:** |  | **Days:** |
| **Location:** |  | **Time:** |
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| **Faculty:** First Last | **Email:** [first\_last@redlands.edu](mailto:first_last@redlands.edu) |
| **Office Hours:** NUH xxx Days Hours | **Phone:** (909) 748-xxxx |
| **Web/Moodle:** | |

**CATALOG COURSE DESCRIPTION**

Focuses on equity-centered and integrated K-8 pedagogical content knowledge and instructional methods in Science, Technology, Engineering, Mathematics (STEM), and related content. Models project-based learning incorporating digital resources, with an emphasis on ELD and Special Needs strategies, with an emphasis on research-based strategies.

Equivalent to EDUG 403/EDUC 503

**Prerequisites:** Permission from the School of Education.

**COURSE DESCRIPTION**

This course addresses STEM methods including, but not limited to, the challenges and successes of certain instructional strategies for teaching these subjects in the elementary school classroom. We will investigate the history, methods, and theories related to STEM education. The course provides a critical examination of the publicly available curriculum and standards for STEM education, as well as the essential procedures for designing curriculum. In order to understand the research and practice of STEM education disciplines, it is necessary to understand its functional components as well as the social and political factors that influence them. In this course, we will explore aspects of STEM education through the literature, recent national reports, discussion, and practice. The goal is to ensure students can facilitate equity-centered STEM specific pedagogy in K-8 classrooms.

**REQUIRED TEXT**

Stinson, D. & Wagner, A. (2012). *Teaching Mathematics for Social Justice: Conversations with educators.* Reston,

VA: National Council of Teachers of Mathematics.

Van de Walle, J., Karp, K., & Bay-Williams, J. (2016). *Elementary and middle school mathematics: teaching*

*developmentally (9th ed).* Pearson: Boston, MA.

**OPTIONAL TEXTS**

Aguirre, J. Mayfield-Ingram, K., Martin, D. (2013). *The Impact of Identity in K-8 Mathematics:*

*Rethinking Equity-Based Practices (1st ed)*. National Council of Teachers of

mathematics: Reston, VA.

Contant, T.L., Bass, J., Tweed, A., Carin, A.A. (2017). *Teaching Science Through Inquiry-Based*

*Instruction* *(13th ed)*. Pearson: Boston, MA.

Cross, A., Borthwick, A., Beswick, K., Board, J., & Chippindall, J. (2016). *Curious learners in*

*primary maths, science, computing and DT*. Thousand Oaks, CA: Sage Publishing.

Hooks, B. (1994). *Teaching to transgress: Education as the practice of freedom*. New York, NY:

Routledge.

Stinson, D. & Wagner, A. (2012). *Teaching Mathematics for Social Justice: Conversations with*

*educators.* Reston, VA: National Council of Teachers of Mathematics.

**REQUIRED READINGS FOR COURSE (on Moodle)**

Bashman, J.D., & Marino, M.T. (2013). Understanding STEM education and supporting

students through universal design for learning. *Teaching Exceptional Children, 45*(4), 8-15.

Bennett, C. A. (2010). “It's hard getting kids to talk about math”: Helping new teachers

improve mathematical discourse. *Action In Teacher Education*, *32*(3), 79-89.

Bryant, D. P., Bryant, B. R., Gersten, R., Scammacca, N., & Chavez, M. M. (2008). Mathematics intervention for first- and second-grade students with mathematics difficulties: The effects of tier 2 intervention delivered as booster lessons. *Remedial & Special Education*, *29*(1), 20-32.

Buck Institute for Education. (2013). *Project based learning for the 21st Century*. Retrieved from <http://www.bie.org>

Chahine, I. (2013). Towards an engaged pedagogy: Bell Hooks manifesto and the teaching and learning of mathematics. *Global Journal of Human Social Science Linguistics & Education. 13*(10), 22-26.

Covington Clarkson, L.M. & Robinson Johnstone, J. (2011). When the African-centered paradigm is not enough: Lessons from an urban charter school. *Journal of Negro Education, 80*(2), 108-120.

Fredette, M. (2013). For these schools, adding arts to STEM boosts curriculum. *The Journal*. Retrieved from <https://thejournal.com/articles/2013/10/17/for-these-schools-adding-arts-to-stem-boosts-curriculum.aspx>

Hefty, L. (2015). STEM gives meaning to mathematics. *Teaching Children Mathematics, 21*(7), 422-429.

Hinton, M. (2016). Diversity Gaps in Computer Science Education. *Education Week*, *36*(10), 5.

Ladson-Billings, G., & Tate, W. (1995). Toward a critical race theory of education. *Teachers College Record, 97*(1), 47-68.

Reeve, R., & Sharkawy, A. (2014). Science education for social justice using the knowledge-building communities model. *LEARNing Landscapes, 7*(2), 283-298

**TECHNOLOGY REQUIREMENTS**

Technology tools, such as Moodle, VoiceThread, and other online web-based applications have been integrated into this course. The website address for Moodle is <http://moodle.redlands.edu>. There is no charge for the use of Moodle. Additional web-based projects will be assigned; therefore, access to a device (laptop, desktop, or smartphone) is essential for this course.

**Required Software:**

* The projects for this course will require Microsoft Office 2010 or 2013 (standard edition is sufficient) and an internet browser (i.e., Internet Explorer, Firefox, Chrome, or Safari). If you do not currently own Office, all University of Redlands students have free access to Office 365 using their MyRedlands account. The required elements of the assignments can be completed using a Macintosh computer or Windows-based operating system.
* Some projects will require the submission of video commentary, which can be accomplished using a webcam or embedded camera on a desktop, laptop, tablet, or smartphone.

**Technical Assistance:**

* If you need technical assistance at any time during the course or to report a problem with Moodle, contact the Office of Information Technology Services in the Willis Center at (909) 748-8063.

**COURSE OBJECTIVES**

To meet course objectives, students will:

1. Research and analyze the gaps in the knowledge and skills students learn and the knowledge and skills needed to meet the nation's current workforce development needs.
2. Analyze local, state, and national data comparing equity gaps for students’ achievement in STEM courses.
3. Apply evidence-based methods for differentiating instruction of STEM content and concepts
4. Demonstrate an understanding of the STEM learning processes of modeling, inquiry, and engineering design as utilized in teaching mathematics and science.
5. Apply evidence-based research and redesign a classroom unit utilizing STEM education attributes.

**ASSIGNMENTS AND ASSESSMENTS**

Learning assessments (such as portfolios) are designed to further support educators in teaching STEM content and to support in their efforts to advocate for STEM opportunities and resources in classrooms. Key assignments (KA) for this preparation are as follows:

1. **STEM Portfolio – 30 points** [TPE 6]: Students will create a digital portfolio and will add STEM materials and resources developed in this class that will be useful for teaching STEM related courses. The STEM portfolio will be assessed at the completion of this course. **(Due Date: Wednesday, Week 4)**
2. **Curriculum Assessment – 25 points** [TPE 1,3,5]: Students will analyze data comparing equity gaps for students’ achievement in K-8 STEM classes to design a rubric to evaluate the structure of, and strategies in, an existing STEM unit. Students will then apply knowledge of research and evidence-based teaching strategies to redesign a classroom unit utilizing STEM education attributes in KA #3. **(Due Date: Wednesday, Week 5)**
3. **Curriculum Development/Delivery – 25 points** [TPE 1,2]: Using knowledge acquired from the Curriculum Assessment assignment, students will develop a lesson that includes evidence-based strategies for differentiation of STEM instruction for diverse students including culture/race, ability/disability, gender, age, socioeconomic status. Students will include instructional strategies that infuse problem-solving, rigorous and relevant questions, systems thinking, problem identification, formulation and solution into instruction and develop strategies to overcome the challenge of meeting the needs of every student. Students will demonstrate an understanding of the STEM learning processes of modeling, inquiry, and engineering design used in teaching mathematics and science. **(Due Date: Monday and Wednesday, Week 5)**
4. **Three Design Challenges (15 points each) – 45 points** [TPE 3,4]: Students will work in virtual design teams to solve problems/challenges associated with STEM education. Over the course of the semester, students will complete three challenges. The challenges are designed to immerse students in the learning in which their own students will engage. Instructions for each challenge will be available online via video. **(Due Date: Weeks 2, 3, and 4)**
5. **Weekly Discussion Board Participation – 25 points** [TPE 1,2,3,4,5,6]: Throughout the semester/term, students will participate in seven weekly discussion board conversations by posting one (1) initial response to a prompt every Monday (3 points), followed by two (2) replies to classmates before Saturday of every week (1 point each).

(**Due Dates: Every Monday – Initial posts, and two follow up posts by every Saturday)**

1. **Reflection Project – 50 points** [TPE 6]: Students will describe their experience in this course, specifically the successes, challenges, and new lessons learned in designing engaging instruction while meeting the needs of diverse learners. The project (e.g., 3-5 page paper) should be submitted on Moodle and include citations in APA format. **(Due Date: Week 5)**

The final grade assigned for this course will be based on the percentage of total points earned and are assigned as follows:

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| Letter Grade | Points | Letter Grade | Points | Letter Grade | Points |
| A (4.0) | 185-200 | B- (2.7) | 160-164 | D- (0.7) | 120-129 |
| A- (3.7) | 180-184 | C (2.3) | 150-159 | F (0.0) | 0-119 |
| B+ (3.3) | 172-179 | C- (1.7) | 140-149 |  |  |
| B (3.0) | 165-170 | D (1.3) | 130-139 |  |  |

**GRADING SYSTEM/SCALE**

(See University Catalog)

4.0 or 3.7 Outstanding

* The student displayed exceptional grasp of the material, frequently with evidence of intellectual insight and original thought. Above and beyond expectations.
* Department Expectation: Any assignment required to be written in APA format is organized, unbiased, and clear with correct and consistent verb tense, subject and verb agreement, singular and plural pronoun agreement, punctuation, spelling, abbreviations, quotations and paraphrases, citations, and references formatted to the sixth edition of the Publication manual of the American Psychology Association (APA).

3.3 or 3.0 Excellent

* The student’s work demonstrated a thorough grasp of the material with occasional errors and omissions. Assignments were thoroughly and completely done, with careful attention to detail and clarity and with evidence of intellectual insight.
* Department Expectation: Any assignment required to be written in APA format is organized, unbiased, and clear manuscript with occasional errors and omissions in verb tense, subject and verb agreement, singular and plural pronoun agreement, punctuation, spelling, abbreviations, quotations and paraphrases, citations, and references formatted to the sixth edition of the Publication manual of the American Psychology Association (APA).

2.7, 2.3, or 2.0 Acceptable

* The quality of work was acceptable, meeting minimal course standards, but was not exceptional. Performance on assignments was satisfactory and demonstrated that the student was keeping up with the material and attending to detail.
* Department Expectation: Any assignment required to be written in APA format contains errors and omissions in verb tense, subject and verb agreement, singular and plural pronoun agreement, punctuation, spelling, abbreviations, quotations and paraphrases, citations, and references formatted to the sixth edition of the Publication manual of the American Psychology Association (APA).

**Graduate students will not receive credit for a course awarded a grade of 1.7 or below. A cumulative grade point average below 3.0 is not sufficient for good standing in graduate programs.**  1.7, 1.3, 1.0, 0.7, 0.0 Unacceptable for graduate credit.

**MINIMUM COURSE CREDIT REQUIREMENT FOR TEACHER CREDENTIAL CANDIDATES**

Students must receive at least a 2.0 to earn credit for the course. The MALT program requires a cumulative grade point average of 3.0 for degree completion and/or credential recommendation.

**COURSE POLICIES**

This course has been designed to support candidates’ success in meeting Teacher Performance Evaluations at the highest possible rating.  The process of successfully completing a case study will entail the candidates’ critical reflection about (a) teaching philosophy, (b) various dimensions of literacy education, (c) pedagogical skills, and an (d) articulation of disposition(s) toward diverse identities.  Students can revise work that meets established deadlines and a minimal standard of outlined criteria.

**ACADEMIC HONESTY**

Academic honesty stands at the center of intellectual pursuits in the academic community. All people should clearly understand what constitutes plagiarism and avoid it. See the university catalog for full text of the academic honesty policy.

**ATTENDANCE POLICY**

Class participation is a critical component and requirement in all courses, and students are expected to attend all class sessions. We realize that emergencies can arise and students need to make important and difficult choices. Students are always responsible for informing the instructor of an absence and making up all required class assignments. Any student who misses more than two sessions of a course may be required to retake the course.

**ACCOMMODATIONS FOR LEARNING**

If you feel you need accommodation to address the impact of a learning or physical disability, please speak with me privately to discuss your specific needs. To coordinate reasonable accommodations for documented disabilities, contact Academic Success and Disability Services at 909-748-8108 or visit them on the bottom floor of the Armacost library.

**COURSE CALENDAR (Subject to Change)**

| **Meeting** | **Topic** | **Assignments Due** | **Readings Due Mondays** |
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| Week 1 | A Sojourn into the Empowering Uncertainties of Teaching and Learning STEM for Social Change | Discussion Post #1  (KA #5) | Article (on Moodle):  STEM gives meaning to mathematics  Textbook Reading(s):  Stinson & Wagner (pp. 1-34) |
| Week 2 | Harnessing Curiosity in STEM - Beyond Apples, Puppy Dogs, and Ice Cream. | Discussion Post #2  (KA #5)  Design Challenge #1  (KA #4) | Article:  Science education for social justice using knowledge-building communities model  Textbook Reading(s):  Van de Walle (Chpts. 1 & 2)  Stinson & Wagner (pp. 81-98)  Cross et al. (Chpts. 1 & 2) |
| Week 3 | Understanding STEM Education and Supporting Students through UDL and the Effects of Tier Intervention | Discussion Post #3  (KA #5)  STEM Portfolio  (KA #1)  Design Challenge  (KA #4) | Articles (on Moodle):  Understanding STEM education and supporting students through UDL  Mathematics intervention for first- and second-grade students |
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| Week 4 | Adding Arts to STEM, Is This Teaching Mathematics for Social Justice? | Discussion Post #4  (KA #5)  Design Challenge  (KA #4) | Article (on Moodle):  For these schools, adding arts to STEM boosts curriculum  Textbook Reading(s):  Van de Walle (Chpts. 3, 4, 5)    Stinson & Wagner (pp. 113-126) |
| Week 5 | Strategies For Motivating the Unmotivated | Discussion Post #5  (KA #5)  Curriculum Assessment (KA #2) | Articles (on Moodle):  “It’s hard getting kids to talk about math”  Textbook:  Van de Walle (Chpts. 6 & 7)  Optional Textbook Reading(s):  Cross et al. (Chpts. 3, 4, 5) |
| Week 6 | STEM+C (Computing) – Where Are We Going? | Discussion Post #6  (KA #5)  Curriculum  Development/Delivery (KA #3) | Article:  Diversity gaps in computer science education  Optional Textbook Reading(s):  Cross et al. (Chpts. 6 & 7) |
| Week 7 | What Does This All Mean? What Now? | Reflection Project  (KA #6) | Article:  Towards and Engaged Pedagogy  Textbook Reading:  Stinson & Wagner (pp. 175-186) |