CULTURALLY RESPONSIVE MATHEMATICS WITH APPLIED TECHNOLOGIES

Overview

EDG 6931 | University of Florida | Thurs, 9:00 AM – 11:00 AM | Spring 2022 | Hybrid Course

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COURSE INFORMATION

Description

Culturally Responsive Mathematics with Applied Technologies is a graduate-level course designed to i**ncorporate technology and culturally sustaining pedagogy in mathematics education, allowing for a customized learning experience that fosters active engagement**.

We will study the methods that can help math educators utilize technology to enhance student learning, engagement, cultural relevance, STEM identity development, and real-world problem solving.

Students will learn how to translate traditional mathematics into technology-based teaching. The software used throughout the class is freely available or does not require a purchase to complete the course.

Objectives

- Students will utilize innovative technologies to solve real-world educational problems.
- Students will develop their identity and value in the STEM field through technology and mathematics.
- Students will experiment with curated software to translate traditional math concepts to technology-based lesson plans.
- Students will analyze the current global issues in social or economic contexts and implement lesson plans that allow for culturally relevant teaching through technology integration.
- Students will explore and critique technology-based conceptual frameworks, such as game-based learning, incidental learning, instructional design principles, and collaborative online environments.

- Students will build professionally applicable skills and projects. The projects provided by this class are preparation for future academic and career pursuits.
- Students will inspire learner's enthusiasm for mathematical language, tools, and thinking.

COURSE REQUIREMENTS

Assignments

- **Discussion and Participation (15%):** Participation in synchronous class and asynchronous weekly discussions is required. The class format will take place in interactive lessons where students have many opportunities to engage with the professors, peers, and material.

  Resources will be used to accommodate communication styles of students, and discussion/feedback will take place through verbal and written mediums. Class sessions will be recorded in-case of absence, and non-attending students will be required to submit a reflection of the class discussion after watching the recording.

- **Weekly Assignments & Reflection (15%):** Weekly assignments will be provided as a supplement to class content. These assignments are present to familiarize students with a variety of software outside of the permitted class time.

  Upon completion of the assignment and readings for each week, students are encouraged to submit a reflection of what they learned and how it can be applied to their professional work. Quizzes will be administered during key checkpoints of the class to review understanding of previous concepts.

- **Culturally Relevant Project (20%):** Students will have three projects to complete for the semester. Each project is created with the purpose of building agency and application of learned skills. For this project, students are allowed to select one software (either showcased in class or a software they are interested in from outside of class) to create a single session lesson plan.

  The plan must cover a culturally sustaining concept: identity building, representation, agency, or community inclusive. These concepts should focus on connecting students to their teachers and learning materials. The subject selected should be one of value or personal relevance.

This lesson plan will be submitted prior to the class session occurring on the due date. Students will teach the class (individually or groups) for 20 minutes during the synchronous class session. After the class session, a reflection of the teaching should be submitted on Canvas.

- **STEM/Non-STEM Development Project (20%):** This project is designed for students to consider how technology can impact educational subjects and benefit learners of varying interests. Although this course is Math-based, the goal is to recognize similarities that exist between all subjects.

  Students will choose a technology-based tool, software, or hardware, and research how this can be applied to a subject outside of their specialization. (Example: sustainability, art, language, or any subject that is important to them.) A plan will be developed to implement this teaching method in schools. In the class session, each individual or group will host a workshop conference session of their chosen technology and explain how it is useful or applicable to all educational contexts.

  Peers will act as audience members and participate in workshop sessions. Students are encouraged to choose a topic that has not seen widespread use in K-12 or college environments. Demonstrative materials and explanations will be submitted prior to the workshop.

- **Final Project (30%):** The goal of this project is examining the intersection between math and technology. With this project's completion, a unique and applicable plan, tool, or creative idea partially developed. This project is assigned to address actions that individuals can take in local communities, personal development, or services that lead towards positive change.

  Students will pick an educational conceptual framework that is applicable to technology-based learning (either covered in class or of their own discovery), alongside a math concept of interest. They are tasked with examining the relationship between these concepts and applying this knowledge to a plan of action. This plan could be a research project, an educational tool of their own creation, coursework, business/startup idea, or creative development of any kind.

  The project idea is completely up to the student but must analyze the intersection between math and technology. Documentation must be submitted on their work process, tools, methodologies, and a visual storytelling experience is required to represent the progress that has been made.

Readings

- Attard, C., & Holmes, K. (2020). “It gives you that sense of hope”: An exploration of technology use to mediate student engagement with mathematics. Heliyon, 6(1), e02945. https://doi.org/10.1016/j.heliyon.2019.e02945

- Barr, M. (2017). Video games can develop graduate skills in higher education students: A randomised trial. *Computers & Education*, *113*, 86–97. https://doi.org/10.1016/j.compedu.2017.05.016

- Barr, M. (2018). Student attitudes to games-based skills development: Learning from video games in higher education. *Computers in Human Behavior*, *80*, 283–294. https://doi.org/10.1016/j.chb.2017.11.030

- Barr, M., & Copeland-Stewart, A. (2021). Playing Video Games During the COVID-19 Pandemic and Effects on Players’ Well-Being. Games and Culture, 15554120211017036. https://doi.org/10.1177/15554120211017036

- Biller, L. (2020). Trouble in Lakeland: This Game Teaches the Impact of the Dairy Industry on the Lakes. Field Day Lab. https://medium.com/fielddaylab/kids-are-using-lakeland-to-play-through-the-phosphorus-cycle-and-talk-about-poop-in-class-7c5bed32461c

- Brown, B. A., Boda, P., Lemmi, C., & Monroe, X. (2019). Moving Culturally Relevant Pedagogy From Theory to Practice: Exploring Teachers’ Application of Culturally Relevant Education in Science and Mathematics. *Urban Education*, *54*(6), 775–803. https://doi.org/10.1177/0042085918794802

- Cairns, D. R., Curtis, R., Sierros, K. A., & Bolyard, J. J. (2018). Taking Professional Development From 2D to 3D: Design-Based Learning, 2D Modeling, and 3D Fabrication for Authentic Standards-Aligned Lesson Plans. Interdisciplinary Journal of Problem-Based Learning, 12(2). https://doi.org/10.7771/1541-5015.1759

- Clark-Wilson, A., Robutti, O., & Thomas, M. (2020). Teaching with digital technology. Zdm, 1–20. https://doi.org/10.1007/s11858-020-01196-0

- Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018

- Ellison, T. L. (2016). Minecraft, Teachers, Parents, and Learning: What They Need to Know and Understand. 20.
- Flynn, T. (2017). Incidental Learning In The Classroom. Wibbu. https://wibbu.com/incidental-learning-classroom/
- Gewertz, C. (2020). Teaching Math Through a Social Justice Lens. *Education Week*. https://www.edweek.org/teaching-learning/teaching-math-through-a-social-justice-lens/2020/12
- Girls Who Game: Empowering female students to pursue STEM with Minecraft | Minecraft Education Edition. (n.d.). Retrieved December 2, 2021, from https://education.minecraft.net/en-us/blog/girls-who-game-empowering-female-students-to-pursue-stem-with-minecraft
- Laurie, A. (2021). Foster a more collaborative learning environment. Maths — No Problem! https://mathsnoproblem.com/blog/teaching-maths-mastery/4-ways-to-foster-a-more-collaborative-learning-environment/
- Leporati, G. (2020) Inside academia's growing interest in 'Animal Crossing.' (n.d.). *Washington Post*. Retrieved November 18, 2021, from https://www.washingtonpost.com/video-games/2020/07/14/inside-academias-growing-interest-animal-crossing/
- Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual Technologies Trends in Education. *EURASIA Journal of Mathematics, Science and Technology Education*, *13*(2). https://doi.org/10.12973/eurasia.2017.00626a
- New Study: Understanding the Impact of Minecraft in the Math Classroom | Minecraft Education Edition. (n.d.). Retrieved December 2, 2021, from https://education.minecraft.net/en-us/blog/new-study-understanding-the-impact-of-minecraft-in-the-math-classroom
- Powers, R. (2005) Technology in Mathematics Education: Preparing Teachers for the Future – CITE Journal. (n.d.). Retrieved November 18, 2021, from https://citejournal.org/volume-5/issue-3-05/mathematics/technology-in-mathematics-education-preparing-teachers-for-the-future
- Reinhold, F., Hoch, S., Werner, B., Richter-Gebert, J., & Reiss, K. (2020). Learning fractions with and without educational technology: What matters for high-achieving and low-achieving students? Learning and Instruction, 65, 101264. https://doi.org/10.1016/j.learninstruc.2019.101264

- Schindler, L. A., Burkholder, G. J., Morad, O. A., & Marsh, C. (2017). Computer-based technology and student engagement: A critical review of the literature. *International Journal of Educational Technology in Higher Education*, *14*(1), 25. https://doi.org/10.1186/s41239-017-0063-0
- Sdravopoulou, K., Muñoz González, J. M., & Hidalgo-Ariza, M. D. (2021). Educating Adults with a Location-Based Augmented Reality Game: A Content Analysis Approach. Mathematics, 9(17), 2071. https://doi.org/10.3390/math9172071
- Tezer, M., Yildiz, E. P., Bozkurt, S., & Tangul, H. (2019). The influence of online mathematics learning on prospective teachers mathematics achievement: The role of independent and collaborative learning. World Journal on Educational Technology: Current Issues, 11(4), 257–265. https://doi.org/10.18844/wjet.v11i4.4361
- Trinder, R. (2017). Informal and deliberate learning with new technologies. ELT Journal, 71(4), 401–412. https://doi.org/10.1093/elt/ccw117
- Tutt, P. (2021). From Headache to Helpful—Teachers on Using TikTok in the Classroom. Edutopia. Retrieved November 18, 2021, from https://www.edutopia.org/article/headache-helpful-teachers-using-tiktok-classroom
- Wan, T. (2016). What Video Games Like Doom Teach Us About Learning, According to GBL Guru James Paul Gee—EdSurge News. EdSurge. https://www.edsurge.com/news/2016-09-06-what-video-games-like-doom-teach-us-about-learning-according-to-gbl-guru-james-paul-gee

COURSE SCHEDULE

Week	Date	Topic Covered	Reading	Exercises
Week 1	12/2	Intro to Applied Technology	Tutt, P. (2021) Powers, R. (2005) Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017)	Introductions & Networking Class Survey

Week 2	12/9	Addition and Subtraction	Girls Who Game: Empowering female students to pursue STEM with Minecraft Ellison, T. L. (2016) New Study: Understanding the Impact of Minecraft in the Math Classroom	Minecraft: Subtraction World
Week 3	12/16	Game-Based Learning	Barr, M. (2017) Wan, T. (2016)	Experience Game-Based Education Week 3 Discussion/Reflection
Week 4	12/23	Multiplication and Division	Leporati, G. (2020) Clark-Wilson, A., Robutti, O., & Thomas, M. (2020)	Animal Crossing: Money Multiplication
Week 5	1/6	Culturally Relevant Math Education	Brown, B. A., Boda, P., Lemmi, C., & Monroe, X. (2019) Gewertz, C. (2020).	**Culturally Relevant Project** Week 1-5 Quiz Week 5 Discussion
Week 6	1/13	Online Teaching Tools	Dhawan, S. (2020) Barr, M., & Copeland-Stewart, A. (2021).	Online Learning Environments Exploration Week 6 Discussion
Week 7	1/20	Decimal and Fractions	Reinhold, F., Hoch, S., Werner, B., Richter-Gebert, J., & Reiss, K. (2020)	Minecraft: Decimal Garden
Week 8	1/27	Accidental/Incidental Learning	Flynn, T. (2017)	Learning Through Play Week 8 Discussion
Week 9	2/3	Time, Money, and Commerce	Biller, L. (2020)	Lakeland the Video Game
Week 10	2/10	Technology-Based STEM/Non-STEM	Barr, M. (2018)	**STEM/Non-STEM Development Project**

				Week 6-10 Quiz Week 10 Discussion
Week 11	2/17	Distance and Location	Sdravopoulou, K., Muñoz González, J. M., & Hidalgo-Ariza, M. D. (2021)	Pokémon Go: Wellness and Learning
Week 12	2/24	Learning Styles and Techniques	Attard, C., & Holmes, K. (2020) Trinder, R. (2017)	What's Your Learning Style? Week 12 Discussion/Reflection
Week 13	3/3	Volume/Weight	Cairns, D. R., Curtis, R., Sierros, K. A., & Bolyard, J. J. (2018)	Tinkercad: Virtual Engineering
Week 14	3/10	Collaborative Learning	Laurie, A. (2021) Tezer, M., Yildiz, E. P., Bozkurt, S., & Tangul, H. (2019)	How Does Collaboration Enhance Learning? Week 14 Discussion/Reflection
Week 15	3/17	Applying the Knowledge	Schindler, L. A., Burkholder, G. J., Morad, O. A., & Marsh, C. (2017)	**Final Project** Week 11-15 Quiz Course Feedback

PROJECT SCHEDULE

Week	Date	Project Concept
Week 5	1/6	How can math-based technology utilize culturally relevant pedagogy?
Week 10	2/10	How can technology apply to STEM and other subjects to make learning more inclusive?
Week 15	3/17	How can we use math, culture, and technology to promote sustainable growth in educators, students, and communities?

ADDITIONAL RESOURCES

Grading

A	B+	B	C+	C	D+	D
90 – 100%	85– 89.9%	80 – 84.9%	75 – 79.9%	70 – 74.9%	65 – 69.9%	60 – 64.9%

University Policy

Requirements for class attendance, make-up assignments, and other work are consistent with UF policies found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

In addition, students must adhere to the UEP Attendance Policy (see below). Final grades will be calculated as an overall percentage, according to the above weightings, and then converted to a letter grade.

Please visit the UF undergraduate catalog for more information on UF Grading Policies at

https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Timely Submission of Assignments is expected as a matter of good professional conduct. Any assignment submitted after the due date, without prior arrangement with the instructor, will receive a deduction of up to 3% per day. Unless previously agreed to by the instructor, assignments that are more than two weeks late will not be accepted.

UF's Honesty Policy regarding cheating, plagiarism, etc. states that students are bound by The Honor Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment. The Honor Code specifies behaviors that violate this
code and possible sanctions. (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) Students are also obligated to report any condition that facilitates academic misconduct. If you have any questions or concerns, please consult with the course instructor.

Accommodations: Students requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/)Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. This procedure should be followed as early as possible in the semester.

UEP Attendance Policy: Class attendance is mandatory. Students must attend all class sessions on time and demonstrate professional participation during all activities both in and out of class. For an absence due to illness, medical documentation must be submitted to the course instructor within 48 hours. Absences for personal reasons (e.g., family visits or trips, work commitments, social or sorority events, etc.) will not be excused. Extreme circumstances (e.g., a death in the family) will be considered on a case-by-case basis at the discretion of the instructor.

Students will be held accountable for all material covered in missed classes. Extended due dates for assignments will not be allowed for any absence without prior notification, except in the event of an emergency. Make-ups or extended due dates may be arranged for absences with prior notification and if documentation is submitted and at the discretion of the instructor.

Course Evaluations: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://gatorevals.aa.ufl.edu/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/."

Online Course Privacy: Our class sessions may be audio and/or visually recorded for students in the class to refer back and for enrolled students who are unable to attend live, primarily due to health-related concerns. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to

consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials are prohibited.

For information on privacy policies of the online tools we'll be using, please consult these websites: Zoom (https://zoom.us/privacy) and Canvas/Instructure (https://www.instructure.com/policies/privacy)

Video/Audio Recording of Class Lectures: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil 6 documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. This procedure should be followed as early as possible in the semester.