EDE 468
Integrating Technology in STEM Education

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Instructors:

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Office hours by arrangement

Course Description

This course will push your thinking about and understanding of STEM in K-12 curriculum. Built off experiences as learners, you will develop and analyze various facets of how technology is and can be integrated in STEM classrooms. This class has been conceptualized as the third course in a three-course sequence designed for Noyce Master Teachers preparing to be teacher leaders in digitally rich contexts. As such, the course straddles the tension between what is current in STEM education and what is possible. Envisioning the skills and knowledge teacher leaders should have, based on the emerging consensus of the research and business communities, we push you to think critically and productively about providing students meaningful learning opportunities in STEM. Overarching questions guiding this course include:

- What are we preparing students for?
- How does the use of technology influence STEM practices?
- How do STEM practices influence our use of technology?
- What are barriers hinder the incorporation digitally rich STEM learning opportunities for students?

To address these questions, the structure of this course incorporates affordances of digitally rich teaching and learning. Specifically, instructors will use a combination of face-to-face, synchronous, and asynchronous sessions to achieve learning objectives.

Prerequisites

- This course is intended as the third in a sequence, building from the courses *Teaching and Learning in STEM* (EDE 546) and *Digitally Rich Teaching and Learning in K-12* (EDE 484A), and thus assumes that the participants have already developed a good understanding of issues around the teaching and learning in math and science and assumes proficiency with basic DRTL practices.

- Field experiences are a crucial component of this course. Therefore, participants are expected to be teaching a course where they can implement various course assignments.

Classroom community

The Warner Graduate School of Education and Human Development is dedicated to fostering a learning community that represents and builds on the rich diversity of human experiences, backgrounds, cultures, histories, ideas, and ways of living. Consistent with our dedication to education, leadership, counseling, and human development that can transform lives and make the world more just and humane, we recruit, support and learn with and from students, staff, and faculty from the broadest spectrum of human diversity. Likewise, we seek the same through our interactions with the broader local and global community. See the following link for the Warner School's statement: (http://www.rochester.edu/warner/warnerataglance/diversity.html). See http://www.rochester.edu/diversity/philosophy.html for the University of Rochester's statements about diversity.

It is expected that our class meetings are supportive environments. A fundamental part of our class work is committing each other to fostering an inclusive, anti-oppressive environment where each person takes responsibility for her/his language, actions and interactions. In this course, an anti-oppressive environment means that we work against language, actions, interactions and ideologies that hurt people, whether intentionally or unintentionally. It is important that we listen to each other about how our words and actions are affecting one another and that we talk about a class moment in which something may feel hurtful. The instructor views these skills as essential to good teaching and not simply professional courtesies. This course is an opportunity to practice these social justice skills in our social interactions and academic work.

Actions deemed by the instructor to be detrimental to the development of a supportive environment will first be addressed by a meeting between the instructor and student(s) at the earliest possible convenience of all parties, but no later than the next class session. If these actions continue after the meeting and are deemed disruptive to the social or academic progress of the class, the instructor may seek additional meetings with the individual, which may involve other parties as needed to resolve the situation. Continued detrimental actions may result in consequences for a student's academic standing in the class.

Course Requirements and Expectations

Class Participation

The course utilizes many formats (e.g. seminar, lab activities, online work, etc.), and therefore depends on students' full participation. Thus, attendance in class is essential. In case you are unable to attend a specific class, please let the instructors know in advance and as soon as possible; in addition, make arrangements *with a classmate* in advance in order to make sure that you receive information about what went on in the class that you missed as well as to get copies of all the material distributed in that class. **Any class (Zoom or F2F) missed, for whatever reason, will result in a decrease in your participation grade for that module**.

Reflective Entries

An important component of the course are reflective activities. In most modules we explore, you will complete two reflective entries. One activity entry focuses on how you are connecting the lessons and experiences to your practice. *The individual entries will be shared only with the instructors using the Journal feature in Blackboard. In the second activity, you will reflect on the module focus, consider its benefits and barriers in K12, and project a vision of change.* This entry will use the Discussion feature in Blackboard and shared with an assigned peer group. Your post will be visible to all fellows, however, you will only be expected to engage with posts from your peer group.

Connecting the STEM Curriculum to the World

Directly stemming from a course guiding question, what are we preparing students for?, this activity is designed to highlight uses of STEM in the workplace. Each individual will find 1 example of a STEM application from the "real-world" highlighting ideas, concepts, or technologies addressed in the module and post them for your group to explore. For each example, post a link to the source material, 1-2 sentence description of what it illustrates, and share why you chose it. These will be due approximately half-way through a module so that your group can work with the applications. Your assigned peer group will then discuss and select one example to share with all of the fellows in the course.

"Readings"

Readings will be assigned in each module, and consist of articles/documents, videos, or other software that will be posted on Blackboard. *It is expected that you draw connections to the readings as you participate in course activities.*

Deep Dive into a STEM practice

As a way to connect to your practice, each fellow will do a deep dive focused on a STEM practice. Once each module, fellows will record a brief, no more than 5-minute, clip of their teaching to be shared with a partner that highlights one of the STEM practices. The debrief with the partner will focus on the role the selected practice has in supporting student learning and reimagining how technology use can support other practices. A total of four examples will be collected and analyzed throughout the semester. This deep dive also ends with a final reflection on the experience.

Reimagining K-12 Curriculum focused on developing STEM practices through technology use:

This summative assignment involves working with your peer group on reimagining the K-12 curriculum to more effectively support meaningful STEM learning with technology. Groups will create a 3-minute video showcasing what STEM should be. Connected to this video, fellows will describe the benefits and barriers related to the vision showcased in the video.

Module Specific Experiences and Activities
Each module will engage fellows in unique experiences as learners. Connected to these experiences, fellows will be engaging in inquiry related activities such as designing, creating, communicating, and analyzing. In addition, modules will contain specific discussion prompts and other assignments connected to the focus of the module.

Chart showing general flow for assignments within a Module.

Assignment Description	Due date
● Reflective Entries	Sunday after the end of each Module
● Connecting the STEM Curriculum to the World	Half-way through each Module
● STEM Practice: Application to Practice	Once per Module
● Module Specific Experiences and Activities	Throughout Each Module
● Individual Summative Assessment: Deep Dive into a STEM practice Reflection	End of Course
● Group Summative Assessment: Reimagining K-12 Curriculum focused on developing STEM practices through technology use	End of Course

Course Evaluation

The course grade will be determined on the basis of the student's performance in the various components of the course, according to the following guidelines:

Module 1: Framing the Course (15%)
Module 2: Embodied Play (15%)
Module 3: Data at the Heart of STEM (15%)
Module 4: Models and Simulations (15%)
Module 5: Computational Thinking (15%)
Summative Module (25%)

The specific breakdown of the grading will be presented in each module in Blackboard. The following list can be used as an approximate breakdown of grades in Modules 2-5:

1. Class participation - attending and actively participating in each meeting and doing the related readings and assignments (20%)
2. Reflective Entries (20%)
3. Connecting STEM Curriculum to the World (20%)
4. Deep Dive into a STEM practice - Application (20%)
5. Module Specific Experiences and Activities (20%)

A: *96-100;* **A-:** *91-95;* **B+:** *88-90;* **B:** *84-87;* **B-:** *81-83;* **C:** *71-80;* **F:** *£70*