

MOLLOY UNIVERSITY GRADUATE EDUCATION

Mathematics and Technology in the STEM K-12 Classroom: Data, Coding and Digital Literacy

3 graduate credits

COURSE DESCRIPTION

The 'Mathematics and Technology in the STEM K-12 Classroom: Data, Coding and Digital Literacy' course offers a comprehensive exploration into the integration of mathematical principles and technological advancements in the K-12 educational setting. This online course is designed to introduce teachers and students to the basics of programming and digital literacy, focusing on how these skills can enhance STEM education.

Throughout the course, participants will delve into various coding programs suitable for school environments, fostering an understanding of fundamental programming concepts. The curriculum will also cover theoretical aspects of robotics as part of the broader discussion on technology in education.

A significant focus of the course is on developing problem-solving strategies and digital literacy skills essential for modern educators. Teachers will learn how to effectively incorporate these elements into their teaching practices, with an emphasis on promoting critical thinking and community building among their students.

Additionally, the course includes an analysis of different STEM models and their implications in education, providing educators with insights into integrating technology into their teaching methodologies. Participants will also examine current makerspace models in schools, gaining knowledge on how to adapt these concepts for online learning environments.

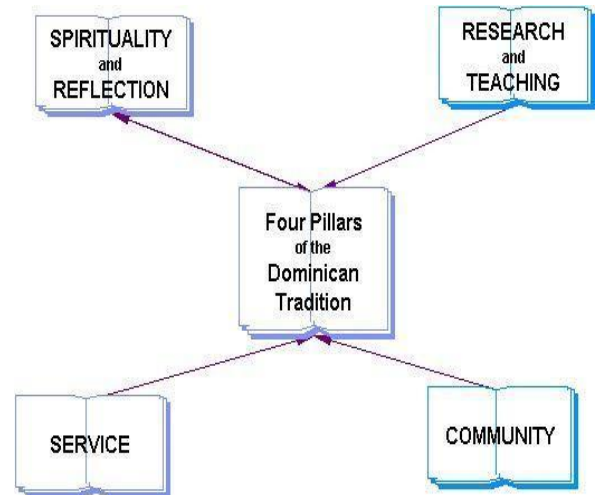
By the end of the course, teachers will be equipped with strategies to integrate data, coding, and digital literacy into their classroom activities, preparing students for the challenges of the 21st century and enhancing the educational experience through the use of technology in STEM education

Shared Vision

The Molloy University Teacher Education faculty has derived its vision for the exemplary teacher from the University's mission statement, the four pillars of the Dominican tradition, comments and input from the Professional Education Unit's Advisory Board and degree candidates as well as numerous faculty discussions rooted in the department's knowledge base which undergirds the initial and advanced programs' curriculum, pedagogy, and values

The teaching professionals who complete Molloy's teacher preparation programs are distinguished by their ability to exemplify and promote core values in their own teaching. These values include:

- Belief that all children can learn
- Learner centered and value-centered curriculum and pedagogy
- Ethics and spirituality
- Intellectual curiosity
- Independence and risk taking, while promoting collective identity and responsibility
- Diversity, multiculturalism and pluralism, including divergent thinking
- Passion for teaching
- Commitment to students and their communities
- Civic responsibility through the promotion of social justice and interdependence
- Commitment to democracy



COURSE OBJECTIVES

STUDENT LEARNING OUTCOMES

Teacher candidates will be able to do the following:

1. **Basic Programming Knowledge:** Acquire foundational skills in basic programming and familiarity with educational programming resources suitable for K-12 classrooms.
2. **Digital Literacy Enhancement:** Develop essential digital literacy skills for navigating and utilizing technology effectively in an educational context.
3. **STEM Integration Techniques:** Learn strategies to integrate basic STEM concepts, especially mathematics and technology, into the curriculum to enrich student learning.
4. **Understanding of Robotics and Makerspace Theory:** Gain theoretical knowledge about the role of robotics and makerspaces in education, and how these can be discussed in an online learning environment.
5. **Data Utilization in Teaching:** Understand how to effectively use and interpret data to enhance teaching methodologies and student learning experiences.

LEARNING COMMUNITY STRATEGIES

Throughout the course, opportunities for discussion, reflection, writing, and analysis will be required to help tie theory and research to situations in schools today.

SUGGESTED READINGS AND OTHER SELECT RESOURCES SUCH AS WEBSITES

Nagler, D. K., & Osei-Yaw, M., (2018). Building a K-12 STEM Lab: a step-by-step guide for school leaders and technology coaches. Portland, Oregon: International Society for Technology in Education.

National Research Council. (2011). *Successful STEM Education: A Workshop Summary*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/13230>. (free download)

Cradler, J., Freeman, M., Cradler, R., McNabb, M. (September 2002). Research Implications for Preparing Teachers to Use Technology. *Learning & Leading with Technology Vol 30, No. 1* 50-54.

Cradler, J., McNabb, M., Freeman, M., Burchett, R. (May 2002). How Does Technology Influence Student Learning. *Learning & Leading with Technology Vol 29, No. 8* 46-56.

Howland, J. L., Jonassen, D., & Marra, R. (2012). *Meaningful learning with technology*. Boston, MA: Pearson.

Course Requirements and Evaluation:

Credit for Benchmark Performances will only be given if uploaded to Chalk and Wire by the required date. Failure to upload by the required date will result in no credit and may result in a failing grade for the course.

Grading Criteria:

1. **Attendance and Participation (20%)**: Regular attendance and active participation in course sessions. This includes contributing to class discussions, sharing insights, and being involved in all interactive aspects of the course.
2. **Engagement in Canvas Discussions (25%)**: Active participation in online discussion forums on Canvas. Students are expected to post thoughtful responses to weekly prompts, engage with their peers' posts, and contribute constructively to the online learning community.
3. **Digital Literacy Reflection and Implementation Plan (30%)**: This assignment requires students to write a reflective essay on the meaning and importance of digital literacy in their classrooms. They should discuss how digital literacy impacts teaching and learning

in the K-12 environment and outline a specific plan for implementing digital literacy principles and practices in their teaching. This plan should include concrete strategies, potential challenges, and expected outcomes for enhancing their students' digital literacy skills.

4. **Data Integration Assignment (25%)**: A practical assignment where students demonstrate how to integrate and use data effectively in a teaching scenario. This could be a case study analysis, a data-driven lesson plan, or a presentation on strategies for incorporating data in classroom teaching.

Academic Integrity Statement:

The University maintains and affirms a strong policy of academic honesty. Every member of the academic community has a duty neither to cheat nor to condone cheating, fabrication, plagiarism, or facilitation of academic dishonesty. Academic infractions are subject to disciplinary action as described in the Graduate Education Student Handbook and the Molloy University Graduate Handbook and Calendar.

Plagiarism is claiming the words, ideas, concepts, outlines, handouts, and drafts of works-in-progress of another as your own without giving credit where it is due. As a component of academic integrity, plagiarism is prohibited at Molloy University. To prevent even the suggestion of plagiarism, quotation marks must be used to indicate the exact words of another author. Additionally, each time you paraphrase another author [*i.e.*, summarize a passage or rearrange the order of a sentence and change some of the words], you will need to credit the source in your text.

Adapted from Principle 6.22 of the *Publication Manual of the American Psychological Association* (6th ed.).

APA Manuscript Style

All manuscripts in the field of education are written in the style format of the American Psychological Association. Candidates in the Graduate Education Programs are required to purchase the *Publication Manual of the American Psychological Association* (6th ed.). (2010). Washington, DC: American Psychological Association. All papers written in every course must adhere to the manuscript prescriptions defined in this manual.

Communicating Across the Curriculum Program: Percentage of Grade Involving Evaluation of Writing, Speaking, Critical Thinking Skills: 25%

Attendance Policy:

Since the classroom experience consists of an exchange of ideas and discussion which cannot be repeated, students are expected to attend all classes punctually and regularly. Attendance and class participation represent 10% of a student's final grade in all graduate education courses. Students who are absent more than **THREE** times during the course of a semester will be assigned an Incomplete grade until the missed time and work is completed. It is the student's responsibility to contact the professor if there are any problems.

As stated in the Molloy University Catalogue:

The grade of "I" is earned in a course when the student has not completed all course requirements. It is a substitute grade given only with the approval of the instructor and Graduate Program Director at the specific request of the student prior to the end of the course. Approval is granted only when the student demonstrates circumstances beyond his/her control, which temporarily prevents completion of the course work. All incompletes must be resolved by the dates indicated in the Academic Calendar for each semester. Any extension beyond the published dates of the Academic Calendar requires written approval of both the instructor and the Director of the Graduate Program.

Any grade of "I" which is not converted to a letter grade within the time allotted, automatically becomes an "F."

Disabilities Statement

Candidates with documented disabilities who believe they may need accommodations in this class are encouraged to contact the Director of the Disabilities Support Service Office. The contact and telephone number is 323-3315.

E-MAIL Policy:

It is mandatory that every candidate have a Molloy University e-mail account and check it daily. Information re: the programs as well as communication from course professors utilize this media. This Molloy e-mail account must be activated immediately. If not utilized within 30 days, the account becomes defunct and needs to be reinstated.

E-Portfolio Account:

All Molloy teacher candidates **must purchase an e-portfolio by registering in EDU 501E so that benchmarks** may be submitted electronically through e-portfolio as part of our assessment

system. Teacher candidates must keep an up-to-date portfolio, which will be used during each advisement session.

Information Literacy Statement

Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information."

Information literacy also is increasingly important in the contemporary environment of rapid technological change and proliferating information resources. Because of the escalating complexity of this environment, individuals are faced with diverse, abundant information choices--in their academic studies, in the workplace, and in their personal lives. Information is available through libraries, community resources, special interest organizations, media, and the Internet--and increasingly, information comes to individuals in unfiltered formats, raising questions about its authenticity, validity, and reliability. In addition, information is available through multiple media, including graphical, aural, and textual, and these pose new challenges for individuals in evaluating and understanding it. The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively.

Information literacy forms the basis for lifelong learning. It is common to all disciplines, to all learning environments, and to all levels of education. It enables learners to master content and extend their investigations, become more self-directed, and assume greater control over their own learning.