

Course Syllabus - Fall 2016

Course Title: Introduction to STEM in the Classroom

Course Code:

Course Semester and Dates: Fall 2016

Instructor Information:

<i>Instructor Name(s):</i>	Colleen Williams	Justin Marriott
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<i>Course Location</i>	Founders Memorial School, ETSD	

Course Description:

This course will focus on developing a deep understanding of current practices for integrating learning across Science, Technology, Engineering and Math. It will focus on integrating NGSS, CCSS and ISTE national learning standards. It will increase collaboration for students as well as educators through intentional lesson planning which seamlessly integrates STEM.

This course will provide an introduction to the foundations of science, technology, engineering and math (STEM) teaching and learning as well as strategies to integrate STEM into classroom settings. Throughout this course we will address STEM education disciplines, STEM pedagogy, integration of STEM, formative assessments and project-based / problem-based instruction and learning. This new way to think about integrated teaching will allow for student learning to be self-directed and student thinking to be integrated across multiple disciplines.

Participants will collaborate with each other to learn and discuss course content in a hybrid course format through both face to face and online learning sessions. Participants will develop an understanding of course content through course readings, class and small group discussions, course research, projects and assignments, including a final culminating project of developing a design brief/ unit around STEM.

Course Objectives:

This course will explore connections among state and national academic and technology learning standards through class work and course content. In order to increase student engagement and higher order thinking skills. We will focus on redefining instructional practices through the lens of science, technology, engineering and math (STEM) integrated pedagogy. We will explore STEM resources and create a project-based learning experience that aligns with CCSS, NGSS and ISTE standards.

To obtain these objectives, participants will:

- A. analyze the NGSS/Common Core and ISTE Standards and other content standards to gain a better understanding of how STEM is integrated throughout the standards and connects to local curriculum.
- B. explore formative assessment opportunities in a project based learning environment
- C. participate in both online and face-to-face discussions.
- D. participate in and facilitate project-based learning activities.
- E. participate and create STEM integrated lessons, projects and assessments.
- F. create a project-based learning experience around the area of STEM that increases student learning, creates high level thinking and questioning skills, and solves relevant, real world problems.

Attendance Policy:

Please note that course attendance is very important. Missing any class time or assignments without instructor approval and completion of any required make up work will result in a lower grade for the course. Class attendance on the first day and the final day of class is mandatory and non-negotiable. If you can not attend both days of class for any reason, please contact the instructors.

*(*Please note the attendance policy is aligned with the University or Institution offering the course credit)*

Office Hours:

Instructors will be available in person on face-to-face class days and by e-mail and phone otherwise. Email is the best form of communication.

Course Hours:

Online	Minimum of 27 hours over the course of 8 weeks. (October 9th - December 8th) ** Note - No coursework will occur during the week of November 21st-26th**
Face to face sessions: (Founders Memorial School, Essex Jct.)	First meeting - Saturday, October 8th (6 hours) - 8:00am - 3:00pm Four In-Person meetings - (3 hours each) Thursday, October 20th Thursday, November 3rd Thursday, November 17th Thursday, December 8th 4:00pm - 7:00pm Total = 18 hours

Course Evaluation and Grading Requirements:

Readings and discussions of required text and resources - **(25%)**

In-class Participation / Presentations - **(25%)**

Quality and appropriateness of posted assignments and/or projects - **(35%)**

Final project - **(15%)**

Required Readings and Materials:

1. Vasquez, Jo Anne, Cary Sneider, and Michael Comer. *STEM Lesson Essentials, Grades 3-8: Integrating Science, Technology, Engineering, and Mathematics*. New Hampshire: Heinemann, 2013.
2. Krauss, Jane, and Suzie Boss. *Thinking through Project-based Learning: Guiding Deeper Inquiry*. Corwin, 2013.

Additional / Supplemental Readings:

1. [THEISTENationalEducationalTechnologyStandards\(NETS-S\)andPerformance IndicatorsforStudents](#)
2. [NextGenScienceStandards](#)

3. [CommonCoreStateStandards](#)
4. Martinez, Sylvia Libow, and Gary Stager. *Invent to Learn: Making, Tinkering, and Engineering in the Classroom*. California: Constructing Modern Knowledge Press, 2013.
5. *Successful K-12 STEM education: Identifying effective approaches in science, technology, engineering, and mathematics*. (2011). Washington, D.C.: National Academies Press. Successful K-12 STEM Education

Discussion Requirements:

Course discussions will be posted every week on Sunday and due by the following Monday at midnight. You will be expected to post four times per week. You will need to respond to an “open discussion” and your choice of at least one instructor posted discussion question each week. Additionally you will need to respond to a minimum of two of your classmates discussion posts each week. To get full credit for your discussion posts each week you will need to post to the open ended and instructor questions by Wednesday each week.

Criteria	Exemplary	Effective	Unsatisfactory
Timeliness	<ul style="list-style-type: none"> • Submits responses to “open ended” question AND one instructor’s question by Wednesday each week, and then posts two additional responses to classmates posts within a week. 	<ul style="list-style-type: none"> • Submits response to only one “open ended” question and instructor’s question by Wednesday, and then posts one additional responses to classmates posts within a week. 	<ul style="list-style-type: none"> • Does not submit all required responses within a week.
Level of Engagement	<ul style="list-style-type: none"> • Contributes to class activities by offering quality ideas. • Actively engages others in class discussions by inviting their comments. • Constructively challenges the accuracy and relevance of statements made. 	<ul style="list-style-type: none"> • Contributes to class activities by offering ideas. • Often engages others in class discussions by inviting their comments. • Identifies and summarizes main points with some extension of the discussion. 	<ul style="list-style-type: none"> • Occasionally contributes to class activities by offering ideas. • Sometimes has an understanding of main points. • No evidence of extension of the discussion.

	<ul style="list-style-type: none"> Effectively identifies and summarizes main points as well as extends the discussion. 		
Demonstrate Knowledge and Understanding	<ul style="list-style-type: none"> Responses show evidence of knowledge and understanding of course content and is applicable to professional practice, also extends the learning of the discussion. Includes relevant direct facts and/or quotes from course readings. 	<ul style="list-style-type: none"> Responses show evidence of knowledge and understanding of course content and is applicable to professional practice. Includes references to course readings. 	<ul style="list-style-type: none"> Responses show little evidence of knowledge and understanding of course content and may be confusing. Does not include references to course readings.

Course Overview:

<u>Course Meetings And Online Learning</u>	<u>Topic(s)</u>	<u>Assignments</u>
Day #1 - Face to face	Agenda: <ul style="list-style-type: none"> Course Boot Camp LMS Course Requirements Intro to STEM Week 1 Assignment questions 	Tasks: <ul style="list-style-type: none"> TED talk videos and Discussion Intro to STEM article and Discussion Marshmallow Challenge
Online Week #1	<u>TheWHATandWHYofSTEM Education</u> <ul style="list-style-type: none"> Defining STEM Education 	Readings and Discussions: <u>Textbook(s):</u>

	<ul style="list-style-type: none"> - Comparing STEM and Traditional Education. - STEM spaces and Materials. 	<ul style="list-style-type: none"> - STEM Lesson Essentials - Chapters 1-2 - Thinking Through Project Based Learning <ul style="list-style-type: none"> - Chapter 3 - STEMIntegrationinK-12 Education:Chapter1 (Introduction) <p>Additional Readings:</p> <ul style="list-style-type: none"> - 10InnovativeWaysto BringSTEMtoSchools - HowToGetYourSchool ReadyforSTEM - <p>Assignments / Projects:</p> <ul style="list-style-type: none"> - Pitch to your Colleagues to Increase STEM Education - Presentation
Online Week #2	<p><u>ImportanceofSTEMEducation</u></p> <ul style="list-style-type: none"> - Learning opportunities - STEM approach to teaching - Integration of STEM learning standards and content. 	<p>Readings and Discussions:</p> <p><u>Textbook(s):</u></p> <ul style="list-style-type: none"> - STEM Lesson Essentials - Chapters 3-4 - Thinking Through Project Based Learning <ul style="list-style-type: none"> - Chapter 6 - SuccessfulK-12STEM Education <p>Assignments / Projects:</p> <ul style="list-style-type: none"> - Opinion Essay - Importance of STEM Education
Day #2 - Face to face	<p>Agenda:</p> <ul style="list-style-type: none"> - STEM standards 	<p>Tasks:</p> <ul style="list-style-type: none"> - Mapping the Standards assignment - Design Briefs as a Teaching Tool - STEM and Blooms
Online Week #3	<p><u>MakerspaceandGeniusHour</u></p>	<p>Readings and Discussions:</p>

	<ul style="list-style-type: none"> - What are Makerspaces and how to the connect to STEM? - What is Genius and how is it related to STEM? - Student choice learning - Creativity in kids - Using design models - Teacher questioning and student driven projects 	<p><u>Textbook(s):</u></p> <ul style="list-style-type: none"> - Invent to Learn- Chapter3 and Chapter5 - Thinking Through Project Based Learning - Chapters 4 and 11 - MakerMovementMovingIntoClassrooms - WhatisGeniusHour? - SirKenRobinsononSchoolKillingCreativity - SirKenRobinsononFlourishingCreativity <p>Assignments / Projects:</p> <ul style="list-style-type: none"> - Multimedia Presentation - How do Makerspaces and/or Genius Hour promote STEM learning.
Online Week #4	<p><u>IntegratedSTEM</u></p> <ul style="list-style-type: none"> - Teaching approaches and best practices for integrating STEM learning and content. - Backwards mapping and planning strategies. - Integrating without taking away from curriculum completion. 	<p>Readings and Discussions:</p> <ul style="list-style-type: none"> - STEM Lesson Essentials - Chapters 7, 8 and 14 <p>Assignments / Projects:</p> <ul style="list-style-type: none"> - Lesson Plan - Integrated STEM content areas.
Day #3 - Face to face	<p>Agenda:</p> <ul style="list-style-type: none"> - Introduction and importance of using a design brief with students in STEM work 	<p>Tasks:</p> <ul style="list-style-type: none"> - Design Brief Challenge
Online Week #5	<p><u>AssessingSTEMLearning</u></p> <ul style="list-style-type: none"> - Assessing STEM - a new way to think about assessment. - Comparing STEM, PBL assessments and traditional assessments. - How do we assess now and how can we improve 	<p>Readings and Discussions:</p> <ul style="list-style-type: none"> - STEM Lesson Essentials - Chapters 13 - Invent to Learn -Chapter 4 - College Pathways to the Science Education Standards - Chapter1, StandardC - IBLandStudent

	<p>or change what we do.</p>	<ul style="list-style-type: none"> - AssessmentinSTEM - DemonstratingAuthenticPBL - ComprehensiveAssessment - MultifacetedAssessmentforPBL - PBLPilotMatching <p>Assignments / Projects:</p> <ul style="list-style-type: none"> - Assessment - Create an assessment or set of assessments for your lesson plan.
Online Week #6	<p><u>STEMasProjectBasedLearning</u></p> <ul style="list-style-type: none"> - How are STEM and PBL related? - What does a project based learning experience look like in STEM? - Difference between processes and practices in Science and Engineering. - How do we structure and organize PBL for our students? 	<p>Readings and Discussions:</p> <ul style="list-style-type: none"> - STEM Lesson Essentials - Chapters 5, 6, and 12 - Thinking Through Project Based Learning - Chapters 1 and 5 - WhatisPBL - DesignThinkingandPBL - StrategiesPBLSTEM - ChangingtheClassroomforPBL - 5KeyRigorousPBL <p>Assignments / Projects:</p> <ul style="list-style-type: none"> - Final Project - Create an integrated STEM project-based learning experience.
Day #4 - Face to face	<p>Agenda:</p> <ul style="list-style-type: none"> - Assessments in a STEM based classroom - Final Project description 	<p>Tasks:</p> <ul style="list-style-type: none"> - Create a design brief that connects to your curriculum
Online Week #7	<p><u>PuttingitAllTogether</u></p> <ul style="list-style-type: none"> - Continue working on Final Project 	<p>Readings and Discussions:</p> <ul style="list-style-type: none"> - STEM Lesson Essentials - Chapter 14 - InspirationalSTEMarticle.puttingallthepieces together

		Assignments / Projects: <ul style="list-style-type: none">- Continue working on Final Project
Day #5 - FINAL Face to face	Agenda: <ul style="list-style-type: none">- Small group Final Project share	Tasks: <ul style="list-style-type: none">- Final Reflection