EDUC 235
Teaching Math and Science: Curriculum and Methods

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Pettengill room 309
office hours: Monday, 9:30 – 11:15 Tuesday, 9:30 – 11:30 Wednesday, 1pm – 3 pm
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Monday and Wednesday, 8 – 9:20 am
Location: Pettingill G50

Essential Questions: What will we learn about in this course?

0 How does the brain assimilate new information (a.k.a. “learn”)?
0 What teacher perceptions of learning influence the way their students learn?
0 How can we design curricula learning experiences to maximize learning?
0 What classroom methods and practices maximize student learning?
0 How do math and science teachers address issues specific to their fields?

As an educated person, you have probably spent much of your life developing an opinion about the essential questions of this course. The astonishing reality that all developing teachers face is that the opinions they formed as students about how to teach are only a starting point. In this course, you will grapple with the above questions using a foundation of research, insights of peers, the laboratory of real classrooms, and the wisdom of experienced practitioners. A combination of hands-on experiences, discussion, reflection and practice should both affirm and challenge preexisting notions about what math and science instruction is and should be.

Learning Objectives: What should I be able to do by the end of this course?

1) Observe and reflect upon how student and teacher misconceptions interfere with learning under traditional teaching practices, and explore teaching practices that address this problem.
2) Demonstrate an understanding of how the brain constructs meaning, and describe the implications of that for instructional techniques.
3) Differentiate between traditional lesson design (planning activities) and backward design (providing learning experiences to meet stated learning objectives), and understand how these approaches impact student learning in a curriculum.
4) Use the Curriculum Topic Study process to effectively incorporate research about learning specific to a particular topic, into the design of a curriculum on that topic.
5) Effectively apply the elements of Understanding by Design into a curriculum.
6) Articulate the value of inquiry-based and field-based learning in science education.
7) Observe, reflect on, develop, and employ student-centered teaching methods in the classroom.
8) Incorporate professional vocabulary into writing and class discussions.
**EDUC 235 Syllabus**

**What should I do to be successful in this course?**

0. Be on time, and only miss class or field placement if you have advance permission from the instructor or your host teacher.

0. Use resources independently; including syllabus, rubrics, texts, Lyceum, the peer writing center, field placement resources, and instructor office hours. *All students will be expected to get feedback from the peer writing center on at least one major writing assignment before handing in.*

0. Hand in all assignments on time, unless prior permission has been granted to extend a deadline. *Unless otherwise specified, all forum posts are due by 7 pm the day before class.*

0. Be organized. Keep journals and class materials quickly accessible both in and out of class. You are always welcome to bring a laptop to class.

0. Change your mind willingly. Learning is a dynamic process; if you are doing a good job of it, you will be a different person when this class ends.

0. Approach learning as a community experience; openly discuss and share ideas with your peers, and don’t try to hide ignorance or confusion. While originality is valued, so is collaboration. Seek the best balance.

0. Budget the time you need to read assigned text like a pro. Preview, question, connect with, and interact with text as you go. Take the time to stop and ponder and discuss.

0. Approach informal writing assignments freely. Write what comes to mind first, and address how it reads after your ideas are articulated.

0. Proofread all writing at least one time before handing it in. More, if your writing is shaky.

0. Expect to revise formal writing assignments as many times as it takes to make them high quality before handing in.

**How will I be graded?**

Your grade will be a combination of the above “scholarship” characteristics, and graded assignments of different types:

**Scholarship: 20%**

**Informal Writing 20%**

**Curriculum Unit 20%**

**Lesson Practicum 10%**

**Portfolio 30%**

These categories are further explained below:
EDUC 235 Syllabus

Scholarship: 20%
This category describes the habits you employ as a student to learn and contribute to the experience of your peers. The attributes above describe examples of excellent scholarship.

The rubric below describes how you will be graded in scholarship:

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Exemplary (A)</th>
<th>Meeting Expectations (B)</th>
<th>Partially Meeting Expectations (C)</th>
<th>Not Meeting Expectations (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attendance</strong></td>
<td>An “A” reflects a student’s ability to:</td>
<td>A “B” reflects a student’s ability to:</td>
<td>A “C” reflects a student’s ability to:</td>
<td>A “D” reflects a student’s ability to:</td>
</tr>
<tr>
<td>0</td>
<td>Attend all classes on time and consistently</td>
<td>0</td>
<td>Attend most classes on time, only missing class(es) with instructor permission</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Attend all field placement sessions on time and consistently</td>
<td>0</td>
<td>Attend most field placement sessions on time, only missing session(s) after notifying host teacher in advance</td>
<td>0</td>
</tr>
<tr>
<td><strong>Participation and Preparation</strong></td>
<td>0</td>
<td>Contribute consistently, concisely and insightfully to class discussions</td>
<td>0</td>
<td>Contribute to class discussions</td>
</tr>
<tr>
<td>0</td>
<td>Listen to and build upon classmates’ ideas, in a way that encourages diversity of voices and perspectives, while challenging peers to extend learning</td>
<td>0</td>
<td>Listen to and build upon classmates’ ideas, in a way that encourages diversity of voices and perspectives</td>
<td>0</td>
</tr>
<tr>
<td><strong>Responsibility</strong></td>
<td>0</td>
<td>Meet every deadline</td>
<td>0</td>
<td>Meet most deadlines, including some extensions granted by instructor</td>
</tr>
<tr>
<td>0</td>
<td>Post all assignments on Lyceum by due date (responses due 7 pm the night before)</td>
<td>0</td>
<td>Post all assignments on Lyceum, 90% by 8 pm the night before</td>
<td>0</td>
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<tr>
<td>0</td>
<td>Complete an accurate daily log of time spent in field placement</td>
<td>0</td>
<td>Fulfill most field placement responsibilities, with advance arrangements made for those not met</td>
<td>0</td>
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<tr>
<td>0</td>
<td>Fulfill all field placement responsibilities</td>
<td>0</td>
<td>Fulfill most field placement responsibilities</td>
<td>0</td>
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<tr>
<td>0</td>
<td>Use resources independently (including syllabus, Lyceum, etc.) to answer questions about the class</td>
<td>0</td>
<td>Develop ability to use resources independently (including syllabus, peer writing workshops, Lyceum, etc.)</td>
<td>0</td>
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<tr>
<td>0</td>
<td>Attend peer writing workshop for assistance on more than one occasion</td>
<td>0</td>
<td>Attend peer writing workshop for assistance on at least one occasion</td>
<td>0</td>
</tr>
<tr>
<td><strong>Academic Growth</strong></td>
<td>0</td>
<td>Substantially respond to feedback on work from both instructor, peer writing workshop, and classmates (when appropriate)</td>
<td>0</td>
<td>Respond to most feedback on work</td>
</tr>
<tr>
<td>0</td>
<td>Increasingly and accurately incorporate new vocabulary into written and spoken lexicon</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Writing and class contributions demonstrate increasing awareness of learning objectives as semester progresses.</td>
<td>0</td>
<td>Writing and class contributions incorporates some awareness of learning objectives.</td>
<td>0</td>
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</tbody>
</table>
Also included in this category:

**Random Assignments:** Throughout the semester, you will be given assignments which do not fit into the categories listed below. Your best efforts at completing them will be reflected in this category.

**Vocabulary Collection:** Call it a list, journal, glossary, whatever; since one of your learning objectives includes the acquisition and assimilation of relevant vocabulary, it would be in your best interests to maintain an ongoing record of new words and their meaning. As a class, we will take the time to identify which new words are of most importance.

**Field placement** – You will complete a thirty hour field placement at one of two local schools; Lewiston High School (LHS) or McMahon Elementary. Matches with teachers will be made within the first weeks of class, after which you will be expected to create a regular schedule to observe and contribute to the classroom. You are obligated to meet the schedule you have defined and to notify your host teacher in a timely way if you are unable to be there if something unexpected comes up. Your field experience will provide you with practical opportunities to clarify the ideas in your reading and classroom discussion, and your curriculum unit and lesson will be tailored to this experience.

→ **Field Experience Documentation Requirements**

  **Log Sheets:** You are required to submit a log sheet documenting your visits and signed by the host teacher, as well as an evaluation by your host teacher, in order to receive a grade in this course.

  **Field Experience Journal** (graded as “informal writing” – see later in syllabus for details): Your field notes will document your observations of educational practices in a local classroom or another setting. Completing your journal is a requirement of the scholarship grade. Quality of entries is factored into your “informal writing” grade.

**Informal writing: 20%**

All informal writing has “double-duty” importance. Not only will each piece earn its own grade, which will be averaged into the “informal writing” grade, but you will be incorporating your most insightful informal writing pieces into both your Curriculum Unit assignment, and in your portfolio as evidence of your meeting the course objectives. You will be cranking out a lot of this work, so while you shouldn’t get worked up about each individual piece, you should pour insight and effort into each one, so that your final weeks of the semester are more about collecting and organizing good work than having to generate better work.

To earn the following grades, informal writing pieces must:

<table>
<thead>
<tr>
<th>Exceeds (100%)</th>
<th>Meets (85%)</th>
<th>Partially Meets (70%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Carefully follow prescribed format and guidelines when given</td>
<td>0 Generally follow prescribed format and guidelines when given</td>
<td>0 Demonstrate comprehension of the subject</td>
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<tr>
<td>0 Include original insights demonstrating total intellectual engagement with the subject</td>
<td>0 Include sound insights revealing full comprehension of the subject</td>
<td>0 Be readable</td>
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<td>0 Cite specific observations and/or examples from reading or class to back up ideas</td>
<td>0 Be easy to understand</td>
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<tr>
<td>0 Incorporate other students’ responses and insights into own when appropriate (In discussion or forum)</td>
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<tr>
<td>0 Be well-organized, grammatically correct, and insightful.</td>
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Informal Writing Assignments Include:

One-Minute Essays
These formative writing exercises will be assigned during class as a method to help you collect and make sense of your thoughts, and reflect on how a class activity enriches your understanding of the topic. They will be collected and returned during the next class.

Reflection Responses
You will be expected to write responses to assigned text and class activities throughout the semester. These responses may be framed by questions posed by the instructor or the class; text will usually be assigned with a “reading for purpose” (RfP) question or goal, which should be addressed in your response. These responses will usually be posted on the Lyceum forum site, and you will be expected to keep your own copies as well. Unless otherwise specified, all forum posts are due by 7 pm the day before class.

Field Placement Journal entries
You will record your reflections about each field placement visit in a journal, which you will hand in every few weeks. Your entries may be structured by a specific goal outlined in class, or it may be open for your own analysis. As the semester unfolds, your response journal entries should become longer as you begin to make connections to earlier readings, discussions and experiences, and to examine issues and concepts from multiple perspectives.

Include in each entry the following components:

<table>
<thead>
<tr>
<th>Journal Entry #</th>
<th>Date of visit</th>
<th>Name</th>
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<tbody>
<tr>
<td>0</td>
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<tr>
<td>Summary of relevant observations (relevance based on topic being addressed, either prescribed or of own choosing)</td>
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<tr>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>Connections (to course readings, class activities, concepts studied in other courses, personal experiences, etc.)</td>
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<td></td>
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<tr>
<td>Analysis (what might be happening here, why) / Alternatives (what you might do differently if you were the teacher)</td>
<td></td>
<td></td>
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<tr>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>Questions / Issues (if any) you’d like to know more about</td>
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Curriculum Unit: 20%
Students apply many of the theories and ideas explored in this course in this culminating final project, which will be tailored to the field placement experience. McMahon students will create an elementary math curriculum unit, and students at LHS will create a field-based freshman science curriculum unit. Both schools hope to make use of these curricula in future years.

Students will use the relevant learning results, the Curriculum Study Topic process and the Understanding by Design curriculum design process to create a curriculum unit that incorporates best practices in math or science instruction. Included in this unit will be individual lessons, one of which will be delivered as the Lesson Practicum assignment. In addition to the basic unit design, there will be a rationale statement which connects the unit design to lessons, text, class discussions, and course learning objectives. Field placement journal excerpts and responses may well be incorporated into the written elements of this assignment.
A detailed product descriptor for the curriculum unit assignment will be provided later in the semester.

**Lesson Practicum: 10%**

Students will deliver one of the lessons in the curriculum unit to their host teacher’s class in their field placement. This lesson will be videotaped, and handed in accompanied by a written rationale statement and reflection piece.

A detailed product descriptor for the lesson practicum will be provided later in the semester.

**Portfolio: 30%**

Your job as a student is to meet the learning objectives of this course. In that vein, the most significant assignment you will hand in will be a collection of all the artifacts of your work throughout the semester that you select as evidence of meeting the learning objectives stated on page 1 of the syllabus. Accompanying each artifact will be a rationale explaining how it meets the learning objective assigned.

*Specific guidelines for the final portfolio will be distributed later in the semester, however “mini-deadlines” indicating collection of artifacts for certain learning objectives will be spread at intervals throughout the term to encourage constant attention to this final project. Of course, artifacts chosen for a “mini-deadline” may change by the time the final portfolio is due.*

**What will we be doing?**

The below outline is presented to you as more of a roadmap than a rigid plan. We may take certain detours or cut out others, depending on your learning needs as students and other unpredictable circumstances (such as cancellations). You will be notified of all changes with as much advance notice as you need.

Your most current information will be available on the Lyceum page.

Do pay particular attention to the deadlines column. I do my best to verbally describe assignments during class, but if I don’t announce an upcoming deadline, and it is on the syllabus, consider it to be still valid.

**Texts:**
The textbooks for this class are:


EDUC 235 Syllabus

Other readings will be pulled from journals, books and other resources, including but not limited to:


<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>New Assignments Given (Others may be added)</th>
<th>Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td></td>
<td></td>
<td>Before next class: Post field placement preference: What field placement you prefer and a justification (Elem. Math or HS science)</td>
</tr>
<tr>
<td><strong>Monday</strong></td>
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<td></td>
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<tr>
<td>1/12</td>
<td>A Private Universe</td>
<td>Read Syllabus</td>
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<tr>
<td></td>
<td>Intro to Field</td>
<td>Post on Lyceum forum page: 0 Minimum of 3 questions and/or reflections about the class; anticipations,</td>
<td></td>
</tr>
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<td></td>
<td>Placements</td>
<td>clarifications, concerns 2) Take “Private Universe” quiz 3) Read introductory chapter of both textbooks,</td>
<td></td>
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<td></td>
<td></td>
<td>fill out textbook form  Post response to quiz and textbooks all forum posts due the day before the next class. by 7 pm</td>
<td></td>
</tr>
<tr>
<td><strong>Wednesday</strong></td>
<td>McMahon Elementary Field</td>
<td>1) Read Mary Burns, “Tools for the Mind” 2) BrainMath Chapter 3, “Elements of Learning” Post response on Lyceum</td>
<td>before next class: Post field placement preference: What field placement you prefer and a justification (Elem. Math or HS science)</td>
</tr>
<tr>
<td>1/14</td>
<td>Trip: Smartboard Lesson</td>
<td></td>
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</tr>
<tr>
<td>Week 2</td>
<td>Monday 1/19</td>
<td>NO CLASS</td>
<td>Attend workshops – learn and grow!</td>
</tr>
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<tr>
<td>MLK Day</td>
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</tbody>
</table>

Begin field placement journal. |

<table>
<thead>
<tr>
<th>Week 3</th>
<th>Monday 1/26</th>
<th>Learning &amp; Constructivist Theory</th>
<th>FP journal: Begin looking for evidence of how students learn and how teachers assess learning</th>
<th>Read: Inquiry chapter 4:”Comparing Traditional and Inquiry-Based Science Classrooms</th>
<th>Post response</th>
</tr>
</thead>
</table>

| Wednesday 1/28 | Using Curriculum Topic Study to address Student Misconceptions | Read: 1) *How People Learn*, “Multiplication with Meaning”, p 165 – 166, “Understanding Negative Numbers”, p 166 - 168  
2) Black, et.al, “Working Inside the Black Box”, *Phi Delta Kappan* | Post response |

| Week 4  | Monday 2/2 | Math Lesson Lab | Read: BrainMath: 1) Chapter 5, “Teaching Mathematics to the Preadolescent Brain”  
2) Chapter 6, “Teaching Mathematics to the Adolescent Brain”, 3) Chapter 7, “Recognizing and Addressing Mathematics Difficulties” | Field placement journal entries 1, 2 |
|---------|-------------|-----------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|

| Wednesday 2/4 | Field Trip: Auburn Learning Lab | Read: Last Child in the Woods: “Natural School Reform” | Post response |

<table>
<thead>
<tr>
<th>Week 5</th>
<th>Monday 2/9</th>
<th>Guests: Inventing Math w/ Mt. Ararat Middle School Alternative Students</th>
<th>Read: BrainMath Chapter 1, “Developing Number Sense” and Chapter 2, “Learning to Calculate”</th>
<th>Post response and questions for Winfred</th>
</tr>
</thead>
</table>

| Wednesday 2/11 | Algorithms & Ethnomathematics Learning Associate Guest: Winfred Kiunga | Read 2) New Yorker and/or Mother Jones Somalian article: | Field placement journal entries 3, 4  
Portfolio: artifacts and rationale for learning objectives 1, 2 | Post response |
| Week 6 Monday 2/23 | Kinesthetic Math Lessons | Take: Multiple Intelligences reading & tests  
**Read:** Inquiry chapter 2, “Learning About Inquiry Through Case Studies”  
Then define “inquiry”  
review chapter 1, “Constructing an Understanding of Scientific Inquiry” to see if your were correct.  
[Post response]  |
|-------------------|-------------------------|--------------------------------------------------|
| Wednesday 2/25    | Inquiry Science Lessons | Read  
1) Inquiry Ch 7, “Managing the Inquiry-Based Classroom”  
2) BrainMath Ch 8, “Putting It All Together: Planning Lessons in Pre-K-12”  
[Post response]  |
| Week 7 Monday 3/2  | Curriculum Topic Study for Curriculum Design Project | Research for CTS:  
Find appropriate CTS guide & associated articles  
Write your reflections about what insights you gained & changes you will make to the curriculum  
(Have Learning Results from field placement ready, identify which CTS plan applies)  |
| Wednesday 3/4      | Intro to UbD Essential Questions, Enduring Understandings | Read:  
Choose one of Chapters 9-12 to read and summarize  |
| Week 8 Monday 3/9  | UbD Lesson Planning: Assessment ↔ Objectives | Read:  
Inquiry chapter 8. “Assessing Inquiry”  
Field placement journal entries 5, 6  
CTS due  |
| Wednesday 3/11     | Instructional Methods | Read:  
Collaborative Learning Case Study  |
| Week 9 Monday 3/16 | Making Labs Inquiry-Based | Read  
Inquiry Chapter 6, “Modifying a Lab Activity Into an Inquiry Investigation”  
[Post response]  |
| Wednesday 3/18     | Modifying Labs (cont’d) | Read;  
Sobel “Place-based education” or Orr “Ecological Literacy”  
2) summarize main points of article to present to peers  |
| Week 10 Monday 3/23| Ecological Literacy | read Gene Clough’s work, post questions you have for him  
[Post response & questions]  |
| Wednesday 3/25     | Technological Literacy | Tovani, Ch 5, “Why am I reading this?”  
[Post response]  |
| Week 11 Monday 3/30| Literacy Techniques in Math/Science | Read Reading from Choice Words  
Or “Leaving No Child Behind Yet Allowing None Too Far Ahead…”  
[Post response]  |
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Discussion</th>
</tr>
</thead>
</table>
| **Wednesday 4/1** | How Teacher Language Supports Learning or Standardized Testing | Parallel Play or The Doubting Disease  
Post questions for Eva |
| **Week 12 Monday 4/9** | Aspergers and OCD in Science Students  
Learning Associate  
Guest: Eva Szillery | Lesson Practicum Due |
| **Wednesday 4/11** | Lesson Feedback | Final Curriculum Unit |
| **Final Exam Date** |  | Field Placement Logs  
Final Portfolio |