SCE 5140: Science Curriculum Development
Sections: 30084, 30085, 30086, 30088
Online 8-Weeks: Feb 28 – April 22, 2022

School of Teaching and Learning
College of Education

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Credits: 3 hours
Office hours: Thursdays from 4-7pm**; via Zoom**

Zoom Link: Provided in Canvas

Introduction:
Teachers are important mediators of science curriculum and effective teaching. Teachers translate teaching materials into practice within their classrooms. But, what is a curriculum? Some scholars describe curriculum as the way the science content knowledge is designed, organized, and delivered which includes the structure, balance, and presentation in the classroom (NRC, 2012). Note that while there are alternative conceptions of curriculum, they all have similar goals – facilitation of students' learning. To what extent should classroom teachers and other instructors be engaged in the development of effective teaching materials? This course will focus on the process, instructional framework, and design principles used to inform the development of coherent inquiry-based science instructional materials. We may not, in eight weeks, be able to answer all of the questions posed above. We do know however, that research-based materials and teaching approaches support meaningful science learning of both content knowledge and scientific and engineering practices. We will therefore investigate the breadth of issues that affect curriculum, examine and debate the issues, and formulate your own ideas about the process of curriculum as it relates to your own educational context. As you explore aspects of science curriculum development and the identification of teaching materials from both a theoretical and practical perspective consistent with your teaching context.

The course is divided into three major areas: 1) The history and theoretical questions undergirding the importance of curriculum development, 2) framework supporting reform-based science curriculum and their development, and 3) Development of an inquiry-based unit of study applicable to your context. During the last component, you will revise/create teaching materials and then critically consider ways of teaching your content in your context. Along the way, you will address possible challenges to the implementation of reform-based curriculum. Our examination of the philosophical and structural framework and the research and pedagogical themes underlying curriculum development and enactment will guide the development of your context-specific unit of work – the product from this course. This unit of study, with specific requirements, will be applicable to your own teaching context and can be made available to peers within the course.

Learning Goals: Students will:

1. Examine underlying frameworks of science curriculum development, including learning-goals-driven and backwards designs to guide the planning of a context-specific unit of study.
2. Explore inquiry-based science as an organizing theme in science curriculum development and in transforming teaching practices.
3. Delineate core science ideas and cross cutting themes outlined in the standards for your course and use these as the framework for developing the context-specific unit of study.
4. Discuss challenges associated with the implementation of science curriculum and develop strategies to overcome them in science classrooms.

Required Readings:
Tweed, A. (2009). *Designing effective science instruction: What works in science classrooms*. NSTA Press.

Other Required Readings Texts:
Keeley, P., & Tugel, J. (2020). *Science curriculum topic study: Bridging the gap between three-dimensional standards, research, and practice*. (2nd ed.). Corwin.

Ornstein, A. C., Pajak, E., & Ornstein, S. B. (2011). *Contemporary Issues in Curriculum (5th ed.). Pearson*.

National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.
[Download for FREE: https://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts]

Other Required Readings (Provided through Canvas):
TBA

Course Delivery:
In this 8-week online, graduate level course, (for the most part) weekly readings replace traditional face-to-face interactions with the instructor and your peers. Opportunities are therefore provided for much online conversations and forum discussions as we collectively share our ideas, negotiate, and arrive at consensus about curriculum, science teaching, and learning. Additionally, assignments and reflection questions for each reading will be provided at appropriate points within the eight weeks. Each module will be delivered using the same format. The first item will consist of an introduction to the unit and its relevance to the course as well as a brief description of how individual units connect to each other. The second item will include a set of learning objectives/questions to guide your reading and to provide some focus for your thought process. The third item provides instructions for assignments associated with the course readings and toward the achievement of the learning goals.

Readings are assigned so that your classroom practice and course assignments will be grounded in your understanding of the research and reform efforts that now inform science curriculum and teaching and learning. In the first weeks of the course, much emphasis will be placed on

understanding contemporary curricular framework. You will be expected to read, reflect on concepts within the readings and on their application to your classroom. You will then critically examine existing curriculum. Finally, you will clearly show how you are making sense of the theories by utilizing them to reflect on your own practice, within your own context. After this "deep-dive" into theory and critical examination, we will spend much time on the development and refining specific teaching materials. The **timeliness of your peer feedback** will therefore be crucial to the achievement of the learning goals of this course. While the composition of the group necessitates levels of differentiation in readings and assignments, I expect that together, we will complete the development of a fair amount of curricular materials (applicable to the different grades for K-20 teachers and selected content areas for students in the ASE program). Accordingly, expect to spend about 6-8 hours per week completing course readings, discussions, assignments, classroom implementation or observations, and reflections.

This course is online. However, I would like to negotiate for three zoom class sessions over the 8-week period. I am reserving Tuesday evening sessions from 5:00 – 7:00pm. If this can be arranged, I will make adjustments to the forum discussions of those three weeks. Here are my initial proposed dates: March 1; March 22; and April 19.

Course Requirements

Participation:

While an online course can provide a working professional the flexibility to learn at times that are convenient and conducive to individual learning, I do require that you adhere to deadlines established in the accompanying course schedule. There will be posted guidelines for online participation and for course assignments. The guidelines for online participation are particularly important because students in this class will only be participating in a module at a certain time. If you delay your participation, not only will we not hear your voice in the discussions, but you will not benefit from the feedback and replies of your peers. This course is designed with the principles of social constructivism – meaning that it is the philosophy of the course designer that learning is constructed through social interactions. Therefore, your timely feedback to the curricular materials will be crucial to the quality of the final products.

Standards for on-line discussion:

Respect, honesty, and professionalism are always expected in this course. Please respond in an appropriate fashion. Remember that online and email communications are often misinterpreted because there are no visual cues or body language that might soften your message.

Suggested Schedule:

Modules are one week in duration. Each module begins on Monday and **usually** (but not always, due to holiday schedules) ends on Sunday of the next week. Most of the graded work in this course will be due on Sundays at 11:59pm.

I recommend that you schedule a couple of hours a few nights during the week to work on this course, and do not wait until Sunday night to complete everything in one sitting. This will allow sufficient time for you to engage in meaningful class discussions, ask clarifying questions, and for me to respond in a reasonably good time.

The following is an example of a general schedule that will help you keep pace within each weekly module:

Monday-Tuesday: Read the introduction to the module and respond to the prior knowledge journal (Journal Entry 1) question. Then, complete the assigned readings.

Wednesday-Friday: Submit your initial discussion forum post. Also, read any assignments coming up and start planning for them.

Saturday through Sunday: Respond to your peers in the discussion forum and complete any written assignments. Respond to the sense-making question in your journal (Journal Entry 2) **after** you have completed all assigned readings, discussion, and assignments for the module. I am available via email to discuss any questions you have. Please note that I will endeavor to respond to email within 24 hours on weekdays but may be a bit slower on weekends. I have office hours on Thursdays from 4-7pm, which I will be available to you via email, as well as through Zoom conferencing.

Course Assignments and Grading:

1. ***Online Journal [35 points]***

   In each module of the course, you will respond to a prior knowledge question and a sense-making question in an online journal. These will be labeled as Journal Entry #1 and Journal Entry #2 in each module. You should respond to the prior knowledge question in your journal <u>before</u> you complete the assigned readings, discussion postings, and assignments for the module. You should respond to the sense-making question <u>after</u> you have completed the assigned readings, discussion postings, and assignments for the module. Carefully note deadlines for submission for each Journal Entry type.

   The purposes of these journal entries are to 1) surface your understanding of the course content, and 2) ensure that you are making sense of the content and making connections to your own practice. In addition to specific references to the course readings, your sense-making journal entries must include connections to relevant forum discussions with your peers and should include a deep reflection on how the week's learning will impact your approach to curriculum and teaching materials moving forward utilizing appropriate supporting evidence.

2. ***Participation in Discussion Forums [90 points]***

   In the small group forum discussions, you will first post your response to the prompts provided. This will be followed by your response to the peers in your discussion group and as instructed in the prompt. Your postings should contain full and thoughtful completion of the forum as indicated in the prompt and consistent with quality discussion among educators. The quality of the assignment should be consistent with graduate level requirements including writing and development of ideas related to the course topics and readings. In addition, all forum discussions should contain specific evidence or reference from assigned readings, other literature, your classroom teaching experiences or other resources to support your claims in these discussions, and explicit connections to the posting of your peers. You should also seek to ask thought-provoking questions of your peers. Discussion forums will be assessed for timeliness, depth of thoughtfulness in

relation to the content of the discussion, and where applicable, the level of criticalness and support offered to peers re the quality of their curricular materials.

3. *Application Assignment: Exploring CUE Framework (40 points)*
   Due:
   The purpose of this assignment is to familiarize you with the CUE Framework. For those who do not work in a K-12 classroom, you may observe any form of science instruction (online or face-to-face) related to your area. Please view the assignment on Canvas for more details and rubric. The assignment is broken down into 3 parts: Lesson critique; analysis and reflection and poster presentation

4. *Final Assignment - The Unit of Study (65 points)*
   Due: 4.20
   4a. The purpose of this assignment is to pull everything that you have learned in the program together into one cohesive unit of study. A unit of study is a **series** of lesson plans that have been developed to teach a **central idea** in a subject area. You will select the "Body of Knowledge" and "Big Idea" from Florida's science standards (or area from your teaching context) and you will develop a **coherent** unit of study. *Note: K-12 classroom teachers, your unit of study will comprise your entire 1ˢᵗ 9-week grading period; in other words, you will have more than one unit. Other educators, you can determine the length of your unit.* Details provided on Canvas

   4b. Course Reflection (20 points)
   The Final Assignment is lengthy, comprehensive, and will be developed over time; therefore, it is a large portion of your course grade. Because of the length of this assignment, we will chunk the assignment and integrate it into our module activities and discussion forums during the last half of the course. This will ensure that you receive feedback on your ideas from your peers which you can then use to improve your unit of study.

Total Points:250

Final grades will be calculated as an overall percentage of 250 and then converted to a letter grade using the following scale:

		B+	87 – 89	C+	77 – 79	D+	67 – 69
A	93 – 100	B	83 – 86	C	73 – 76	D	63 – 66
A-	90 – 92	B-	80 – 82	C-	70 – 72	D-	60 – 62

Tentative Course Outline

Mod	Dates	Module Title	Readings
1	2.28	What is curriculum? Curriculum, Decisions and the Purpose of educational Programs	Pre-assessment
2	3.7	Curriculum Conceptions, Design and Teaching Themes	Ornstein, Pajak, & Ornstein (2011)
3	3.14	Building the Framework – **Science core ideas & Learning Goals-driven Design**	Tweed (2009): Ch. 1 & 2 McTighe, J. & Wiggins, G. (2012)/ Wiggins, G. & McTighe, J. (2011) pp. 57-69 AND 89-101 Sample lesson (provided in Canvas)
4	3.21	Building the Framework - **Understanding**	Tweed (2009): Ch. 3
5	3.28	Building the Framework - **Environment**	Tweed (2009): Ch. 4
6	4.4	Designing effective science instruction-Phase 1	National Research Council (2012): p. 7-34 AND chapter 5, 6, or 7 as a reference for an activity. **Application Assignment Due**
7	4.11	Challenges in implementing in reform-based science curriculum materials	National Research Council (2012), p. 277-290. McTighe, J. & Wiggins, G. (2012). Understanding by design framework. **Optional:** Wiggins, G. & McTighe, J. (2011) Understanding by design guide to creating high quality units, pp. 33-56 AND pp. 102-117.
8	4.18	Designing effective science instruction-Phase 2	National Research Council (2012), p. 41 – 79. McTighe, J. & Wiggins, G. (2012). Understanding by design framework. **Optional:** Wiggins, G. & McTighe, J. (2011) Understanding by design guide to creating high quality units, pp. 1-32
	4.22	**Final Assignment Due**	

Course Policies

- **Attendance:** Attendance is required for all the class sessions. Excused absence in this class is consistent with the university policies and require appropriate documentation. A reasonable amount of time will be provided to complete assignment tasks due during the period of excused absence. Additional information can be found in Attendance Policies. In

general, acceptable reasons for absence from or failure to participate in class include illness, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, professional conferences), military obligation, severe weather conditions, religious holidays, and participation in official university activities such as music performances, athletic competition or debate. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) will be excused. Absences related to personal reasons (e.g., family visits or trips, outside work commitments, social or sorority events, etc.) do not fall under the purview of illness or other acceptable absences as defined by the university. Students are responsible for satisfying all academic objectives and requirements of the course and will be held accountable for all material covered in missed classes. The university recognizes the right of the individual professor to make attendance mandatory. Refer to the UF Attendance Policy at https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

- **Professional Conduct:** Attendance and conduct of a professional nature is expected of all students for every class session. Professional conduct includes academic honesty, submission of work reflective of professionals (i.e., thorough and thoughtful responses as opposed to sentence fragments), and respectful behavior by instructors and classmates (active listening, refrain from talking while others are presenting, not being prepared for class, etc.).
- **Work Submission Policy:** Timely submission of assignments is expected as a matter of good professional conduct. All assignments are due on the day identified in this syllabus or negotiated at the beginning of the semester. Late work without excused absence will be accepted but it will accrue a half letter grade deduction (B+ → B) for every day that it is late. Please note that the deduction is based on days, not class periods.

Academic Honesty: Students are bound by the guidelines and regulations established by the University of Florida's policies on academic honesty and integrity. UF students agree to uphold the tenets of the Student Honor Code and violations will be addressed appropriately. The following is The Honor Code as stated in the student handbook (UF, 2008, 6C1-4.041): We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty 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." Each of us is held accountable for the enforcement of UF policies. Examples of violations include plagiarism, unapproved collaboration on projects, submission of any part of another student's work (past or present), using significant portions of text found on websites or in other resources regardless of correct citations, and collaboration and discussion on out-of-class activities. For more information, review the guidelines on: http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php.

University Policy on Accommodating Students with Disabilities: Students requesting accommodation for disabilities must first register with the Dean of Students Office (http://www.dso.ufl.edu/drc/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking

the quizzes or exams. Accommodations are not retroactive; therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

University Policy on Course Evaluation: "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/."

Campus Resources
Student Health, Counseling and Wellness Services

Health and Wellness:
- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.
- Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc/Default.aspx, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.
- Sexual Assault Recovery Services *(SARS)* Student Health Care Center, 392-1161. *University Police Department,* 392-1111 (or 9-1-1 for emergencies). http://www.police.ufl.edu/
- *U Matter, We Care*: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center*: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center*: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.
- *University Police Department*: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).
- *UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

Academic Resources:
- *E-learning technical support*: Contact the UF Computing Help Desk at 352-392-4357 or
- via e-mail at helpdesk@ufl.edu.
   Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance
- and counseling services.
- *Library Support*: Various ways to receive assistance with respect to using the libraries or finding resources.
- *Teaching Center*: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- *Writing Studio:* 2215 Turlington Hall*,* 352-846-1138. Help brainstorming, formatting, and

writing papers.
- *Student Complaints On-Campus*: Visit the Student Honor Code and Student Conduct Code webpage for more information.
- *On-Line Students Complaints*: View the Distance Learning Student Complaint Process.