EDSE 4400/L & EDTE 6931/L: Secondary Science Methods
Fall 2017

3 credits lecture/1 credit lab
Tuesdays 3:05-5:55 p.m. – McCracken Hall 331

The Gladys W. and David H. Patton College of Education

Core Values

We prepare graduates who are CALLED to LEAD: Change Agents who are Lifelong Learners committed to Embracing Diversity and LEADership. Our leader-educators, practitioners, and human service professionals share our commitment to serving society responsibly as change agents in meeting diverse human and social needs and engage in lifelong learning.

Sami Kahn, J.D., Ph.D.
Office: McCracken 309Z
Phone: (O) 740-593-4487
(C) 646-732-5389

Email: kahns@ohio.edu
Office Hours: Wednesdays 3:00-5:00 p.m
and by appointment

Prerequisites (EDSE 4400): A minimum of 12 hours of undergraduate science courses from an approved list; EDSE 3510 – Secondary School Managing and Monitoring of Learning; junior standing.

Textbooks: There are no textbooks for this course. However, a materials fee of $30 is charged to cover the costs of curriculum materials consumed in class or given to you.

Course Description: This course is designed to prepare Adolescent-Young Adult teacher candidates with a broad-based understanding of central issues involved in the learning and teaching of science, and the nature of knowledge in science. These concepts will be integrated into practical activities designed to prepare the candidates for teaching in actual science classrooms and in the community through the integration of service learning projects. Candidates will be expected to design individual lessons and a unit that take into consideration national and state standards, classroom management, student safety, learning theory, assessment, the nature of science, and science in the community. Candidates will also be expected to apply accurate science content, inquiry skills, and practices through class/field activities and assignments. As this course has a service learning component, students will be required to actively participate in and reflect upon meaningful service commitments within the community. Travel to and from service learning sites will be necessary and will be be organized collaboratively through our class. These service learning obligations will require out of class time; however, all efforts will be made to ensure that scheduling and service options are flexible and meet student professional needs and interests.

Course Objectives/Outcomes:
The course outcomes - knowledge, skills, and dispositions – align with the National Science Teachers Association (NSTA) Preservice Science Teacher Standards, Ohio Standards for the Teaching Profession (OSTP), and the conceptual core (CC) standards of the Patton College of Education and

Department of Teacher Education. The alignment chart and NSTA, OSTP, and CC standards are found on pp. 5-6 of this syllabus.

Course Content: Big Ideas

1. Nature of Science – What is the purpose of science? What distinguishes science from other ways of knowing? How can we help students understand the nature of science?
2. Assessment – How can we find out what students know about science and use that information to monitor student learning and inform instructional decision making?
3. Learners – How can we teach science in ways that relate to students' lives and consider their prior knowledge, backgrounds, and experiences?
4. Sequencing Science Instruction – What types of activities comprise science instruction and how should these activities be sequenced to support student learning?
5. Science Teaching Strategies – What are the different science teaching strategies and how can they be used to support students' understanding of science concepts and abilities to engage in scientific practices?
6. Safety – What are best practices for ensuring that students are safe during science lessons?
7. Professional Development – What resources and experiences can enhance our professional development as science teachers?
8. Science and Empowerment – How can science serve as a conduit for personal and community empowerment, equity, and social justice?

Assignments/Evaluation of Student Outcomes

All written assignments should be prepared electronically and submitted via Blackboard. In addition, three assignments must also be submitted through Livetext. Please notify me in advance if you are unable to submit an assignment on time. I reserve the right to deal with late assignments based on the situation. This can include a delayed submission date, loss of points, etc.

NOTE: Three NCATE/CAEP Assessments are Required in EDSE 4400/L & EDCI 6931/L. Submit through Blackboard AND Livetext:

Safety Unit	Unit Plan	Professional Development Reflection

Grading

Scoring rubrics will be provided in advance for each of the following:

1) **Class Participation – (10%)** – Energetic, informed, curious, challenging, dynamic participation is encouraged!
2) **Service Learning Project Requirements – (20%)** – Commit to and engage in at least 10 hours of structured, intentional work on service learning projects with the Ohio Valley Museum of Discovery (www.ovmod.org) and/or Rural Action (www.ruralaction.org). Other opportunities may be available. You will be provided with a menu of service options during the first few weeks of the course. Your commitments may include science teaching in the community, active participation in an environmental conference, field work and/or research, and citizen science projects, among others. You will be assessed on your active engagement and reflections.
3) **Misconceptions in Science/Assessing Student Ideas – (10%)**
   Select a Keeley probe formative assessment (see: http://www.nsta.org/publications/press/uncovering.aspx for description) and identify students' misconceptions regarding a science concept taught in your field experience.
4) **Professional Development Project (10%)**
   Seek out science education professional development opportunities and reflect on them at the end of the semester. This can be accomplished by participating in **two** of the following menu of options: (1) Two OU-NSTA meetings and One OU-NSTA event, (2) CAT Research Symposium, or (3) an equivalent to be approved IN ADVANCE by me (for example, a professional development activity at your field

school, a science talk through the "Science Café" series, a webinar through the NSTA website, etc.). You will reflect on these experiences in a final paper. At least one of the experiences must be science-specific. You will need to verify participation/membership using receipts, signed forms, or other means. ***Submit through BB and LiveText.***

5) **Science Teaching Strategy Presentation – (10%)**
   Individually or in pairs, design a lesson plan and teach a science lesson in the methods course. Then reflect on that experience.
6) **Field Teaching – (10%) Choose <u>one</u> of the following options:**
   - **Inquiry Lesson.** Teach one inquiry lesson in your field placement in which students are collecting data and developing evidence-based explanations. Discuss how the lesson aligns with the essential features of classroom inquiry; **or**
   - **Nature of Science Lesson.** Teach one lesson in your field placement that targets students' understanding of the nature of science. Design an in-depth lesson plan, analyze student work using pre- and post-assessments, and reflect on the teaching experience.
7) **Field Log – (5%)**
   Keep a daily log of your class observations, noting the date, total time observed, grade level, and topic taught – have your cooperating teacher sign this log indicating that you met the class requirements. 60 hours is required.
8) **Safety Unit – (10%)**
   Individually or in groups, design an introductory unit on science classroom safety that you can teach to middle and secondary students at the beginning of the year. The unit will address general safety procedures, emergency safety procedures, maintenance of equipment, chemical safety, and treatment/upkeep of living organisms. ***Submit through BB and LiveText***.
9) **Unit Plan – (15%)**
   Construct an in-depth two-week unit plan that includes at least three full consecutive science lessons. The unit plan will include detailed lesson plans with explanations of the content to be covered, appropriate learning objectives that align with state and national standards, use of equitable formative and summative assessments, accommodations / modifications for students with special needs, considerations of student diversity, use of technology, and use of inquiry and other science teaching strategies. ***Submit through BB and LiveText.***

Letter grades will be assigned using the following standards:

A = 95-100%
A- = 91-94%
B+ = 87-90%
B = 83-86%
B- = 79-82%
C+ = 75-78%
C = 71-74%
C- = 68-70%
D+ = 65-67%
D = 62-64%
D- = 60-61%
Failing below 60%

Please speak to me as soon as possible if issues arise regarding assignments, course participation/completion, illness, or any other situations which impact your progress in this course. I will do my best to work with you to resolve them in a fair and mutually-agreeable manner, if possible

For successful completion of the lab course (EDSE 4400L, EDTE 6931L):

- Spend at least 60 hours of observation and participation in a secondary childhood <u>science</u> classroom. Participation in the classroom can take many forms – working with small group of students, facilitating discussions, tutoring individual students, designing instruction and assessment, grading, helping with classwork or homework, teaching, and so on.

- Teach at least three different whole-class lessons (each on a different day, preferably spread out throughout the semester). This could reflect the lesson submitted for #6 above, plus two others.
- Successfully complete course assignments 2, 3, 6. 7, and 9.

For graduate credit

- Complete requirements for lab course
- Select a topic or issue from the list provided below. Create an annotated bibliography of 10-12 research articles from approximately the last 10 years. Write a one page essay that synthesizes your understanding of the status of knowledge gained in this topic/issue. The list of topics includes (but is not limited to):
    a. Equity and/or Cultural Issues in Science Education
    b. Students' Attitudes and Beliefs towards Science
    c. Science and Technology
    d. Nature of Science
    e. Inquiry/Problem Solving and Student Achievement
    f. Socioscientific Issues

Course Policies

ADA/Accommodations Statement
Any student who suspects s/he may need an accommodation based on the impact of a disability, ethical, or scheduling constraint should contact me privately at the beginning of the semester to discuss the student's specific needs. Students with disabilities should provide written documentation from the Office of Student Accessibility Services. If the student is not yet registered as a student with a disability, s/he should contact the Office of Student Accessibility Services. Please speak to me as early as possible in the semester so that we can develop a thoughtful accommodation plan. Every effort will be made to modify the service learning component in order to accommodate students' needs.

Attendance
Attendance is mandatory and unexcused absences will negatively affect your grade. It is expected that you will telephone, e-mail, or text me **in advance** of an absence. Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide me with notice of the date(s), in writing, by the second class meeting.

Tardiness
Please arrive to class on time. We will frequently begin activities with teammates at the start of class. Your success and that of your classmates depends on your full participation. To that end, repeated (two or more) unexcused incidences of tardiness (15 minutes or more) will be considered grounds for reduction of course grade by one full letter grade.

Assignments
Assignments are due on the date listed on the syllabus. I reserve the right to refuse any late assignment. If an assignment is accepted past the time of the due date it will be subject to reduction of one letter grade of the assigned value unless there are serious extenuating circumstances which have been communicated to me either before the assignment due date or as soon as practicably possible thereafter. Also, please maintain copies of all assignments. In the unlikely event I misplace a submitted assignment, the burden will rest upon you to provide an additional copy.

Policy on Dishonesty and Academic Misconduct
Descriptions of these policy items can be found in the Student Handbook. Both offenses are subject to receiving failing grades and referral to the director of judiciaries, which may result in expulsion from the university. Cheating on examinations, submitting work of other students or entities (i.e., the Internet) as your own, or plagiarism in any form will result in penalties ranging from "F" on an assignment to additional sanctions imposed Ohio University judiciaries, depending on the seriousness of the offense.

Specific violations of plagiarism or embellishing information from web---based sources will be recognized and dealt with according to policy stated above. Students are encouraged to consult the APA Style Guide (6th edition) regarding formatting and references of web-based sources.

Final Comments: I am looking forward to a wonderful semester of learning together. You each bring a wealth of information and experience that will be tremendously useful to our class and to your new career as a secondary science teacher. Please come with an open mind, a strong work ethic, a sense of adventure, and an understanding that you are embarking on one of the most meaningful, challenging, and gratifying of careers!

Alignment of Outcomes (Knowledge/Skills/Dispositions) to NSTA, OSTP, and CC Standards, and with Course Assessments

Knowledge, skills, and dispositions	NSTA	OSTP	CC	Assessment
The preservice teachers will draw upon their knowledge science content, the nature of science, cross--curricular connections, social issues, technology, and a variety of teaching strategies to plan and teach secondary level science lessons that address the state and national standards.	1a, 1b, 1c, 2a, 2b, 3a, 3b, 5c	2, 4	LE 1.1, LE 1.4, LE 1.5, CA 3.2	2, 5, 6, 8, 9
The preservice teachers will develop and use formative assessment strategies to diagnose secondary level students' prior knowledge to inform instructional decision-making, monitor student learning, and develop summative assessments.	2c, 3c, 5a, 5b	1, 4, 5	LE 1.3, D D 2.2, D 2.3, D 2.4, CA 3.1	2, 5, 9
The preservice teachers will plan and teach secondary science lessons that consider students' cognitive, behavior, instructional, cultural, and safety needs.	3b, 3c, 3d, 4a, 4b, 4c, 5c	1, 4, 5	LE 1.3, D 2.1, D 2.2, D 2.3, D 2.4, CA 3.1	2, 5, 6, 8, 9
The preservice teachers will identify and reflect upon strategies, resources, and experiences that develop professional knowledge of secondary level science teaching and help them engage in professional endeavors with educators and community members.	6a, 6b	6, 7	LE 1.6, CA 3.3, CA 3.4, LL 4.2	1, 2, 3, 4, 7

National Science Teachers Association (NSTA) Standards

S1: Content Knowledge – Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure.

S2: Content Pedagogy – Effective teachers of science understand how students learn and develop scientific knowledge. Preservice teachers use scientific inquiry to develop this knowledge for all students.

S3: Learning Environments – Effective teachers of science are able to plan for engaging all students in science learning b setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources – including science---specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met.

S4: Safety – Effective teachers of science can, in a P---12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P---12 science classroom appropriate to their area of licensure.

S5: Impact of Student Learning – Effective teachers of science provide evidence to show that P---12 students' understandings of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach.

S6: Professional Knowledge and Skills – Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community.

Ohio Standards for the Teaching Profession (OSTP)

S1: Student--- Teachers understand student learning and development and respect the diversity of the students they teach.

S2: Content ---Teachers know and understand the content area for which they have instructional responsibility.

S3: Assessment ---Teachers understand and use varied assessments to inform instruction, evaluate and ensure student learning.

S4: Instruction---Teachers plan and deliver effective instruction that advances the learning of each individual student.

S5: Learning Environment ---Teachers create learning environments that promote high levels of learning and achievement for all students.

S6: Collaboration and Communication ---Teachers collaborate and communicate with students, parents, other educators, administrators and the community to support student learning.

S7: Professional Responsibility and Growth --- Teachers assume responsibility for professional growth, performance and involvement as individuals and as members of a learning community.

CONCEPTUAL CORE CANDIDATE PROFICIENCIES FOR TEACHER EDUCATION

- *Leader---Educators/Practitioners*: the Unit prepares expert, ethical and reflective leader--- educators/practitioners and decision---makers who are committed to holistic learning, and engage in collaborative and professional service to society;
- *Change Agents:* the Unit prepares leader---educators/practitioners who address the changing human/social needs through inquiry, research, assessment, critical thinking, problem---solving, and proactive use of technology.
- *Diversity*: the Unit prepares leader---educators/practitioners who appreciate the variety of human cultural expression, employ multiple approaches to inquiry, use knowledge and practice for the benefit of a diverse society, and promote social equity and justice for effective civic engagement.
- *Lifelong Learning:* the Unit prepares leader---educators/practitioners who engage in self---reflection and professional development for continuous personal growth, and who inspire such practices in those whom they serve.

Teacher Education Candidate Proficiencies			
Leader Educator/Practitioner	**Diversity**	**Change Agent**	**Lifelong Learning**
LE 1.1 Demonstrate knowledge in content subject matter (e.g., math, science, special education)	D 2.1 Follow codes of ethical conduct including acting with integrity and fairness	CA 3.1 Advocate for the rights and belief that all students can learn	LL 4.1 Engage in ongoing self--- assessment through critically reviewing and learning from experience
LE 1.2 Use students' strengths to promote learning	D 2.2 Differentiate instruction to address students with diverse and special learning and/or behavioral needs	CA 3.2 Integrate technology into curricular experiences	LL 4.2 Commit to ongoing professional development
LE 1.3 Engage in developmentally and exceptionally appropriate learning activities	D 2.3 Demonstrate knowledge of the influence of context and culture on behavior	CA 3.3 Demonstrate knowledge of the changing educational needs of our society	LL 4.3 Interpret assessment data to improve teaching and student learning
LE 1.4 Collaborate with other disciplines to better serve all students	D 2.4 Foster students' self--- esteem, motivation, character, civic responsibility and respect for individual, cultural, religious, class, and racial differences	CA 3.4 Demonstrate knowledge of and use~~s~~ research to inform practice in teaching and/or other professional endeavors	
LE 1.5. Demonstrate knowledge of and use community resources that benefit students			
LE 1.6 Communicate effectively with parents, colleagues, and community members			
LE 1.7 Include and use formative and summative assessment measures in teaching in a fair and equitable manner			