# Auburn University

Syllabus

1. Course Number: CTSE 4970 or CTSE 7970

Course Title: Spatial Thinking in K12 Education

Course Credits: 1 Semester Hour

Prerequisites: None

Corequisites: None

2. Term: Fall 2017

Day/Time: Every other Monday 3:30 – 5:00 pm

Instructor: Dr. Christine Schnittka

Office Address: 5072 Haley Center

Contact Information: Schnittka@auburn.edu or (334) 844-8277

Office Hours: Monday 1-3 pm and Tuesday 2-4 pm and by appointment

3. Texts: *Learning to Think Spatially* by the National Research Council. Additional readings will be provided through Canvas.

4. Course Description

This course will introduce education students to the field of spatial thinking and visualization skills. It will give all students the opportunity to explore spatial thinking concepts, curricula for spatial thinking development, different fields that rely on spatial thinking skills, research on spatial thinking in K12 education, and assessments for spatial thinking. Students will experience, evaluate, and design interdisciplinary curricula to be used within K-12 classrooms to promote spatial thinking skills in STEM and beyond.

5. Course Objectives

This course examines theoretical and practical perspectives about spatial thinking skills, methods of improving spatial thinking skills in one’s self and in one’s students, and the implications of improved spatial thinking abilities. Students will spend fall semester examining existing curricula and standards in science and other disciplines to identify where and how spatial thinking skills can be developed. They will critically reflect on readings and on presentations by guest speakers. They will learn to examine education with a different lens.

## 6. Course Content Outline

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| --- | --- | --- | --- |
| **Module #** | **Date** | **In Class** | **Assignments Due** |
| **1** | 8-21 | Take Spatial Thinking AssessmentsReview text Introduce course goals and projectsSpatial thinking across K-12 | Read syllabus |
| **2** | 8-28 | Spatial Thinking ActivityShark TankGuest speaker Paul SwamidassReading discussion | Spatial thinking autobiographyReading Response: Chapter 1 |
| **3** | 9-11 | Spatial Thinking ActivityReading discussionGuest speaker Karen McNealSpatial Thinking in Geosciences | Reading Response: Chapter 2Wai, Lubinski, & Benbow (2009) |
| **4** | 9-25 | Spatial Thinking ActivityReading discussionDiscussion about Project | Reading Responses: Chapter 3Swamidass & Schnittka (2017) |
| **5** | 10-9 | Spatial Thinking ActivityReading discussionGuest speaker Peter LivantSpatial Thinking research in chemistry |  Reading Response:Chapter 4NSTA articles |
| **6** | 10-23 | Spatial Thinking ActivityReading discussionGuest visitor Barb BondySpatial thinking in the arts | Reading Response: Chapter 5Andersen (2014) |
| **7** | 11-6 | Spatial Thinking ActivityReading discussionSpatial thinking, individual differences, and training | Reading Response: Chapter 6Bailey & Sims (2014)Linn & Petersen (1985) |
| **8** | 12-4 | Share Projects |  |

### 7. Course Requirements/Evaluation:

### Graded Assignments:

Spatial thinking autobiography: 10 points

Responses to journal article readings: 50 points

Responses to book chapters: 50 points

Class participation: 10 points

Curriculum project: 30 points

Total: 150 points

### Graduate Student Assignment

Research review paper 20 points

### Grading Scale:

|  |  |
| --- | --- |
| Percentage | Grade |
| 91 -100% | A |
| 81 - 90 % | B |
| 71 - 80% | C |
| 70 % or below | F |

**8. Professionalism**:

As faculty, staff, and students interact in professional settings, they are expected to demonstrate professional behaviors as defined in the College’s conceptual framework. These professional commitments or dispositions are listed below:

* Engage in responsible and ethical professional practices
* Contribute to collaborative learning communities
* Demonstrate a commitment to diversity
* Model and nurture intellectual vitality

**9.   Class Policy Statements:**

Participation:  Students are expected to attend class, bring required materials, and participate in all class discussions and participate in all activities.  It is the student’s responsibility to contact the instructor if assignment deadlines are not met.  Students are responsible for initiating arrangements for missed work.

Attendance/Absences:  Attendance is required at each class meeting.  Contact the instructor as soon as you know that you have to miss class for any reason. If an exam is missed, a make-up exam will be given only for University-approved excuses as outlined in the Student Policy Handbook [www.auburn.edu/studentpolicies](http://www.auburn.edu/studentpolicies) .  Arrangement to take the make-up exam must be made in advance.  Students who miss an exam because of illness need a doctor’s statement for verification of sickness and should clear the absence with the instructor the day they return to class.  All absences must be documented and cleared with the instructor **in advance**. All work missed, even class work, will need to be made up and turned in within one week. Homework is always due on the due-date, even if class is missed. Do not wait until the night before class to complete your assignments!

Unannounced quizzes:  There may be unannounced quizzes covering assigned readings.

Accommodations:  Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by e-mail. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).

Honesty Code:  The University Academic Honesty Code and the Student Policy Handbook Rules and Regulations pertaining to Cheating will apply to this class. All work must be original. All infractions of the Academic Honesty Code will be reported to the Provost. (Note: All written work will be scanned for plagiarism. Be sure you know what plagiarism is.) Cheating will likely result in dismissal from the Teacher Education Program, and may result in dismissal from the university.

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**10. Justification for Graduate Credit (for Graduate Credit Only)**

This course provides doctoral students, current teachers, and pre-service teachers who desire an “A” Certificate opportunities to develop an in-depth understanding of how research on spatial thinking can be applied to the classroom.

**THIS SYLLABUS IS A WORK IN PROGRESS. UPDATED VERSIONS WILL BE POSTED ON THE COURSE WEBSITE AND MODIFICATIONS TO ALL ASSIGNMENTS WILL BE MADE AS NECESSARY ON THE COURSE WEBSITE.**

**References:**

Linn, M., & Petersen, A. (1985). Emergence and characterization of sex differences in spatial ability: A meta-analysis. *Child Development, 56(6),* 1479-1498.

Ganesh, B., Wilhelm, J., and Sherrod. S. (2009). The development of a tool for assessment of geometric spatial visualization concepts. *School Science and Mathematics, 109*, 461-472.

Andersen, L. (2014). Visual–Spatial Ability: Important in STEM, Ignored in Gifted Education. *Roeper Review*, *36*(2), 114-121.

Assessing Women in Engineering (AWE) Project. (2005). Visual spatial skills. AWE Research Overviews. Downloaded from <http://www.aweonline.org>.

Wai, J., Lubinski, D., & Benbow, C. P. (2009). Spatial ability for STEM domains: Aligning over 50 years of cumulative psychological knowledge solidifies its importance. *Journal of Educational Psychology, 101(4),* 817-835.

Bailey, S. K., & Sims, V. K. (2014). Self-reported craft expertise predicts maintenance of spatial ability in old age. *Cognitive processing*, *15*(2), 227-231.

Swamidass, P., & Schnittka, C. (2017). Finding and Preparing Teachers to Meet the Needs of US Student Innovators in the Making. *Technology & Innovation*, *18*(4), 331-342.