

## STEAM Education in Early Years Syllabus

- Lecturer: Ching-Ting Hsin/ Associate Professor
- Email: cthsin@mx.nthu.edu.tw
- Time: Tuesday 78 (15:30-17:20)
- Classroom: N201, Nanda Campus

- Class description

The purposes of this class are to help students to understand how to design and implement inquiry-based STEM activities and projects. Standards of early science in U.S. and Taiwan are introduced. Four approaches guide students to design their curriculum: (1) theme-based STEM activities, (2) learning center STEM activities (3) project-based STEM module, and (4) culturally integrated STEM module. Students will use their knowledge and skills that they learn in this class to develop lesson plans and guide kindergarteners to conduct STEM activities. Students will also develop STEM projects.

師培專業素養指標	<p>3. 規劃適切的課程、教學及多元評量</p> <p>3-2 依據課程綱要/大綱、課程理論及教學原理，以協同發展跨領域/群科/科目課程、教學及評量。</p> <p>3-3 具備任教領域/群科/科目所需的專門知識與學科教學知能，以進行教學。</p> <p>5. 認同並實踐教師專業倫理</p> <p>5-3 透過教育實踐與省思，以發展溝通、團隊合作、問題解決及持續專業成長的意願與能力。</p>																																																
師培課程核心內容	<p>3-(4) 幼兒園領域專門知識與教學知能</p> <p>5-(1) 教師自我省思、溝通互動與解決問題</p>																																																
融入議題	<p>➢ 十二年國教 19 項議題融入(系辦最後檢視是否全部議題都有課程勾選)</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td><input type="checkbox"/></td> <td>性別平等教育</td> <td><input type="checkbox"/></td> <td>生命教育</td> <td><input type="checkbox"/></td> <td>能源教育</td> <td><input type="checkbox"/></td> <td>多元文化教育</td> </tr> <tr> <td><input type="checkbox"/></td> <td>人權教育</td> <td><input type="checkbox"/></td> <td>法治教育</td> <td><input type="checkbox"/></td> <td>安全教育</td> <td><input type="checkbox"/></td> <td>閱讀素養</td> </tr> <tr> <td><input type="checkbox"/></td> <td>環境教育</td> <td><input type="checkbox"/></td> <td>科技教育</td> <td><input type="checkbox"/></td> <td>防災教育</td> <td><input type="checkbox"/></td> <td>戶外教育</td> </tr> <tr> <td><input type="checkbox"/></td> <td>海洋教育</td> <td><input type="checkbox"/></td> <td>資訊教育</td> <td><input type="checkbox"/></td> <td>家庭教育</td> <td><input type="checkbox"/></td> <td>國際教育</td> </tr> <tr> <td><input type="checkbox"/></td> <td>品德教育</td> <td><input type="checkbox"/></td> <td>(含數位學習)</td> <td><input type="checkbox"/></td> <td>生涯規劃教育</td> <td><input checked="" type="checkbox"/></td> <td>原住民族教育</td> </tr> </table> <p>➢ 新興議題</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td><input checked="" type="checkbox"/></td> <td>媒體識讀</td> <td><input type="checkbox"/></td> <td>通用設計</td> <td><input type="checkbox"/></td> <td>修復式正義</td> <td><input type="checkbox"/></td> <td></td> </tr> </table>	<input type="checkbox"/>	性別平等教育	<input type="checkbox"/>	生命教育	<input type="checkbox"/>	能源教育	<input type="checkbox"/>	多元文化教育	<input type="checkbox"/>	人權教育	<input type="checkbox"/>	法治教育	<input type="checkbox"/>	安全教育	<input type="checkbox"/>	閱讀素養	<input type="checkbox"/>	環境教育	<input type="checkbox"/>	科技教育	<input type="checkbox"/>	防災教育	<input type="checkbox"/>	戶外教育	<input type="checkbox"/>	海洋教育	<input type="checkbox"/>	資訊教育	<input type="checkbox"/>	家庭教育	<input type="checkbox"/>	國際教育	<input type="checkbox"/>	品德教育	<input type="checkbox"/>	(含數位學習)	<input type="checkbox"/>	生涯規劃教育	<input checked="" type="checkbox"/>	原住民族教育	<input checked="" type="checkbox"/>	媒體識讀	<input type="checkbox"/>	通用設計	<input type="checkbox"/>	修復式正義	<input type="checkbox"/>	
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- Weekly schedule

week	Date	Topic	Reading/assignments
1	2/14	Introduction and grouping Pretest: self-efficacy and outcome expectation in teaching science	
2	2/21	Introduction to STEM Education: Content of STEM STEM activities (Taiwan and Thailand)	Moomaw C1 handouts video clips & PPT
3	2/28	<b>Peace Day</b> <b>(Scratch Jr., Zenbo)</b>	
4	3/7	Effective teaching Inquiry cycle and scientific and engineering practices Guideline for ECE and care in Taiwan: Cognitive domain	Moomaw C1 Gelman et al C3 handouts
5	3/14	STEM activities for learning centers	Moomaw C2 <a href="#">Presentation 1</a>
6	3/21	Haus der Kleinen Forscher (Little Scientists' House) Program: the theme of technology: forces and effects; lights, colors and vision; water & air	Handouts <a href="#">Presentation 2</a>
7	3/28	Computational thinking	PPT
8	4/4	<b>Children's Day</b> <b>(develop lesson plan)</b>	
9	4/11	Driving questions for investigation Project approach: airplane and spinning tops	Krajcik & Czerniak, C3 C4 Helm & Katz, C1 C9
10	4/18	<a href="#">Mid-term exam</a> Design and prepare for teaching STEM in a kindergarten: develop lesson plans	
11	4/25	Design and prepare for teaching STEM in a kindergarten: rehearsal and revised lesson plans	
12	5/2	Teaching a STEM activity in Elementary School Affiliated Kindergarten	
13	5/9	Example of STEM projects: spinning tops, respiratory diseases, ice, tree,	Moomaw C5 Video clip

		movie, quilts Culturally integrated STEM projects: Tom Yum Kung	
14	5/16	Development of STEM project	Turn in lesson plans and reflection
15	5/23	Share and demonstrate STEM projects Posttest: self-efficacy and outcome expectation in teaching science	
16	5/30	Review of the class	Turn in STEM projects

- Teaching methods

Lectures, small group discussion, classroom activities, teaching STEM in a kindergarten, presentations of STEM projects

- Assignments and evaluation

1. STEM activity and project presentations (20%)

Choose one of the two presentations, 3/14 3/21

Choose 2-3 members to form a group. Each group presents 10-15 minutes.

2. Mid-term exam (20%) 4/18

3. A lesson plan and reflection on a STEM activity (25%) due 5/16

- Choose 3-4 members to form a group.

- For the lesson plan: Modify the lesson plan according to your teaching.

Present the best lesson plan. Write the lesson plan in detail. Consider the requirements for the lesson plan (i.e., inquiry cycle, questions/sentences you use to guide children, at least two STEM disciplines)

- For the reflection, 1 page (Word document), 12-point-font, single-spaced.

Consider the following questions when writing: What are the differences between the lesson plan and the actual teaching? What are the activities/sentences/questions you added or removed and what are the reasons? What are the strengths of your teaching? What are the things that you can improve? Do you achieve your objectives and what are the evidences? What have you done or what do you need to do to achieve the objectives? What do you learn from this activity?

4. The web of concepts and activities of the STEM project (25%)

Group work, 3-4 pages (Word document), single space, due 5/30

Determine group members by drawing a lottery. Each group has 3-4 members. Each group presents 15 minutes.

5. Attendance and participation in classroom activities (10%)
  - Readings
    1. Gelman, R., Brenneman, K., Macdonald, G., & Román, M. (2010). *Preschool pathways to science (PrePS): Facilitating scientific ways of thinking, talking, doing, and understanding*. Paul H. Brookes Publishing.
    2. Haus der Kleinen Forscher (Little Scientists' House) Program
    3. Helm, J. H., & Katz, L. G. (2016). *Young investigators: The project approach in the early years* (3rd ed.). New York: Teachers College, Columbia University.
    4. Krajcik, J. S., & Czerniak, C. M. (2018). *Teaching science in elementary and middle school: A project-based learning approach*. Routledge
    5. Moomaw, S. (2013). *Teaching STEM in the early years: Activities for integrating science, technology, engineering, and mathematics*. Redleaf Press.
    6. ppt and handouts
    7. 辛靜婷、吳心楷 (2021)。探究取向幼兒 STEM 方案課程：設計、教學與評量。心理出版社。