STEAM Education in Early Years

Syllabus

- Lecturer: Ching-Ting Hsin/ Associate Professor
- Email:cthsin@gapp.nthu.edu.tw
- Time: Wednesday 56 (13:20-15:10)
- Classroom: 1405, 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. Standers 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.

<table>
<tr><td>師培專業素養指標</td><td>3.規劃適切的課程、教學及多元評量
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。
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。
5.認同並實踐教師專業倫理
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。</td></tr>
<tr><td>師培課程核心內容</td><td>3-(4)幼兒園領域專門知識與教學知能
5-(1)教師自我省思、溝通互動與解決問題</td></tr>
<tr><td>融入議題</td><td>● 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)
<table>
<tr><td></td><td>性別平等教育</td><td></td><td>生命教育</td><td></td><td>能源教育</td><td></td><td>多元文化教育</td></tr>
<tr><td></td><td>人權教育</td><td></td><td>法治教育</td><td></td><td>安全教育</td><td></td><td>閱讀素養</td></tr>
<tr><td></td><td>環境教育</td><td></td><td>科技教育</td><td></td><td>防災教育</td><td></td><td>戶外教育</td></tr>
<tr><td></td><td>海洋教育</td><td rowspan="2"></td><td>資訊教育</td><td></td><td>家庭教育</td><td></td><td>國際教育</td></tr>
<tr><td></td><td>品德教育</td><td>(含數位學習)</td><td></td><td>生涯規劃教育</td><td>■</td><td>原住民族教育</td></tr>
</table>
● 新興議題
<table>
<tr><td>■</td><td>媒體識讀</td><td></td><td>通用設計</td><td></td><td>修復式正義</td><td></td><td></td></tr>
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- Weekly schedule

week	Date	Topic	Reading/assignments
1	9/15	Introduction and grouping	
2	9/22	Introduction to STEM Education: Content of STEM STEM activities (Taiwan and Thailand)	Moomaw C1 handouts video clips & PPT
3	9/29	Effective teaching strategies Inquiry cycle and science and engineering practices (NGSS) Guideline for ECE and care in Taiwan: cognitive domain	Moomaw C1 Gelman et al C3 handouts
4	10/6	STEM activities for learning centers	Moomaw C2 Presentation 1
5	10/13	Haus der Kleinen Forscher (Little Scientists' House) Program: the theme of technology: forces and effects; lights, colors and vision; water & air	Handouts Presentation 2
6	10/20	Expert talk: Programing	Turn in notes and questions of the talk
7	10/27	Computational thinking	handouts
8	11/3	Driving questions for investigation Project approach: airplane and spinning tops	Krajcik & Czerniak, C3 Helm & Katz, C1 C9
9	11/10	Mid-term exam Design and prepare for teaching STEM in a kindergarten: develop lesson plans	
10	11/17	university sports day Develop lesson plans	
11	11/24	Design and prepare for teaching STEM in a kindergarten: rehearsal and revised lesson plans	
12	12/1	Teaching a STEM activity in Hsinchu City Kindergarten https://www.hckd.hc.edu.tw/nss/p/index	
13	12/8	Example of STEM projects: ice, tree, movie, quilts Culturally integrated STEM projects:	Moomaw C5 Video clip Turn in lesson plan

		Tom Yum Kung	and reflection
14	12/15	Development of STEM project	
15	12/22	Share and demonstrate STEM projects	
16	12/29	Review of the class	Turn in STEM projects

- Teaching methods

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

- Assignments and evaluation

1. STEM activity and project presentations (20%)
   Choose one of the two presentations, 10/6 10/13
   Choose 3-4 members to form a group. Each group presents 15 minutes.
2. Mid-term exam (20%) 11/10
3. A lesson plan and reflection on a STEM activity (25%)
   Group work, lesson plan in detail, reflection 1 page, single space, due 12/23
   Choose 5 members to form a group.
4. The web of concepts and activities of the STEM project (25%)
   Group work, 4-5 pages, single space, due 1/13
   Determine group members by drawing a lottery. Each group has 7-8 members.
   Each group presents 10 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. (2007). *Teaching children science in elementary and middle school: A project-based 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