Assessment 6 (required): Additional assessment that addresses NAEYC initial teacher preparation standards
Section IV – Evidence for Meeting Standards
Science Investigation Unit

1. Description of the assessment and use in the program

The Science Investigation Unit is a curriculum project that demonstrates our candidates' ability to observe and assess children's development and learning, provide developmentally appropriate application of a science concept, and understand the role of science education in the early childhood profession. Candidates research an appropriate science topic and the developmental characteristics and needs of the children they will teach, plan and implement a series of three sequentially related learning experiences, assess and document children's learning, write a self-reflection paper on each learning experience and on the entire unit, and present the project to peers. Candidates conduct a scientific investigation to increase their understanding of the science concept as part of the content research. Candidates apply national and state curriculum standards to align instructional outcomes for this project. Candidates collaborate with cooperating teachers and the supervisor prior to teaching their unit. This assessment is completed during the Early Childhood Methods course in the Birth-5 field placement site.

2. A description of how this assessment specifically aligns with the standards it is cited for in Section III

This assessment focuses on the following four standards:

Standard 1: *Promoting Child Development and Learning* is evident due to candidates' research on the science content and the characteristics, needs, and multiple influences on development and learning of the children they are teaching. Candidates design and implement three learning experiences and utilize age appropriate resources to challenge and support learning in this content area.

Standard 3: *Observing, Documenting and Assessing to Support Young Children and Families* is evident in our candidates' ability to successfully create an age appropriate assessment plan and document learning using appropriate tools and approaches. Candidates document and analyze children's learning through photos, checklists, work samples, and anecdotal records.

Standard 4: *Teaching and Learning* is evident in our candidates' ability to plan how children will be guided and supported throughout this unit. Candidates research background knowledge of science content, review their child development content knowledge, and apply the scientific process to promote meaningful learning experiences.

Standard 5: *Becoming a Professional* is evident in this assignment by our candidates' ability to reflect on their practice after teaching each learning experience, consider best practices throughout the planning and implementation process, and apply national and

state standards to unit outcomes. In addition, they demonstrate their growing ability to be advocates in planning meaningful science curriculum, collaborate with professionals, and present the entire project in a workshop format to peers.

3. A brief analysis of the data findings.

Our findings determine that 92% of our candidates meet or exceed the expectations of this assignment over the last three years. Candidates who need improvement have a basic understanding of planning age appropriate science experiences with young children, but may not have the ability to organize all components of this assignment successfully, especially as related to researching content, conducting a science investigation and writing comprehensive learning experience plans. In addition, these candidates sometimes lack organizational ability and writing skills. Candidates scoring below "meets expectations" are expected to utilize the KSC Writing Center for assistance with writing skills. As noted in Assessment #3, Learning Experience Plans, candidates are typically challenged with aligning objectives with assessment and utilizing appropriate assessment strategies. The course instructor meets with these candidates to revise their work and improve the alignment. The candidate receiving an unacceptable rating self-selected out of the Early Childhood Development Program, based in part on this experience.

4. Interpretation of how data provides evidence that NAEYC standards have been met.

Our findings demonstrate that candidates successfully meet Standards 1, 3, 4 and 5; key elements in this success include collaborating with the cooperating teacher in the selection of an appropriate science topic, receiving feedback from professionals prior to teaching, and the educational resources provided by the Early Childhood Methods course. The science unit follows the math unit in the course schedule; we can attribute some of the improvement over the math unit to the fact that candidates have gained prior experience in unit development and planning. The instructor will now teach content on aligning assessment with objectives earlier in the semester. Additionally, candidates in this course will now be required to purchase the NAEYC text *Developmental Screening in Early Childhood, A Guide (5th edition)* by Samuel J. Meisels and Sally Atkins-Burnett.

5. Assessment Documentation

5a. Assessment instrument

Science Investigation Project
ESEC 381/386: EC Methods

Purpose:
The independent science investigation is an opportunity to develop a unit of study relating to a science concept. The outgrowth of your investigation will provide an opportunity to explore ideas for creating experiences for young children to do scientific

exploration in the early childhood setting. Like any scientific study, this investigation requires careful planning and research, a method for investigation, careful observation, record keeping, and incorporating the use of mathematics as a means of reporting data. This project will be implemented in your Birth – 5 field placement.

The NAEYC standards addressed in this assignment are:
Standard 1: Promoting Child Development and Learning
Standard 3: Observing, Documenting, and Assessing to Support Young Children and Families
Standard 4: Teaching and Learning
Standard 5: Becoming a Professional

Directions

Step 1 **Discuss** science topics with your cooperating teacher, and choose a concept to study that will fit with the curriculum planned in that classroom.

Step 2 **Research** the concept as an adult. This means you will need to conduct background reading to better understand the concept, and to design an investigation/experiment for yourself to further your understanding of both the concept and the scientific process. This will involve finding resources for both teachers and children on the topic.

Step 3 **Conduct** a scientific investigation of your topic using the scientific method. You will develop a hypothesis, set up independent and dependent variables, collect data and record and graph the results. This investigation should increase your understanding of the science concept, and will undoubtedly lead to new questions. It is imperative for teachers to understand the concepts they teach on an adult level, not just at the introductory level for young children. This step must be completed and written up prior to designing your science LEPs.

Step 4 **Design** a series of at least three **sequentially related learning experiences** that will introduce the children in your group to the science concept you investigated and to the scientific method. Remember that you need to make your activities developmentally appropriate; the children may not be able to conduct the same exact investigation that you did because of safety concerns or because of the abstract nature of your hypothesis. You will be teaching the scientific method as well as the science concept you have chosen through these lessons.

Your activities should include some opportunity for the *students* to *pose questions, observe, investigate, collect data* and *record results* using their mathematical skills. Activities should be neat, colorful, and appealing to the children. Remember to consider safety and developmental appropriateness for the level of your classroom.

Step 5 **Write** a detailed description of each of activity using the Learning Experience Plan format. Be sure to include an extension plan for each activity. Focus on your questioning techniques within the plan, as well.

Step 6 **Implement** the activities as planned with your cooperating teacher. This will have the dual purpose of bringing added resources to your placement as well as giving you the opportunity to observe children as scientists.

Step 7 **Assess** children's science learning from the above activities. Document all learning experiences with photos, children's dialogue and other ways children represent their own learning.

Step 8 **Complete** your written Independent Investigation report.

Step 9 **Present** your project to the class. Your presentation should include a description of your investigation and lessons, what you learned about the science concept, as well as time to share how children responded and what you learned about yourself as a teacher. Be prepared to share lesson sample, documentation of children's learning and a bibliography.

Refer to the outline below and the grading sheet on the following page as you construct your final project. Each report must include the following:

- A table of contents that helps the reader find the different components of your investigation.
- A one to two-page summary of your background research on your independent investigation topic.
- A write-up of your investigation carefully explaining what you investigated and how you went about your investigation. State the question(s) for your investigation. Use the scientific method of investigation worksheet to help you organize your investigation write-up. Identify the independent variable(s) (cause) and the dependent variable(s) (effect) in your scientific method of investigation write-up.
- Evidence of careful mathematical record keeping (a graph based on annotated notes, observation records, etc.) for your investigation.
- Summary statement: What happened in your investigation? What conclusion can you draw? Use the mathematical results of your investigation in your summary.
- Three LEPs describing your science activities with children, including lesson reflections.
- Summary of teaching experience: Describe what you learned about children as scientists, the concept, and yourself as a teacher of science.
- Annotated bibliography (APA format) of three resources each for teachers and children on the Independent Investigation topic.

Schedule:
Discuss topic with cooperating teacher
Discuss assignment in class
Conduct own research (Step 2)
Conduct investigation (Step 3)
Write-up of your scientific research (Steps 2 & 3)
Draft science LEPs and Investigation DUE
Implement Science LEPs
Final Project and Presentations DUE

5b. Scoring guide: Grading sheets

Science Investigation Project Grading Sheet
EC Methods

Name: Concept (step 1):

Science Concept Research (step 2) _____/ 10 points
(NAEYC Standards 1 and 4)
- Introduction
- Summary of research
- Sources of information
- Length approximately 2 pages

Write-up of your investigation (step 3) _____/ 10 points
(NAEYC Standard 4)
- Question(s)
- Scientific method
- Mathematical record keeping
- Summary statement and conclusion

3 sequential lessons on topic (steps 4 & 5) _____/ 25 points
(NAEYC Standard 1 and 4)
- 3 LEPs
- Teacher-made material
- Related LEP extensions

Activity implementation and assessment (step 6) _____/ 30 points
(NAEYC Standards 3, 4, and 5)
- 3 LEP reflections
- Assessment of children science learning
- Work samples

Summary of what you learned (step 7) _____/ 10 points
(NAEYC Standard 5)
- About children as scientists
- About concept
- About yourself as teacher of science

Demonstrate evidence of research _____/ 5 points
(NAEYC Standard 5)

- 3 teacher resources
- 3 children's resources

APA format used and grammar, spelling, and mechanics acceptable

Presentation of science activities in class _____/ 10 points
(NAEYC Standard 1, 3, 4, and 5)

- Identify the science concept and briefly discuss research.
- Describe the project and all activities. Share sample lesson plans and activities taught during unit.
- Describe how children participated and share documentation of their learning.
- Discuss what you learned about science education, the scientific process and your role as a teacher.
- Provide bibliography for participants.

Comments:

Grade:
Signed:

Science presentation grading sheet
EC Methods

Name: _____/ 10 points

1. Identify the science concept and briefly discuss research.
2. Describe the project and all activities. Share sample lesson plans and activities taught during this unit.
3. Describe how children participated and share documentation of their learning.
4. Discuss what you learned about science education, the scientific process and your role as a teacher.
5. Provide bibliography for participants.

5b. Scoring guide (continued): Rubric

	Needs Improvement	Meets Expectations	Exceeds Expectations
STANDARD 1. PROMOTING CHILD DEVELOPMENT AND LEARNING **1a.** Knowing and understanding	Science content not thoroughly researched or explained; background knowledge of developmental needs	Background knowledge is clearly expressed and includes both science content and child development knowledge.	Background knowledge is detailed and includes science content and knowledge of child development. Objectives are age

young children's characteristics and needs **1b.** Knowing and understanding the multiple influences on development and learning **1c.** Using developmental knowledge to create healthy, respectful, supportive, and challenging learning environments	of children not clearly explained. Plans are confusing, and/or do not provide appropriate objectives or adaptations for the developmental level.	Objectives are age appropriate and accurate. Plan is coherent and based on DAP principles. Appropriate adaptations to support student learning are included.	appropriate and accurate based on the characteristics and needs of children in the class. Adaptations for student learning meet the needs of the specific children in the class.
	Needs Improvement	Meets Expectations	Exceeds Expectations
STANDARD 3. OBSERVING, DOCUMENTING, AND ASSESSING TO SUPPORT YOUNG CHILDREN AND FAMILIES **3a.** Understanding the goals, benefits, and uses of assessment **3b.** Knowing about and using observation, documentation and other appropriate assessment tools and approaches **3c.** Understanding and practicing responsible assessment **3d.** Knowing about assessment	Assessment strategies do not clearly align with objectives. Unit includes 1-2 items as documentation, but does not adequately explain them. Limited or no indication of consultation with cooperating teacher. Brief letter to families included.	Assessments align with objectives, several assessment strategies are identified and documentation is described. Evidence of documentation is presented. Consultation with cooperating teacher is evident in planning, goals, assessments, and documentation. Evidence of family communication included (e.g. letters, posters, notes home, family involvement, etc.)	Assessments align with all objectives and diverse assessment strategies are identified. Documentation is provided through diverse methods, and includes description and analysis of student learning. Clear evidence of consultation with cooperating teacher. Multiple examples of family communication and involvement included.

partnerships with families and other professionals			
	Needs Improvement	Meets Expectations	Exceeds Expectations
STANDARD 4. TEACHING AND LEARNING **4a.** Knowing, understanding, and using positive relationships and supportive interactions **4b.** Knowing, understanding, and using effective approaches, strategies, and tools for early education **4c.** Knowing and understanding the importance, central concepts, inquiry tools, and structures of content areas or academic disciplines **4d.** Using own knowledge and other resources to design, implement, and evaluate meaningful, challenging curriculum to promote positive outcomes	LEPs represent one approach to learning but don't clearly build on each other in a sequential fashion. Concept research and understanding of the appropriate scientific principles appears limited; standards are not clearly referenced; and bibliography contains fewer than 3 children's and 3 adult resources. Reflection is descriptive but does not include analysis or areas for improvement. Reactive techniques for child guidance are listed. Limited repertoire of adaptations or extensions included.	LEPs are coherently designed and linked to each other, principles of DAP are clearly utilized and age appropriate teaching methodology is evident. Accurate knowledge of scientific principles is apparent through research and explanation; national science standards are referenced; bibliography includes 3 children's and 3 adult resources. Reflection focuses on successes and areas for improvement for each experience. Reactive and proactive techniques for child guidance listed, and several possible adaptations are included. Extension plans provide next steps in unit.	LEPs are coherently designed and sequentially developed; principles of DAP are utilized and appropriate methodology is detailed in outline of each experience. Plans provide opportunity for inquiry, data collection and representation; extensions foster practice and provide enrichment. Research and explanation of science content is very detailed and shows an advanced understanding of the scientific method; district, state and national standards are discussed and clear evidence of science standards is included. Bibliography includes more than 3 children's and 3 adult resources. Reflection indicates use of effective approaches, strategies and tools and provides new directions and ideas for the unit. Reactive

			and proactive child guidance techniques are listed and individualized adaptations for effective support of specific children in group are included.
	Needs Improvement	Meets Expectations	Exceeds Expectations
STANDARD 5. BECOMING A PROFESSIONAL **5a.** Identifying and involving oneself with the early childhood field **5b.** Knowing about and upholding ethical standards and other professional guidelines **5c.** Engaging in continuous, collaborative learning to inform practice **5d.** Integrating knowledgeable, reflective, and critical perspectives on early education **5e.** Engaging in informed advocacy for children and the profession	Basic understanding of developmental approach to teaching science expressed in reflection. No evidence of communication with cooperating teacher in preparation of unit. Presentation to peers demonstrates limited understanding of content and standards; 1-3 lessons presented. Limited evidence of understanding of personal growth as a science educator.	Solid understanding of the importance of developmental approach to teaching science with reference to national science standards. Communication with cooperating teacher evident in planning. Presentation includes description of the science concept, 3 lessons, and national standards. Reflection on what was learned about concept, the role of teacher, and how children responded is evident. Work samples and bibliography distributed. Value of science education and personal growth indicated in summary.	Solid understanding of the importance of developmental approach to teaching science and application of national science teaching standards. Communication and collaboration with cooperating teacher in developing and integrating concept and unit into science curriculum evident. Presentation includes description of concept, science investigation, lessons, local and national standards, what was learned about concept and the role of teacher, and how children responded. Work samples and bibliography distributed; presentation is interactive and involves peers. Reflections integrate knowledge about children, science content and the role

			of the teacher. Value of science education and personal growth indicated in summary, discussion of ways in which science education will be promoted in the future included.

5c. Data Table

Data Table: Science Investigation Unit
(Totals do not equal 100% due to rounding.)

	Unacceptable	Needs Improvement	Meets Expectations	Exceeds Expectations
2003 - 2004 (9)			**3 (33%)**	**6 (67%)**
2004-2005 (13)			**6 (46%)**	**7 (54%)**
2005-2006 (14)	**1 (7%)**	**2 (14%)**	**5 (36%)**	**6 (43%)**
Total (N=36)	**1 (3%)**	**2 (6%)**	**14 (39%)**	**19 (53%)**

NB: We recognize that this data is global; in the future we will collect data by standard.