

Mar 8th, 10:30 AM - 11:15 AM

Providing Early Childhood Pre-Service Teachers with Increased Science Content Knowledge and Effective Teaching Strategies: A Two Year Project

Lyndall Muschell
Georgia College

Holley M. Roberts
Georgia College

Christine Mutiti
Georgia College

Follow this and additional works at: <https://digitalcommons.georgiasouthern.edu/stem>

 Part of the [Pre-Elementary, Early Childhood, Kindergarten Teacher Education Commons](#), and the [Science and Mathematics Education Commons](#)

Recommended Citation

Muschell, Lyndall; Roberts, Holley M.; and Mutiti, Christine, "Providing Early Childhood Pre-Service Teachers with Increased Science Content Knowledge and Effective Teaching Strategies: A Two Year Project" (2013). *Interdisciplinary STEM Teaching & Learning Conference*. 64.

<https://digitalcommons.georgiasouthern.edu/stem/2013/2013/64>

This event is brought to you for free and open access by the Conferences & Events at Digital Commons@Georgia Southern. It has been accepted for inclusion in Interdisciplinary STEM Teaching & Learning Conference by an authorized administrator of Digital Commons@Georgia Southern. For more information, please contact digitalcommons@georgiasouthern.edu.

Providing Early Childhood Pre-service Teachers with Increased Science Content Knowledge and Effective Teaching Strategies: A Two Year Project

Dr. Lyndall Muschell

Dr. Holley Roberts

Dr. Christine Mutiti

Georgia College & State University

Rationale

- Teachers certified in Early Childhood Education are required to possess a broad knowledge base including reading, language arts, mathematics, science, and social studies as well as a strong foundation in a range of effective learning strategies. Even though science knowledge is critical in providing young children with an understanding of the world around them, there is currently an alarming lack of focus on science within pre-kindergarten through fifth grade classrooms.
- Consistently, many of the early childhood pre-service teachers have expressed their reluctance to teach science based on their lack of knowledge in the content area as well as their lack of exposure to strategies which will actively engage and motivate their students.

Examples of Comments from Pre-service Teachers:

- I was never interested in science as a child so it was always a struggle to me. I feel more comfortable teaching science for kindergarten through 1st grade, but am terrified of teaching science for 4th and 5th grade.
- I have never been very strong in science and worry about my knowledge level. I could easily research, but I worry my lack of confidence will show while teaching.
- I do have some prior knowledge of the science concepts, but I do not know good teaching techniques or activities to help students learn the concepts. I only know the information on a higher level of thinking and do not know how to break it down to teach elementary school students.

Goals and Objectives

- To provide pre-service teachers with increased knowledge of science concepts, a range of effective strategies, and necessary resources to improve science instruction.
- To provide pre-service teachers with effective teaching strategies which are designed to encourage interactive, “minds-on” experiences by providing concrete examples; direct connections between science and other content areas; and interactions with real world situations.
- To increase the confidence of pre-service teachers for teaching science.

Project WET and WILD Experiences

- Fall 2011 and 2012 – Project WET and Project WILD Educator Workshops were conducted for both the senior and junior early childhood cohorts.
- Fall 2011 and 2012 – Pre-service teachers utilized the Project WET and Project WILD resources to plan and implement lessons in host placements.

Exploring the Characteristics of Water



**Outdoor Experiences:
Supporting Real Life
Applications**

- Fall 2011 and 2012 – Pre-service teachers traveled to Charlie Elliott Wildlife Center where they actively engaged in experiences to increase their knowledge of science concepts as well as provide strategies for presenting these concepts to students. Activities included engaging in pond study, experiencing center activities based on a variety of life science concepts, learning about specific species of wildlife, and exploring roles of organisms within an ecosystem.

Charlie Elliott Wildlife Center

Rehabilitated Wildlife: Birds of Prey and the Gopher Tortoise



Pond Study



Science Workshop Experiences

- Spring 2012 – A Science Workshop was conducted in April during which pre-service teachers continued their explorations of a variety of science based experiences as well as developmentally appropriate teaching strategies. This workshop will be provided Spring 2013 for the current group.



- Investigating the predator/prey relationship by examining owl pellets.
- Exploring “sound” through learning stations
 1. Musical Rulers
 2. Making a Splash
 3. Ping Pong Ball Vibrations
 4. Dancing Rice
- Developing lessons on Magnetism/ Temperature/ Sound

Materials and Resources

- Project WET Educator Guide
- Urban Watershed Guide
- Project WILD and Aquatic WILD Guides
- Tuning fork
- Magnifying Glasses (2)
- Bar Magnets (2)
- Circle Magnets (2)
- Thermometers (2)
- Pipettes (10)
- Owl Pellets (1 to dissect, 1 to use in the classroom)
- Set of Dissecting Tools

Data Collection

- Likert scales were used to evaluate the strategies and resources presented in both the Project WET and Project WILD Educator Workshops.
- Pre and post tests were administered to determine gains in science content knowledge for pre-service teachers.
- Pre-service teachers implemented lessons in their placements which utilized strategies provided in the Project WET and/or Project WILD curriculum guides. For each lesson pre and post tests were conducted in order to guide planning and implementation as well as to determine student learning. In addition, pre-service teachers were asked to critically reflect upon the effectiveness of their teaching and planning and the resources.

Attitudinal Assessments

- In Spring 2012, debriefing sessions were used to collect qualitative data to determine the perceived usefulness and effectiveness of the Project WET and Project WILD strategies and resources for engaging and motivating PreK through 5th grade students in learning science as well as any change in attitude/comfort level for teaching science concepts.

Debriefing Questions

1. Rate your level of confidence in teaching science before your participation in these workshops (1-5 with 1 being not confident and 5 very confident). Why?
2. Rate your level of confidence in teaching science after your participation in these workshops? (1-5 with 1 being not confident and 5 very confident). Why?
3. Dispositions Change
4. What do you think you can use?
5. Suggestions for future activities like this?

- In the Fall 2012, the Revised Science Attitude Scale (Bitner, 1994) was administered via an on-line survey to determine a baseline for the current group's attitudes toward the importance of science content knowledge as well as their comfort levels for the teaching of science in the early childhood classroom.
- The survey will be re-administered at the end of spring semester 2013 after all experiences have been completed.

2011-2012 Pre/Post Test Data Analysis

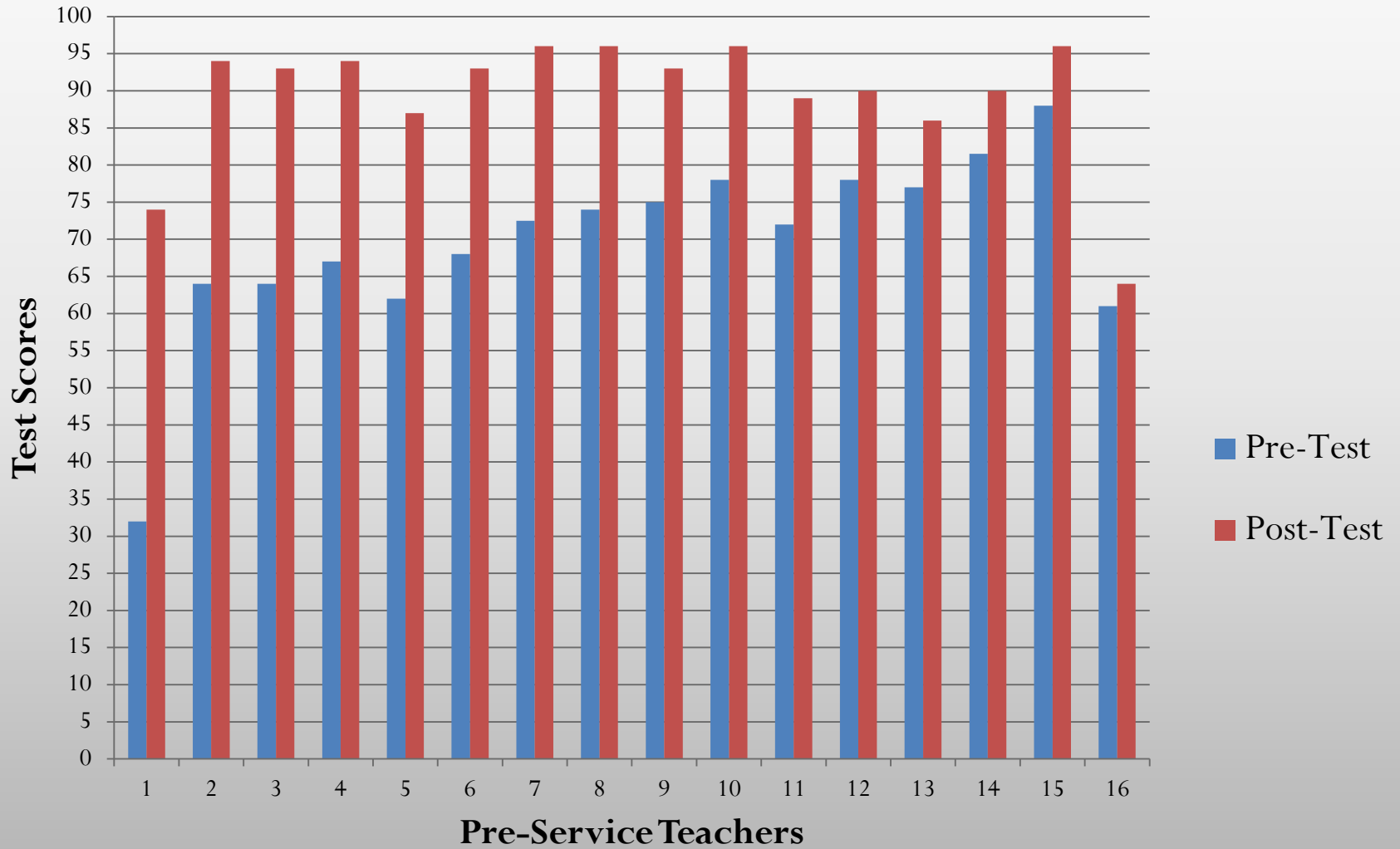
- Pretest and Posttest Results

Average Pretest Score: 72 / 100

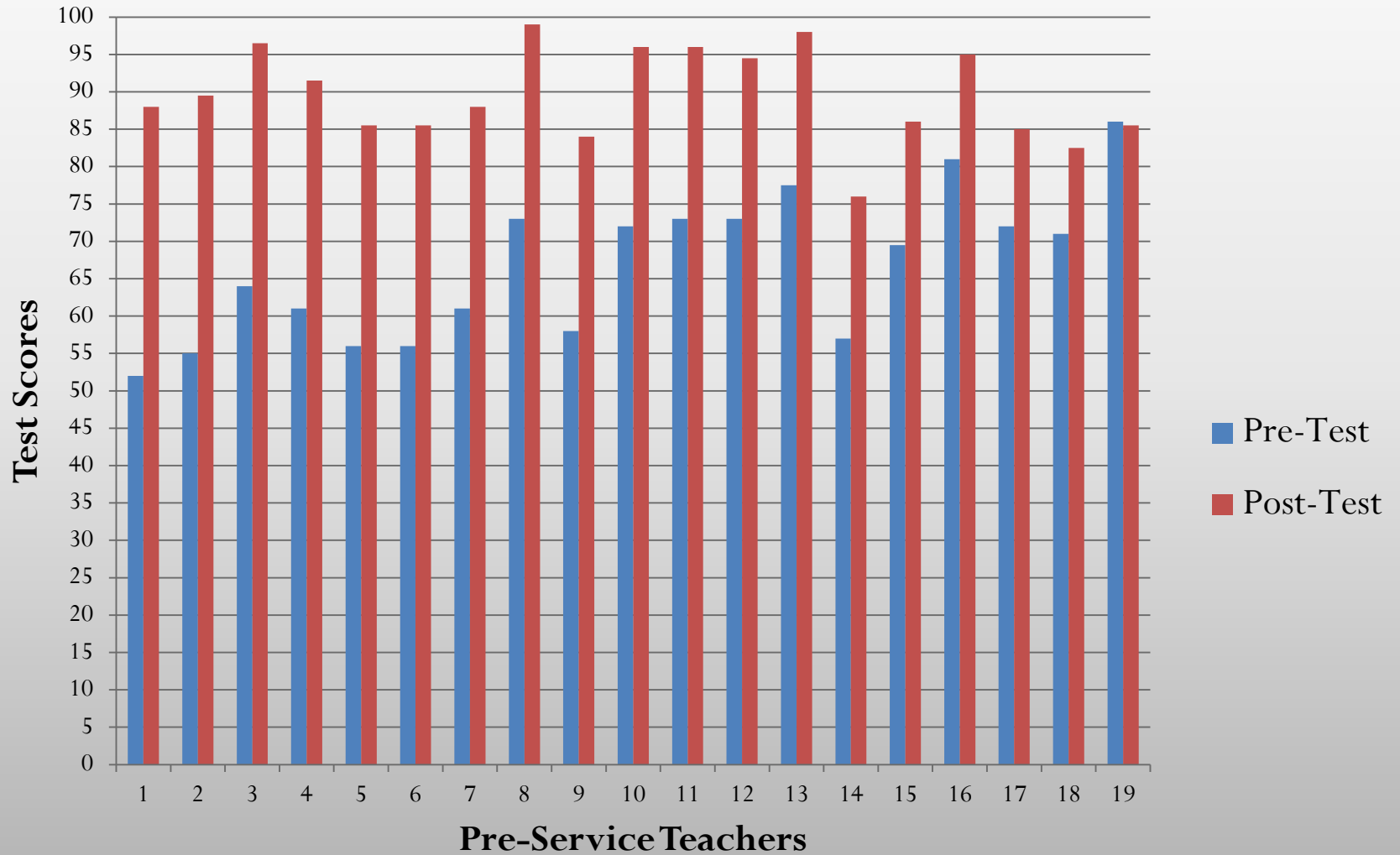
Average Posttest Score: 92 / 100

- 77% of pre-service teachers scored at least 10 points higher on the posttest than the pretest with only 2 showing no increase.
- The greatest gain achieved was 42 points.
- In the post tests many more examples were given and explained than in the pretests. The pre-service teachers provided definitions of concepts and made specific connections to experiences that correlated with science content knowledge, thus, providing evidence of a much deeper understanding.

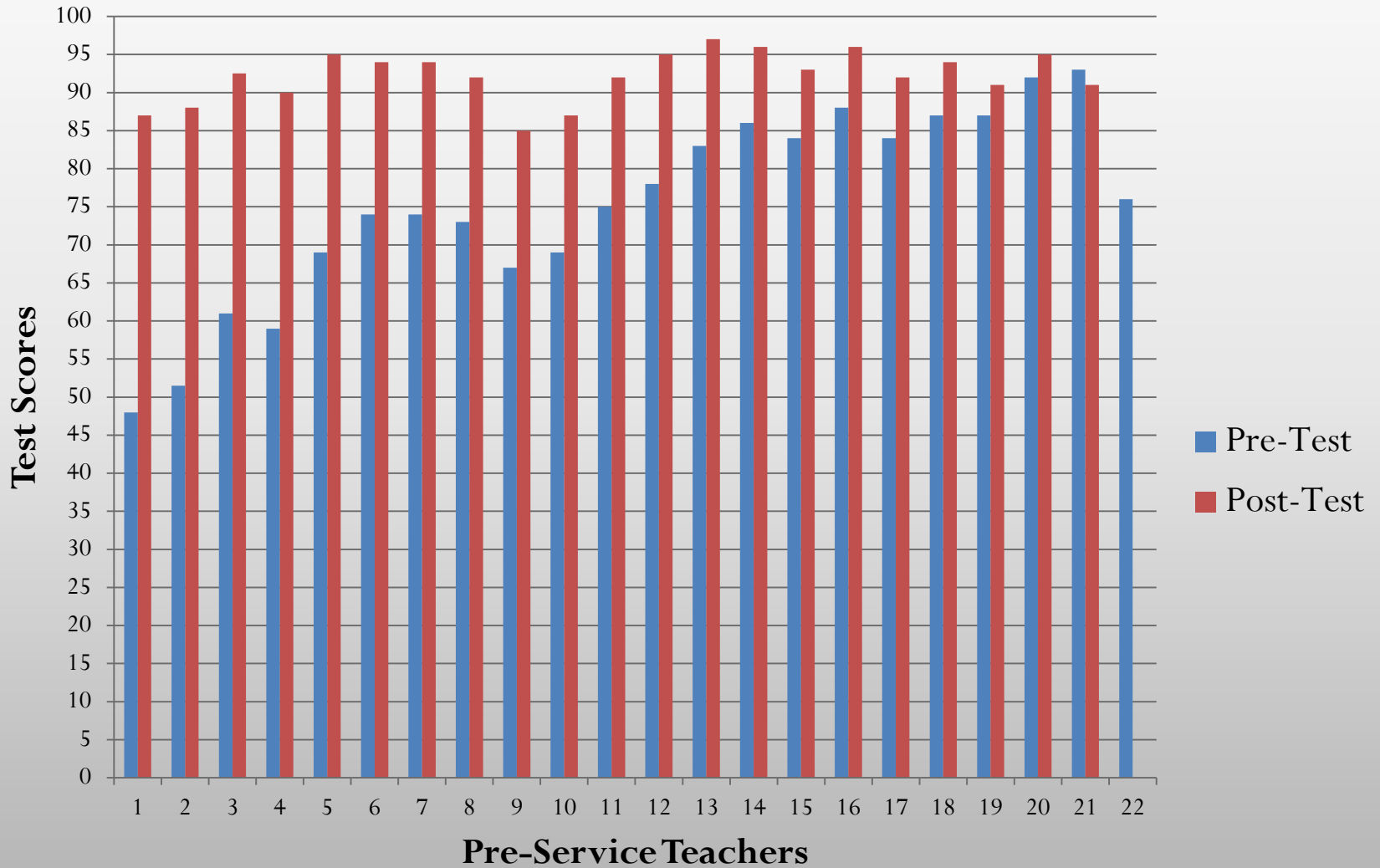
Senior Cohort 1 - 2011



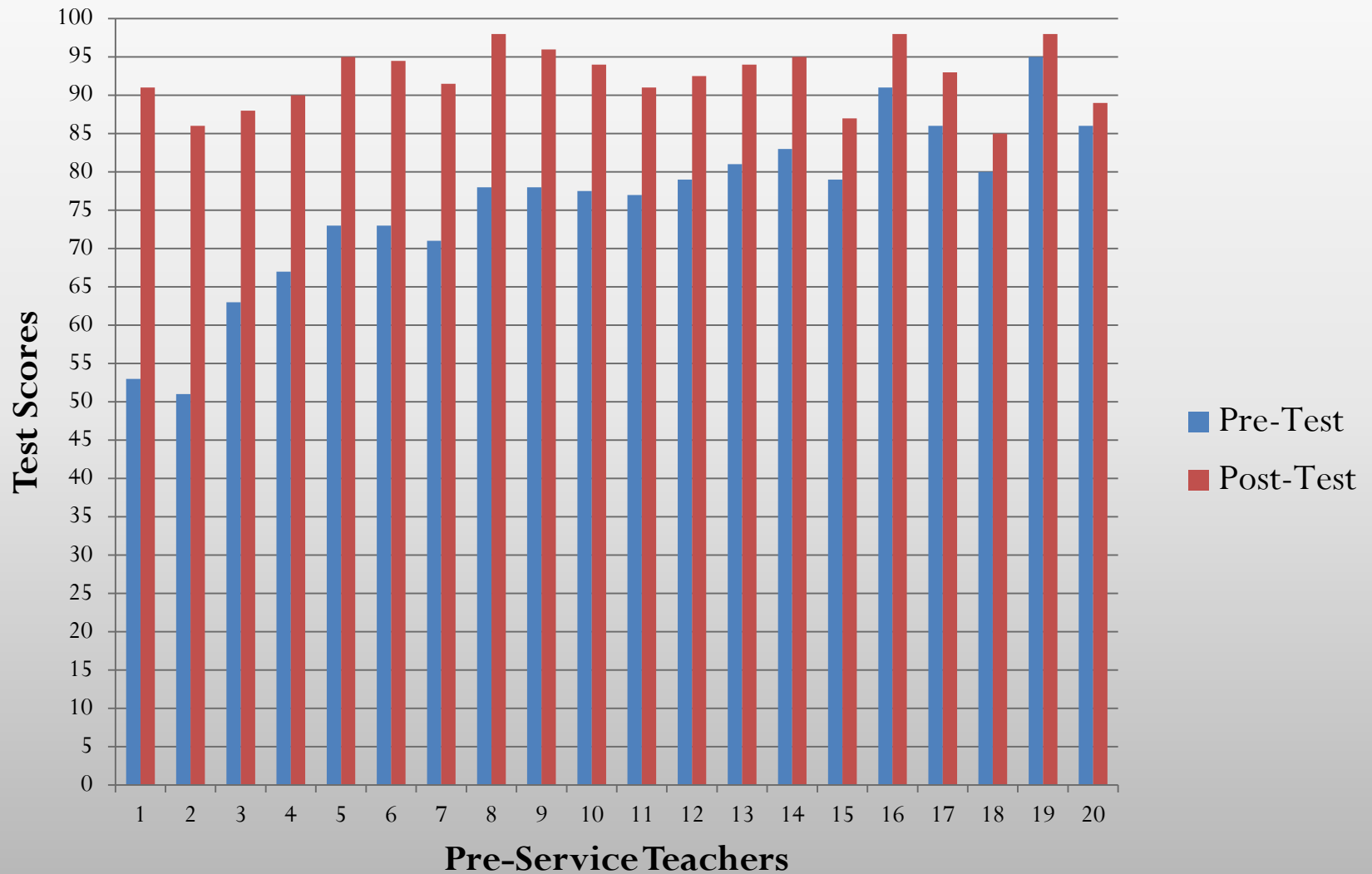
Senior Cohort 2 - 2011



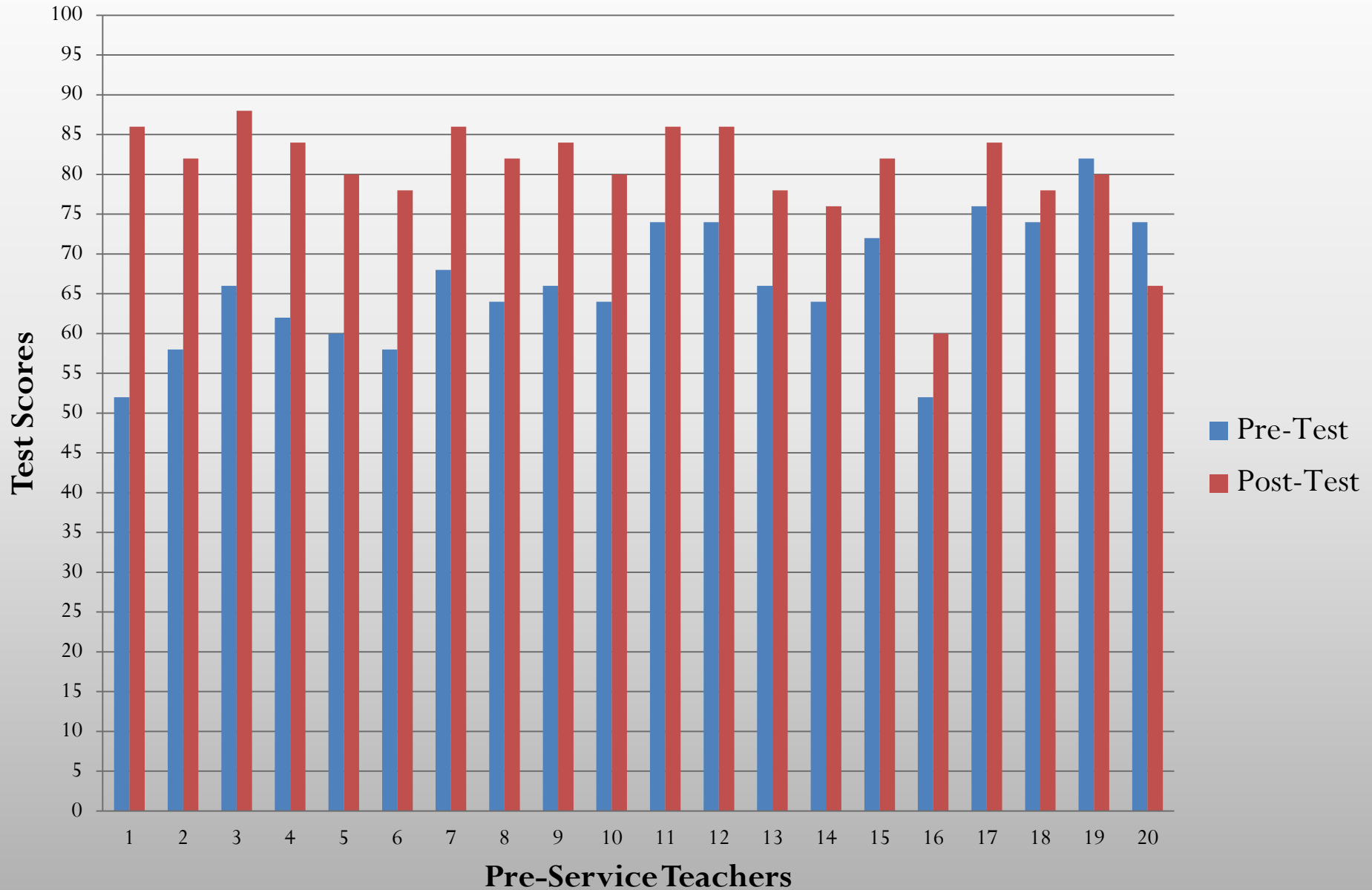
Junior Cohort 1 - 2011



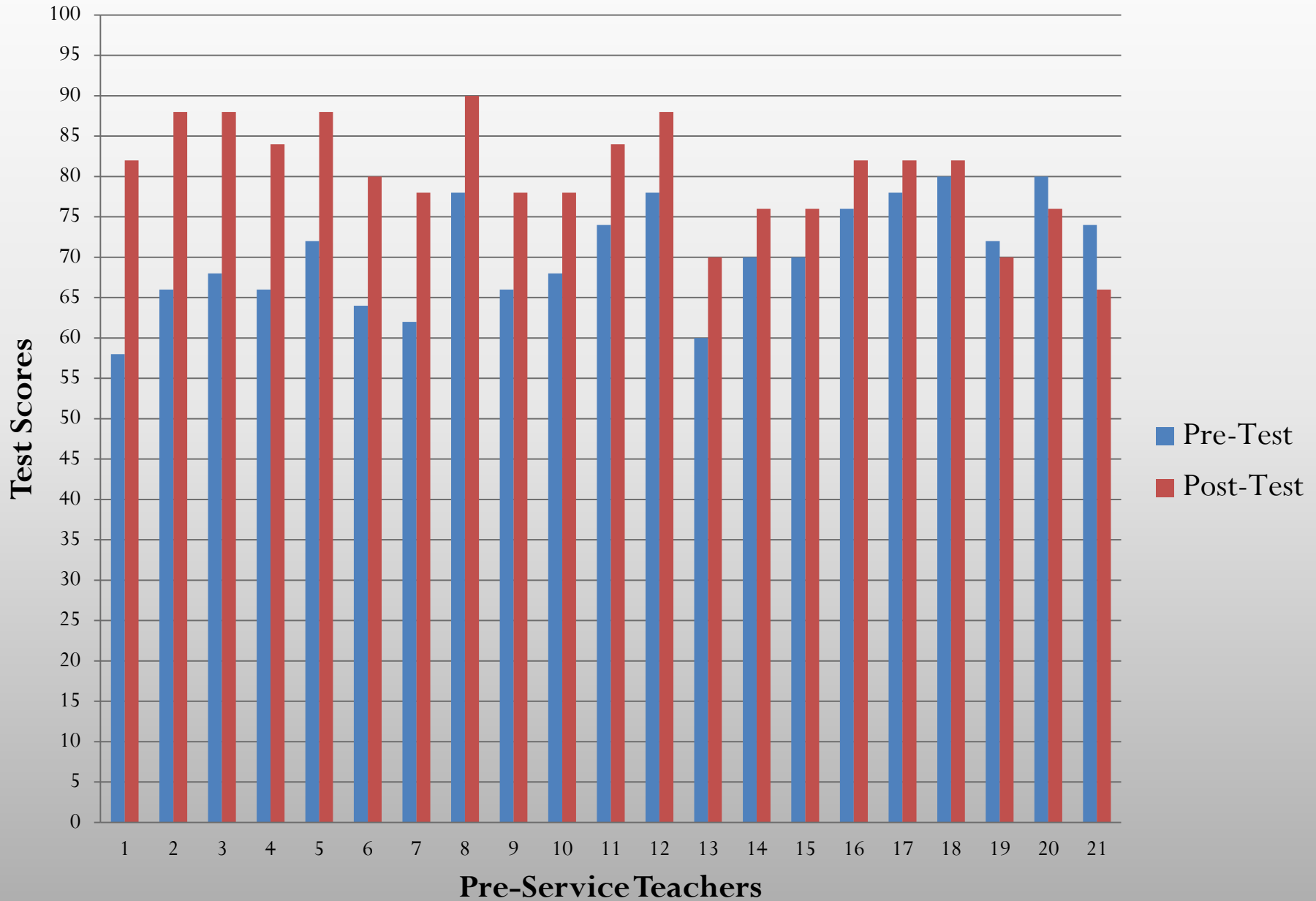
Junior Cohort 2 - 2011



Junior Cohort 1 - 2012



Junior Cohort 2 - 2012



Analysis: Spring 2012 Debriefing Session

- Overall, pre-service teachers reported that their confidence for teaching science increased as a result of the workshop experiences and resources.
- Participation in the experiences contributed to the increase in knowledge and confidence.
- Resources/materials/experiences provided models for ways to engage students in science.
- Participation in experiences which modeled inquiry to promote student learning increased understanding of the value of questioning and its role in promoting higher levels of thinking.

Pre-Service Teacher 1

“Prior to the workshops, I felt confident about my knowledge of science concepts. However, I was unsure about how to go about sharing that knowledge with students.

Now, I have numerous resources and activities to draw on and use in the classroom. I have learned how to make science engaging but also challenging to students. I can see ways to probe their thinking and extend their learning.”

Pre-Service Teacher 2

“I was very nervous about teaching science because it can be very hard for students to understand and for teachers to explain. I was very nervous about explaining science concepts so that children would understand.

I now know how to use students’ curiosity to my advantage. I know how to ask questions, and I am much better equipped with sample lessons and ideas for activities. I feel like I understand concepts better myself now that I have participated in these activities.”

Pre-Service Teacher 3

“I did not know where to get started. In addition, I struggled with understanding science concepts because of my lack of interest in science. I felt in the past that experiments had no meaning, and I had a negative attitude toward them. Therefore, science was not an interesting subject to me, affecting my confidence.

I now have a lot of resources which were provided through the workshops that make me feel more confident. I have trouble getting started, and these resources and ideas which were provided have given me a way to get started by modifying lessons to meet my students' needs. In addition, I have learned a lot just through participation in the activities. That has given me confidence in knowing the concepts that I will be teaching.”

Implications of the study include:

- Contributions to teacher preparation in order to build the confidence and competence in the teaching of science by pre-service teachers.
- Increasing the knowledge base in science through encouraging the integration of science into other content areas and providing opportunities for actively engaging students in learning science.
- Cultivating teachers who are confident and enthusiastic about teaching science, connecting scientific concepts to real world applications, and integrating science into the curriculum are more likely to motivate their students, to spark their curiosity, and to increase their desire to pursue further explorations in science.
- Pre-service teachers who will one day gain classrooms of their own and will potentially serve as models for other teachers providing them with new ideas and strategies for teaching and integrating science.

Next Steps

- Complete data collection and analysis for 2012-2013 STEM Mini-Grant Project.
- Submit STEM proposal for project continuation for incoming juniors.
- Develop follow-up experiences for the current participants for Fall 2013.
- Follow-up with the participants of the 2012-2013 in spring of 2014 to assess any changes in their attitudes toward the teaching of science.

Questions?