A SUMMER ACADEMY PROGRAM FOR PROSPECTIVE TEACHERS: MODEL TEACHING EXPERIENCES

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This article describes the project, **A Summer Academy Program for Prospective Teachers: Model Teaching Experiences**, of the Oklahoma Teacher Education Collaborative (O-TEC), one of the nation's Collaboratives for Excellence in Teacher Preparation (CETP). To recruit highly qualified teachers in science and mathematics, O-TEC institutions promote a program of summer academies that provide prospective teachers with opportunities to become familiar with effective teaching methods. During the academy, high school juniors and seniors explore inquiry-based teaching strategies, exemplary curricula, science and math content, and state and national standards in math and science education–all under the tutelage of mentor teachers, a Master-Teacher-in-Residence, and university faculty. The prospective teachers have opportunities to put into practice what they learn about effective teaching. For two weeks, the prospective teachers experience teaching science lessons to elementary children from neighboring school systems. These experiences help the prospective teachers perceive the challenges and rewards of teaching at a pivotal time in their lives.

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Introduction

Emphases of Teacher Preparation Reform

Universities across the nation are participating in reform initiatives to improve teacher preparation programs. The focus of reform is on the art of teaching [1] and the goal of teaching, i.e., learning. Learning is considered a criterion and product of effective instruction. Effective teaching requires focusing on both content and the process of learning [2].

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Collaboratives for Excellence in Teacher Preparation

Reforming science and mathematics teacher education requires change in teacher practices at all levels [3] [4]. The **Oklahoma Teacher Education Collaborative (O-TEC)** is participating in the National Science Foundation's **Collaboratives for Excellence in Teacher Preparation (CETP)** program with a goal of reforming mathematics and science education. This reform effort recognizes that preservice teachers need opportunities to develop theoretical and practical understanding, not just technical skills [3] [4]. The reform emphasizes inquiry-based instruction for all teacher preparation programs.

The intent is to shift the focus of teaching from traditional methods of instruction that emphasize memorization of facts and procedures toward inquiry-oriented methods that facilitate the development of conceptual understanding [3] [4] [5]. The use of hands-on instruction designed to promote students' conceptual knowledge by building on prior understandings, active engagement with the content, and application to real-world situations are all critical components in all O-TEC programs [3] [4] [5].

The O-TEC collaborative is pursuing systemic reform of teacher education by three methods:

- recruiting high ability prospective teachers interested in math and science through summer academies;
- revising undergraduate curricula for science and mathematics education majors;
- providing support through teacher institutes and networks to retain entry-level teachers who have one to three years of teaching experience.

Literature Review of Effective Teaching

Teaching Science as Inquiry

What is the best way to teach science in the elementary school? Studies show that effective teachers have teaching methods that use inquiry to promote student discovery and concept constructions [3] [6]. Science as inquiry, modeled on the scientist's method of discovery, focuses on asking questions, investigating, considering explanations, and weighing evidence [6] [3]. According to the National Science Education Standards published by the National Academy of Science [3]:

> Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning and conducting investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating results.

Inquiry-based teaching guides students to construct their understanding of fundamental scientific ideas through direct experience with materials, technological resources, experts, and by conducting investigations [3][6][7]. Through debate, students communicate their ideas and refine their explanations. Science as inquiry includes high expectations for students to acquire knowledge; each student constructs knowledge through the interplay of prior learning and newer learning [8]. The new vision of science as inquiry recommends that students combine processes and knowledge as they use scientific reasoning and critical thinking to develop their understanding of science [3]. This type of teaching creates opportunities for students to take responsibility for their own learning, individually, and as members of groups.

<u>The Constructivist Learning Cycle Model</u>

The constructivist learning cycle model serves as a learning and teaching method [9]. The learning cycle is anchored in an understanding of the development of cognitive reasoning abilities [10]. The phases of the learning cycle provide the structure for planning an effective science activity. Once the concept is identified, the teacher structures the learning activity to incorporate exploration, concept invention, application, and evaluation. The cycle provides a dynamic planning system that balances student-centered exploration with teacher-guided conceptual construction.

The exploration phase is student-centered and affords students with concrete materials and direct experiences to promote the concept construction [6]. Students are more receptive to understanding a concept if they have engaged directly in a concrete experience which has raised a question in their minds. Data collection prepares the students for the next phase of the learning cycle.

The concrete experience provided in the exploration phase is used as a basis for generalizing the concept in the concept invention phase. The teacher's responsibility is to lead the students through discussions so that they "invent" the concept independently [3][6]. The teacher facilitates the students by introducing specialized vocabulary and concept labels. In this phase, the students restore mental equilibrium through accommodation as supported in the developmental learning theories of Piaget [10]. When the students "invent" the concept, it is more likely remembered.

The application phase affords each student an opportunity to directly apply the concept to everyday science experiences. This phase provides additional time for accommodation required by students needing more time for equilibration [10] [3]. Application nurtures understanding as the new dimensions of science learning are internalized.

The purpose of the evaluation phase is to assess student outcomes including hands-on performances. The evaluation phase assesses beyond standard forms of testing [11]. The phase focuses on a holistic evaluation of the students' learning including process skills checklists (Table 1, opposite), systematic observations, reflective questioning, interviews, pictorial assessment, hands-on performances, and journals. Evaluation occurs at any point in the activity, and consistent evaluations reveal misconceptions before they become deeply rooted.

Exemplary Inquiry-Based Curricula

Science and Technology for Children (**STC**) is an exemplary science curriculum developed by the National Science Resources Center [12]. The **STC** curriculum is a comprehensive, inquiry-based science curriculum that has mathematics content embedded in the investigations. The exemplary science curriculum is:

- Research-based;
- Developed collaboratively by master teachers, educators, scientists, and engineers;
- Nationally field-tested with diverse classrooms in rural, urban, and suburban schools.

A research and development process insures that **STC** modules are scientifically accurate and pedagogically appropriate for all students including students with ethnically diverse backgrounds.

Research Supports the Use of Activity-Based Science Programs

Research on the effectiveness of activity-based science programs has examined different measures of student performance. Results of research to determine the effectiveness of activity-based programs have been statistically significant [13] [14] [15]. Using research literature and data aggregation procedures, Shymansky, Kyle, and Alport [7] conducted a meta-analysis of activity-based programs, within the elementary, junior high, and high school curricula. The analysis on 18 different measures of student performance showed the greatest gains in achievement and process skill development for students who received instruction from activity-based programs.

Table 1. Indicators of Process Skills	
Observation	• Describes attributes of objects. • Describes changes in terms of actions.
Classification	• Creates groups using a single attribute to express linear relationships. • Creates groups using several attributes to express symmetrical relationships.
Prediction	• Guesses based on limited observable facts. • Guesses based on an accurate understanding of cause-and-effect relationships.
Controlling Variables	• One manipulative variable and without holding others constant. • Several manipulative variables and holds at least one variable constant.
Inferring	• Explains using observable data. • Explains using quantifiable observable data.
Defining Operationally	• States relationships between observed actions to explain phenomena. • Explains relationships by generalizing to other events not observed.
Hypothesizing	• Statement based on simple sensory observations without explanations. • Statements used to create concepts through explanations

In 1986, these results were reanalyzed using refined statistical procedures [7]. Data from the reanalysis showed that students in hands-on programs outperformed their traditional elementary school counterparts by 9 percentile points on a composite performance measure. From the data, it was concluded that the new elementary science programs were more effective in enhancing student achievement and problem-solving skills than traditional programs [7]. The *Science and Technology for Children* module, ***Electric Circuits***, used in the Summer Academy of 1997 is one of the new elementary science programs supported by this research.

Effective Questioning Techniques

Research verifies that teachers use questions more than any other teaching method. Teachers ask about 93 percent of all questions and allow students little wait time to respond or opportunity to ask their own questions [11]. The questions teachers generally ask require factual answers and low levels of thinking. Questions that require application, analysis, synthesis, or evaluative thinking are very seldom used [11]. Bredderman [16] discovered that the questions teachers used influenced the students' level of response.

Bredderman [16] reported a direct relationship between the level of questioning and the level of response. Increased use of higher-level questions may be a significant difference between activity-based science learning and traditional teaching. The effect of raising the cognitive level of classroom discussions could result in increased achievement [16] [17]. The general conclusion is that the prospective teachers began to perceive this effect in their model teaching experiences. They discovered that using more advanced questions could result in more analytical thinking.

The Roles of the Teacher and Students

Research of the teacher's and the students' roles reveals that the constructivist teacher assumes many roles but largely functions as a facilitator of knowledge construction. The constructivist model is based on the proposition that knowledge is not transmitted directly from one person to another but is actively constructed by the learner [18] [10] [11]. Constructivist theory focuses on the mental activity of the learner as he/she assimilates new ideas, tries to resolve the cognitive conflict created during the process of fitting the new ideas into existing concepts, and restores mental equilibrium through assimilation and accommodation [18] [10] [11].

Learning Styles

Despite research that attempts to identify common elements of learning, educators contend that everyone learns differently. According to Reiff [3], although each person is born with certain tendencies toward particular learning styles, inherited characteristics are influenced by culture, personal experience, maturation, and development. A learning style is described as a set of factors, behaviors, and attitudes that facilitate learning [19] [20] [21]. Learning style is the manner in which various elements in one's environment affect learning.

Because there appears to be a relationship between culture and learning style [22] [23], teachers should provide students with a variety of ways to learn. Learners that come from cultures that exercise authoritative control and/or lack good nutrition tend to be field-dependent learners. Students who exhibit this learning style prefer group interaction with the teacher, need explicit instruction, and require praise for motivation [3] [21]. Students from societies that depend on unspoken observations for survival are visual learners [21] [20]. Preferring to learn from the written word are students from contemporary, literate societies; whereas, students from traditional, preliterate cultures prefer to learn from direct experience [22] [21].

The Study

This article describes the development, operation, and evaluation of the project, ***A Summer Academy Program for Prospective Teachers: Model Teaching Experiences***, conducted at one of the nine higher education institutions participating in the ***Oklahoma Teacher Education Collaborative (O-TEC)***.

The Focus of the Summer Academy

The summer academy is the mechanism to recruit high ability juniors and seniors interested in science and mathematics to participate in a four-week program that introduces them to teaching as a career. The summer academy incorporates state and national standards adopted for student learning in grades K - 12 in order to provide the prospective teachers with opportunities to strengthen their skills in science and to experience the rewards and challenges of teaching. Academic and practical experiences are provided to encourage a long-lasting interest in mathematics and science. The summer academy creates a supportive climate that promotes high expectations; builds inquiry; fosters communication skills; and encourages critical thinking.

Targeted Population

Recruitment targets minorities and historically underserved student populations. Teaming with the Teacher Cadet program directed by the Oklahoma Minority Teacher Recruitment Center of the Oklahoma Board of Regents for Higher Education provides a network for minority recruitment. High school juniors and seniors who are Native Americans, African Americans, and Spanish-speaking Americans attending schools in rural areas were encouraged to participate.

Selection of Participants

Twenty-four juniors and seniors from high schools in western Oklahoma were selected as prospective-teacher participants. Twenty-five percent of the participants were represented by minorities with Native Americans representing the majority. The participants were selected according to the following criteria: (a) high school junior or senior from a rural school, (b) personal interest in learning about the teaching profession, (c) some practical experience working with young students, and (d) recommendation by school personnel familiar with student's academic and interpersonal skills. The prospective teachers' working experience with elementary children ranged from actively participating in the Teacher Cadet program to baby-sitting their neighbors' children.

The Design of the Program

The four-week program focused on the development, operation, and evaluation of a summer academy for prospective teachers using model inquiry-based teaching experiences. During the first week of the academy, twenty-four high school juniors and seniors actively explored inquiry-based teaching strategies, exemplary curricula, science and math content, and the state and national standards in mathematics and science education--all under the tutelage of mentor teachers, the Master-Teacher-in-Residence, and university faculty. In the following weeks, the prospective teachers put into practice what they had learned about effective teaching. The prospective teachers presented sixteen science activities from the ***Electric Circuits*** module to elementary school children. During the final week, the University involved the prospective teachers in a geology field excursion, career day, and a culminating activity. A summary of the summer academy activities is shown in Figure 1, opposite.

University Faculty and Master-Teacher-in-Residence

The university faculty was represented by two university professors of science education, one professor of mathematics, and the Master-Teacher-in-Residence. A Master-Teacher-in-Residence (MTIR), added to the university professional education team, assists in the planning, developing, implementing, and monitoring of the summer academy. The MTIR position is funded by NSF (with an overhead match by the institution) to aid each site in completing the following specified tasks:

- Redesigning curricula in selected science, mathematics, and education course;
- Encouraging greater use of technology, interdisciplinary, and inquiry-based approaches;
- Developing increased levels of communication with teachers in public schools;

- Establishing a series of summer academies;
- Disseminating best practices developed by the O-TEC collaborative;
- Monitoring key factors in order to evaluate the program; and
- Facilitating continuing dialogue, planning, and participation among O-TEC participants.

		Activities
Week 1	Morning	Learning Theories Science Process Skills The Learning Cycle Questioning Strategies Critical thinking Skills
	Afternoon	Electricity Labs Content Sessions Teaching Preparations Reflection
Weeks 2 & 3	Morning	Exploration Activity with Elementary Students Concept Invention Phase Application/Extension Phase Assessment/Journal Writing by Elementary Children
	Afternoon	Journal Writing Small Group Sessions on Morning Sessions Debriefing Sessions on Successes, Challenges, and Problems Large Group Sessions on Teaching Strategies Teaching Preparations
Week 4	Morning/ Afternoon	Self-Reflection Activities Field Experience Career Day Evaluation Banquet

Figure 1. Schedule of Activities for the Summer Academy for Prospective Teachers

Using Mentor Teachers with the Prospective Teachers

Four master teachers of mathematics and science in the public schools served as *mentors* for the twenty-four prospective teachers. Both academic and pedagogical support was provided during the summer academy. The mentors helped the prospective teachers with daily problems that they encountered as they participated as learners and practicing teachers. The prospective teachers observed how the mentors worked with them during the first week of the academy. The mentors served as role models as they:

- Exhibited patience;
- Adjusted teaching demeanor to a student's action;
- Experimented with numerous instructional and evaluation strategies; and
- Challenged students with math and science content [2].

The STC Module: **Electric Circuits**

The **STC** module, ***Electric Circuits***, was used by the prospective teachers when they experienced teaching with the elementary children. The inquiry-based activities focused on the properties and uses of electricity. The elementary children, under the prospective teachers' guidance, constructed circuit testers, investigated conductivity, made glowing filaments, built switches, created their own flashlights, created models of series and parallel circuits, and discovered the properties of diodes. The challenging activity involved the elementary children with the tasks of designing, constructing, and wiring a cardboard-box "house." First, the elementary children learned how to draw detailed plans for wiring a house. Using D-cell batteries, insulated wires, single-pole and double-pole switches, and series and parallel circuits, the elementary students wired their four-room cardboard box "house." This activity provided opportunities for the elementary children to perceive the interconnectedness of math, science, and engineering.

Planning Week : Sessions Involving Mentor Teachers and University Faculty

During the planning week, the mentor teachers and university faculty discussed pedagogy, reviewed the learning cycle, discussed concepts of electricity, and investigated labs on the uses and properties of electricity. They planned activities from the ***Electric Circuits*** module to be presented as model lessons in laboratory settings with the prospective teachers. The mentor teachers discussed the objectives of the state and national standards for mathematics and science education and planned the integration of the standards with the content. Evaluative methods including reflection and journal writing instruments were developed (Figures 1-4).

Week One: Prospective Teachers' Training

The first week of the academy involved 24 high school students participating in morning and afternoon sessions. Early morning sessions directed by the university faculty and the MTIR included *Learning Theories*, *Science Process Skills*, *The Learning Cycle*, *Effective Questioning Strategies*, and *Critical Thinking Skills*. Sessions facilitated by the mentor teachers focused on *Exemplary Curricula*, ***Electric Circuit*** *Activities*,*Cooperative Learning*, and *Journal Writing*. All staff members presented the afternoon sessions which centered on *Electricity Labs*, *Content Sessions*, *Reflection*, and *Teaching Preparations*.

Weeks Two and Three: Model Teaching Experiences

The second and third weeks provided the prospective teachers with opportunities to involve elementary children in the science activities that they had prepared and practiced. During these two weeks, the Master-Teacher-in-Residence and mentor teachers monitored the activities as the prospective teachers presented their lessons. Using their acquired effective instructional strategies, the prospective teachers engaged the elementary children in the ***Electric Circuits*** activities. The ***Electric Circuits'*** manual provided suggestions for using problem-solving skills with the activities that were selected. The culminating activity of the module involved teams of elementary children. Each team constructed a four-room house out of a cardboard box, designed a detailed plan for wiring the "house," and then used insulated wire, bulbs, single-and-double poled switches, and D-cell batteries to install the wiring in their "houses." A performance assessment was the finale of the week when the elementary children demonstrated the open and closed circuits in their cardboard box "houses."

Week Four: Field Experiences, Career Day, Reflection, and Culminating Activity

The fourth week involved the prospective teachers in a earth science field excursion, career day, reflection, and a banquet. The one-day field excursion included a historical and geological tour of the Roman Nose Canyon and three natural springs. A retired science education professor served as a guide for the excursion and emphasized the historical and cultural aspects of the canyon. The Native American, Chief Roman Nose of the Southern Cheyenne, settled this area in the 1800s. This experience helped the prospective teachers understand the interconnectedness of science and social studies.

A career day was sponsored by the School of Education and the Science Education Section of the Department of Chemistry. A variety of careers for math and science teachers were featured by several of the faculty members of the School of Education. The Elementary and

Secondary Undergraduate Education programs were described, and a question-and-answer session was provided. The prospective teachers were invited and encouraged to visit the campus during the following school year.

Journal writing was emphasized as a tool for continual reflection. Over the four-week academy, the prospective teachers participated in daily journal writing for reflection. Each afternoon, the prospective teachers were provided sufficient time to write in their journals. This reflection helped them capture their teaching, analyze their progress, and identify needs for further learning (Figures 2 and 3, below).

1. What activities did you do in the sessions today?
2. What did you learn in the content and investigation sessions today?
3. Were you puzzled about the concepts or activities in today's presentation?
4. Describe your enjoyments and/or dislikes in the sessions today.
5. Describe your accomplishments today.
6. In what ways can you describe your performance today?

Figure 2. Journal Format for Prospective Teachers for Week One.

1. Describe the elementary students in your group and how they responded to the activities.
2. How do you feel about this morning's teaching?
3. What did you do well during your teaching sessions?
4. If you were going to teach this lesson again, what would you do differently next time?
5. Please write additional thoughts or comments about today's teaching experience.

Figure 3. Journal Format for Prospective Teachers for Weeks Two and Three.

An evening banquet honored the prospective teachers and their parents. The evening's program included speeches by the site director and university faculty and the presentation of certificates by the Dean of the School of Arts and Sciences.

Data Collection and Outcomes

Data collected from the project, *A Summer Academy Program for Prospective Teachers:*

Model Teaching Experiences, included daily journals, collegial reflection, an evaluation instrument, ***Perceptions of the Summer Academy***, and a follow-up questionnaire (Figures 2 - 4). Journal writing facilitated the prospective teachers in capturing their learning and

1. Now that you have completed your participation in the **A Summer Academy for Prospective Teachers: Model Teaching Experiences**, what do you perceive as positive aspects of teaching as a *career*?
2. What do you perceive as negative aspects of teaching as a *career*?
3. How likely is it that you will choose teaching as a *career*? Please circle the number that matches your response.

   1__________2__________3__________4__________5

   I *will not* be a teacher. I *will* be a teacher.
4. If you are not planning to become a teacher, what other *career(s)* are you considering?

Figure 4. Follow-up Questionnaire for the Prospective Teachers

teaching, analyzing their progress, and identifying their needs for further learning and teaching (Figures 2 and 3).

Journal Writing from Week One: Capturing Their Learning

The prospective teachers responded to the question "What did you accomplish in the sessions today? (Figure 2). The prospective teachers' responses reflected realistic aspects of teaching; i.e., how to:

- *Ask questions.*
- *Teach to the point that it is effective.*
- *Have patience and work together.*
- *Make science fun and easier.*
- *Effectively communicate.*
- *Write complete lesson plans and what to put in them.*

The prospective teachers identified some concepts that they learned from the lab and content sessions (Figure 2). Some of the described accomplishments were:

- *The ability to turn on a bulb with a battery and wire.*
- *I have the parallel and series circuits down.*

- *How to build a flashlight.*
- *I wired a cardboard box house and found that very rewarding.*
- *A broader understanding of electricity.*

Journals : Capturing Their Teaching and Analyzing Their Progress

Self-assessments are an important part of the authenticity established in constructivist teaching. A journal, a self-assessment tool, assists the reflective process when teachers record what they have done and what they have learned (Figure 3). The prospective teachers described their thoughts about their teaching experiences with the elementary children.

- *The children's performance was good; they participated well.*
- *My kids were great, and I can't wait until tomorrow.*
- *I was able to do better today than yesterday.*
- *I found that my performance gets better every day.*
- *Dealing with different personalities helps a teacher become strong and more open to new ideas and viewpoints.*

The prospective teachers' responses in their journals revealed that they analyzed their progress by assessing their performance (Figure 3).

- *My performance was good because everyone remembers what they learned.*
- *I was not as clear yesterday as I thought.*
- *My students seemed a little bored. I could have done better.*
- *I feel that I did very well relating to the students today.*
- *First, I thought I wasn't doing anything right, but after I saw the students understand what they were doing, I felt better.*

Journal Writings: Assertions

Analysis of the journal writings yielded two assertions (See Figure 3). The assertions focused on active participation and concrete experiences with science phenomena.

Assertion 1. Science learning is a process which requires active participation on the part of both the learner and the teacher.

- *That it depends on the way you ask questions to get the different answers.*
- *I learned to learn right along with them and have fun while learning.*
- *I taught about how things relate to the real world and got them thinking about*

conductors in their houses and around them.

Assertion 2. Engaging in concrete activities stimulates curiosity and promotes further investigation.

- *Today I learned that the kids learn by experimenting. Just by letting them experiment and then answer their questions.*
- *I learned that kids like to experiment and take their time.*
- *I learned that most kids enjoy science or should I say hands-on activities.*
- *I learned that the students have to touch everything no matter what.*

Collegial Reflection: Expressing Their Thoughts and Revising Their Beliefs

The afternoon debriefing sessions which were moderated by a panel including mentor teachers, the Master-Teacher-in-Residence, and university faculty, provided the prospective teachers with opportunities to share successes, challenges, and problems that they had encountered during that day of teaching (Figure 1). The exchange of ideas and the subsequent teaching suggestions provided support for their activities scheduled for the following day. From their comments, the prospective teachers appeared to be acquiring an appreciation of the nature of effective science teaching.

Perceptions of the Summer Academy

The evaluation instrument assessed the prospective teachers' perceptions of the design of the program and the individual benefits (Table 2, next page). The prospective teachers perceived that the hands-on activities were useful and that they became more comfortable using them. Seventy-five percent of the prospective teachers thought that the summer academy's experiences had improved their teaching ability. They identified working with the elementary children as a most valuable experience. Many of the prospective teachers stated that the *hands-on* time with the elementary children made the "things said during lecture make sense."

Table 2. Perceptions of the Summer Academy (n=24)			
Item	No opinion (%)	Agree (%)	Strongly Agree (%)
Was interesting.	4	29	67
Hands-on useful.	0	25	75
Was worth the time.	4	29	67
Academy was fun.	0	21	79
More comfortable with hands-on.	4	33	63
Improved my teaching ability.	0	25	75
Program was excellent.	0	17	83
Comments: Most valuable experience • Teaching the elementary students. • Being able to apply what we had learned when teaching the elementary students. • The hands-on experience with the children. • Getting to work with the children and the mentor teachers; also the friendships made. • Helping students further their interest in math and science. • Getting to work with the students really gave it a real life meaning and was enjoyable. • Being able to teach using hands-on teaching methods. • Hands-on time with the children; it made the things said during lecture make sense. • Working with the kids in a classroom atmosphere. • Learning teaching strategies and the hands-on.			

Follow-Up Questionnaire

A major question on the survey was "How likely is it that you will choose teaching as a career?" Of the fourteen respondents, 49 percent responded that they plan to choose teaching as a career. Seven percent believe that they will not enter the teaching profession, and 36 percent are still unsure of a career choice (Table 3, opposite).

Conclusion

Based on the data collected, it was determined that the prospective teachers perceived the importance of hands-on activities, the roles of the learner and teacher, and effective questioning strategies. The prospective teachers' responses showed that 75 percent perceived

Table 3.	Follow-up Questionnaire: How likely is it that you will choose teaching as a career? (n=14)				
	Will not be a teacher.		Unsure		*Will* be a teacher.
	1	2	3	4	5
Responses	1	1	5	4	3
Percent	7	7	36	28	21

Comments:

Positive aspects of teaching career:
- Sense of accomplishment.
- Helping children.
- Meeting new people.
- Academy confirmed my ambition to become a teacher.
- Summers off.

Negative aspects of teaching career:
- Challenge of children with special needs.
- Frustrating sometimes.
- Time required for planning.
- Difficult profession.
- Children not enjoying learning.
- If kids don't learn.
- Amount of patience needed.

the usefulness of hands-on activities and 63 percent replied that they were more comfortable teaching using activity-based science lessons (Table 2). In their journals, the prospective teachers described how the roles of the learner and teacher play an important part in the learning process (Figure 3). The general conclusion is that the prospective teachers began to perceive the importance of questioning in their teaching experiences. They discovered that using more advanced questions could result in more analytical thinking (Figure 3).

This program of summer academies to recruit potential teachers interested in mathematics and science is a step toward strengthening our educational system. The Third International Mathematics and Science Study [24] shows that "what we teach and how we teach" is what determines students' achievement. During the academy these prospective teachers had access to outstanding teachers, exemplary curricula, and inquiry-based instruction. They had a glimpse of the need for teachers to be prepared to teach effectively. The prospective teachers learned, from practical experience with the elementary students, the importance of high expectations. The TIMSS [24] report shows a link between having higher expectations for students and getting better results.

A team of professors in the Department of Psychology at the University of Tulsa, the lead O-TEC institution, is tracking all prospective teachers who participate in O-TEC summer academies. Each O-TEC institution will be able to determine the number of prospective teachers who follow through with their interest in teaching as a career. The prospective teachers who attend O-TEC higher education institutions will be supported during their undergraduate programs. ■

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