

# Novice Teacher Implementation of Contextual Teaching and Learning: Analysis of Eight Case Studies in Classrooms

Richard L. Lynch and Scarlette Spears Studdard  
University of Georgia

Final Report  
June 30, 2003

The work reported herein was prepared in association with the *contextual teaching and learning in preservice teacher education* and *studies of novice teachers' implementation of CTL approaches in the classroom* projects at the University of Georgia, with funding support from the U.S. Department of Education, Office of Vocational and Adult Education, Contract # ED-98-CO-0085, 1998 – 2003.

Novice Teacher Implementation of Contextual Teaching and Learning:  
A Cross-Case Analysis of Eight Case Studies in Classrooms  
Richard L. Lynch and Scarlette Spears Studdard  
University of Georgia

**Abstract**

The purpose of this case study research was to better understand the applications of contextual teaching and learning strategies by studying classroom implementation of contextual teaching and learning (CTL) by novice teachers who participated in UGA's preservice teacher education CTL model. Eight novice teachers participated in this project. Cross-case analysis of the eight case studies led to six main categories of findings. First, there were clear differences in the novice teachers' classroom and instructional strategies than those used in more traditional classrooms. Second, the novice teachers implemented specific CTL strategies in their everyday teaching practice. Third, there were facilitators to CTL implementation. Fourth, there were also barriers present that inhibited CTL implementation. Fifth, CTL implementation positively impacted student achievement. Finally, there were other, unexpected findings, such as the appeal of CTL strategies to minority cultures, a higher level of novice teacher performance than might be expected, and the transferability of CTL approaches to non-school settings. The findings support the view that CTL implementation is valuable by having a positive impact on student achievement and novice teacher performance.

## Table of Contents

|   |    |
|---|----|
| <b><u>Introduction</u></b> .....  | 1  |
| <b><u>Purpose of the Study</u></b> .....                                | 1  |
| <b><u>Methodology</u></b> .....   | 2  |
| <u>The Novice Teachers</u> .....  | 6  |
| <u>Assumptions/Limitations</u> .....                                    | 7  |
| <b><u>Findings</u></b> .....  | 8  |
| <b><u>Differences</u></b> .....   | 9  |
| <u>Increased Noise and Activity Levels</u> .....                        | 9  |
| <u>Positive Classroom Environment</u> .....                             | 12 |
| <u>Community of Learners</u> .....                                      | 13 |
| <u>Student Focused</u> .....  | 16 |
| <u>Multidisciplinary</u> .....  | 18 |
| <u>Repertoire of Constructivist Strategies</u> .....                    | 19 |
| <u>Summary</u> .....  | 19 |
| <b><u>Strategies</u></b> .....  | 20 |
| <u>Hands-on-Activities</u> .....  | 21 |
| <u>Collaborative Learning</u> .....                                     | 22 |
| <u>Community Involvement</u> .....                                      | 23 |
| <u>Real-World Connections</u> .....                                     | 25 |
| <u>Problem-based Learning</u> .....                                     | 27 |
| <u>Project-based Learning</u> .....                                     | 29 |
| <u>Inquiry-based Learning</u> .....                                     | 31 |
| <u>Self-directed Learning</u> .....                                     | 32 |
| <u>Authentic Assessment</u> .....                                       | 34 |
| <u>Technology-assisted Instruction</u> .....                            | 37 |
| <u>Summary</u> .....  | 38 |
| <b><u>Facilitators</u></b> .....  | 38 |
| <u>Teacher Philosophy</u> .....   | 39 |
| <u>Positive Student Response</u> .....                                  | 40 |
| <u>Block Schedules</u> .....  | 42 |
| <u>Support</u> .....  | 43 |
| <u>Technology</u> .....   | 44 |
| <u>Good Training from the University</u> .....                          | 45 |
| <u>Summary</u> .....  | 46 |
| <b><u>Barriers</u></b> .....  | 47 |
| <u>Subject Matter</u> .....   | 47 |
| <u>Time</u> .....   | 49 |
| <u>Lack of Support</u> .....  | 50 |
| <u>Apathetic Student Response and Poor Preparation</u> .....            | 51 |
| <u>Curriculum, Textbook, and High-Stakes Testing Requirements</u> ..... | 53 |
| <u>Class Management</u> .....   | 56 |
| <u>Summary</u> .....  | 57 |
| <b><u>Student Achievement</u></b> .....                                 | 58 |
| <u>Active Engagement</u> .....  | 58 |

|  |    |
|--|----|
| <a href="#">Better Recall</a> .....                        | 60 |
| <a href="#">Ownership of Learning</a> .....                | 62 |
| <a href="#">Metacognition</a> .....                        | 63 |
| <a href="#">Summary</a> .....                              | 65 |
| <b><a href="#">Other Findings</a></b> .....                | 65 |
| Applied Differently in Academic and Elective Courses ..... | 66 |
| Appeal to Minority Cultures .....                          | 67 |
| <a href="#">Opportunities often Missed</a> .....           | 69 |
| <a href="#">Higher Level of Teacher Performance</a> .....  | 71 |
| <a href="#">Transferability of Approach</a> .....          | 71 |
| <a href="#">Summary</a> .....                              | 72 |
| <a href="#">References</a> .....                           | 77 |

### List of Tables

|  |    |
|--|----|
| Table 1. Differences .....                                 | 9  |
| Table 2. Strategies .....                                  | 21 |
| Table 3. Facilitators .....                                | 39 |
| Table 4. Barriers .....                                    | 47 |
| Table 5. Student Engagement/Mastery .....                  | 58 |
| Table 6. Other Findings .....                              | 66 |
| Table 7. Summary of Findings from Cross-Case Analysis..... | 72 |

**Novice Teacher Implementation of  
Contextual Teaching and Learning:  
Analysis of Eight Case Studies in Classrooms**  
**Richard L. Lynch and Scarlette Spears Studdard**  
**University of Georgia**

**Introduction**

The Contextual Teaching and Learning (CTL) case study research reported herein represents a continuation of the original three-year grant to the University of Georgia (1998 – 2001) to develop a CTL-based preservice teacher education model. The preservice CTL project at UGA began in Fall 1998 with a three year contract from the U.S. Department of Education to develop a model of excellence for contextual teaching and learning in preservice teacher education. The result of this work was the development and implementation of a teacher education model where students (a) completed courses, seminars, and other experiences in professional education and content areas which integrated contextual teaching and learning concepts into instruction; (b) used experiences in community, workplaces, and school contexts to inform teaching and learning; and (c) were prepared to use CTL strategies in professional practice. In September 2001 the U.S. Department of Education approved a continuation of the CTL project at UGA to examine the implementation of CTL strategies in classroom settings by novice teachers who participated in the UGA preservice CTL teacher education model.

**Purpose of the Study**

The purpose of the case study research was to better understand the applications of CTL strategies in actual teaching contexts and how this might affect teaching and learning. The study

identified eight novice teachers (student teachers or first year, full-time teachers) who had participated in UGA's CTL-infused teacher education model. Research was designed to examine which CTL concepts and practices beginning teachers used with their students to (a) enrich subject matter, (b) engage students in learning, and (c) increase student mastery of subject matter. By examining actual teacher behaviors in the context of school classrooms and labs, we have been able to deepen our understanding of the transfer of CTL knowledge from university preservice teacher education to the real world of teaching practice in public schools.

### **Methodology**

The purpose of this case study research was to better understand the applications of CTL strategies in actual teaching contexts by studying classroom implementation of CTL strategies by novice teachers who have participated in UGA's preservice teacher education model with a focus on CTL instructional approaches. A qualitative case study research approach was undertaken to explore these applications. Qualitative methodology allows researchers to focus on understanding behaviors and experiences (Bogden & Biklen, 1998) and to explore the issues of interest in context (Merriam, 1998). The case study approach to qualitative inquiry is "a specific way of collecting data, organizing data, and analyzing data" (Patton, 1990, p. 303). Data in case study research includes all the information about the case and can include interviews, observations, and document review. Merriam (1998) identifies a case study as an examination of a bounded system or "case." She describes a case as "a specific phenomenon such as a program, an event, a person, a process, an institution, or a social group" (p. 9) chosen as an example of a concern or issue. Merriam also describes various types of case studies. She indicates that case studies can be descriptive, interpretative, or evaluative. Merriam (1998) points out that descriptive case studies are particularly useful when looking at innovative programs and

practices. This case study research is descriptive in nature, as it provides a detailed account of the teaching strategies employed by the eight novice teachers.

This research included case studies of eight novice teachers who had been trained in contextual teaching and learning instructional approaches while enrolled in UGA's preservice teacher education programs. The public school classrooms in which these novice teachers were now working or "practicing" (i.e. student teachers) were the bounded systems, or "cases" (Merriam, 1998) for the purposes of this research. Each of the eight novice teachers and their classrooms were viewed as a single, bounded case. After the data were collected, analyzed, and written up for each case, they were then compared and contrasted to form a single cross-case analysis. For the single cross-case analysis, data were analyzed using the constant comparative method of data analysis (Glaser & Strauss, 1967; Merriam, 1998; Patton, 1990, 2002). Creswell (1998) describes the constant comparative method as "taking information from data collection and comparing it to emerging categories" (p. 57). In the constant comparative method, comparisons are constantly being made within and between data. Specifically, in the course of this research, each of the eight individual case study reports was read and then reread to identify themes. These themes were then compared across the cases to arrive at common categories. The information reported herein details categories from across the eight case study reports.

The intent of this study was to better examine actual teaching processes, the extent to which the novice teachers used CTL strategies in teaching content, and what helps or hinders this approach. Participants were chosen purposively. According to Merriam (1998), purposive sampling allows the researcher to choose a sample that will provide the best possible information.

The pool of possible candidates for this study consisted of students who had participated in a sufficient number of courses and activities in the preservice teacher education program at UGA to be grounded in CTL concepts and strategies, had graduated from UGA, and had full-time teaching positions. Initial review of student participation records from the CTL project indicated that, due to the timing of this study, many of the students who completed the core CTL courses had not yet completed their student teaching or other degree requirements and graduated from UGA. To reach a minimum sample size, it was decided to broaden the definition of novice teacher to include student teachers as well as graduates with full-time jobs in the schools. Members of the final pool of novice teachers had each completed two or more CTL core courses, either graduated from UGA or were in their senior year, and were either student teaching or holding a teaching job during spring semester 2002. Three of the spring semester teachers were subsequently employed as full-time teachers during the fall semester, 2002.

Creswell (1998) indicates that data collection consists of activities designed to gather good information. Data collection methods for this case study research consisted of classroom observations of the novice teachers, in-depth interviews, and document analysis. Observational data “represent a firsthand encounter with the phenomenon of interest” (Merriam, 1998, p. 94) and allow researchers the opportunity to view and interpret the phenomenon being studied. Observational data were important to this study because field observations in the schools provided researchers with firsthand knowledge of the teaching practices of the novice teachers involved in the study. According to Seidman (1998), “the primary way a researcher can investigate an educational organization, institution, or process is through the experience of individual people” (p. 4). Merriam (1998) also suggests that interviews are important when researchers are interested in how participants interpret their experiences. Interviews can vary

from highly structured protocol-driven interviews which use predetermined questions to open-ended conversational style interviews that allow respondents to determine their own meaning from experiences (Merriam, 1998). Document analysis allows researchers to look at a variety of materials connected to the phenomenon of interest. Documents and artifacts are collected and reviewed to obtain additional relevant information (Merriam, 1998). This case study research relied on observations, artifacts, and conversational interviews.

Field data collection occurred on-site during school hours. CTL faculty members at UGA went to the individual schools and observed the novice teachers in their individual classrooms. Each researcher took field notes while on site. Additionally, the researchers interviewed the novice teachers after the observation. This practice allowed the researcher to get the novice teacher's interpretations and feelings on what was taking place in the classroom and to see how the novice teacher was making meaning of his or her experiences. Interviews and observations were conducted in the field beginning spring semester 2002 through fall semester 2003 and, in one case, through January 2003.

Data analysis was multi-tiered. Each individual case study researcher analyzed the data for the particular classroom and reported the findings. When the individual case studies were complete, a cross-case analysis was conducted. The constant comparative method of data analysis (Glaser & Strauss, 1967) was employed. The constant comparative method is often used for its rigorous focus on the data (Glaser & Strauss, 1967; Merriam, 1998; Patton, 1990, 2002). Comparisons are constantly being made both within and between data. Data were coded and organized into broad categories. The categories were then subsumed into themes. The themes were then organized according to the research questions.

The findings for this case study were triangulated to assure that the reported findings match reality as closely as possible (Merriam, 1998). Multiple data sources, or data triangulation was employed. These multiple sources included the eight individual case study reports. Additionally, multiple researchers were involved in the process. There were eight faculty members who completed the individual case studies. Peer debriefing, involving knowledgeable associates in the research process to critique and comment on tentative findings, was also employed to ensure that interpretations were consistent with the data (Merriam, 1998). These forms of triangulation allow for a deeper and clearer understanding of the materials being presented.

The intent of the study was to gain a better understanding of how novice teachers implement CTL strategies in the classroom. The constant comparative method of data analysis helped to not only identify strategies used but also to make meaning of the process by which these practices have evolved.

### **The Novice Teachers**

Eight novice teachers were chosen to participate in this study. Novice teachers were chosen based on their participation in UGA's CTL preservice teacher education program. Below is a brief description of each of the eight novice teachers; all names are pseudonyms:

- Cindy - Full-time teacher, first year, high school, female, taught 9-12<sup>th</sup> grade family and consumer sciences spring '02 and fall '02 semesters
- David - Full-time teacher, first year, high school, male, taught 9-12<sup>th</sup> grade technology education spring '02 and fall '02 semesters
- Julia - Substitute teacher, middle/high school, female, taught science education spring '02 semester; full-time middle school science teacher fall '02 semester

- Lynn - Student teacher, high school, female, taught 12<sup>th</sup> grade mathematics, spring semester '02, completed graduate degree fall semester '02, full-time math teacher spring '03
- Nancy - Student teacher, high school, female, taught 10-12<sup>th</sup> grade biology, science, spring '02 semester; intern with Center for Disease Control, curriculum development fall '02 semester
- Rhonda - Student teacher, high school, female, taught 9-10<sup>th</sup> grade mathematics spring '02 semester; full-time teacher, high school math, fall '02 semester
- Sarah - Full-time teacher, first year, middle school, female, taught 7<sup>th</sup> grade life science spring '02 and fall '02 semesters
- Susan - Student teacher, high school, female, taught 9-12<sup>th</sup> grade marketing spring '02 semester; worked in business fall '02 semester

### **Assumptions/Limitations**

There are several limitations for this cross case analysis. First, the findings from this qualitative study are not meant to be generalizable beyond the scope of the study. The background information and description provided should be utilized to determine if this study has bearing on the reader's situation. Second, this was a single-site study. All eight of the participants were students or graduates of UGA. Thirdly, the perspectives of the researchers and participants are clearly present in the research process. It is possible that the researchers' perceptions and beliefs about the effectiveness of CTL strategies influenced the study. To limit researchers' bias, multiple researchers and peer debriefing were utilized.

Finally, it is important to recognize that CTL instructional strategies typically appear somewhere along a continuum from very traditional (lecture, note-taking, grill and drill, reliance

on textbooks, and teacher as sole authorities) to more student-centered, totally “real world,” contextualized manner of teaching. The researchers may have been limited by our view of our own framework [[www.coe.uga.edu/ctl](http://www.coe.uga.edu/ctl)] which emphasizes teaching strategies and practices more to the right of the continuum. This framework became the benchmark or lens from which we wished to train teachers and designed our model for infusing CTL into preservice teacher education courses.

### **Findings**

The purpose of this study was to better understand the application of CTL strategies in actual teaching contexts by studying classroom implementation of novice teachers who have participated in the preservice teacher education program at UGA. Four research questions guided the study:

- 1) How does the teaching practice of CTL-trained novice teachers differ from more traditional approaches to teaching the subject matter?
- 2) Which CTL strategies do CTL-trained novice teachers use in classroom teaching contexts?
- 3) What are the facilitators and barriers to the implementation of various CTL strategies in actual classroom practice in school settings?
- 4) What effect does use of CTL strategies have on student engagement and mastery of subject matter content?

These questions were also used to organize and present the data. Data were organized into six overarching categories: Differences, strategies, facilitators, barriers, student mastery/engagement, and other more general findings.

## Differences

This section deals with the perceived differences between traditional classrooms and classrooms in which CTL strategies are employed. Traditional classrooms were assumed to be teacher centered and directed, utilizing practices such as lecture, individual work, using traditional assessment such as quizzes and tests, and with few real-world connections. Six clear differences from these traditional teaching practices emerged from the case studies: 1) increased activity/noise, 2) comfortable, relaxed classroom environment, 3) community of learners, 4) multidisciplinary instruction, 5) student focused, and 6) use of a repertoire of constructivist strategies. Table 1 provides a visual representation of the findings in this theme.

**Table 1. Differences**

|                             |   |
|-----------------------------|---|
| <b>Positive Differences</b> | Increased Activity/Noise                |
|                             | Positive Classroom Environment          |
|                             | Community of Learners                   |
|                             | Student Focused                         |
|                             | Multidisciplinary                       |
|                             | Repertoire of Constructivist Strategies |

### Increased Noise and Activity Levels

The noise and activity levels in the CTL classrooms were a major difference from traditional classrooms that were observed. Students in the CTL classrooms were encouraged to be interactive – to talk, question, move around, and work in groups. In traditional classrooms students are expected to be silent unless called upon to answer a question. This was not the case in the observed classrooms. Constructive noise, including instruction-related talking, discussing, questioning, and sharing was the norm. Students were encouraged to ask questions of the teacher and other students. Group work was common and required the students to interact. Additionally, students felt free to ask questions, to correct other students and, even occasionally, to correct the teacher. “Focused chaos” was a term used to describe the classrooms.

Rhonda's classroom provided an excellent example of classroom noise, "One girl went to the white board and began writing homework problem numbers down as students were calling out numbers." Students felt comfortable commenting, critiquing, and questioning in this classroom. Teachers who were not trained in CTL practices sometimes found the classrooms to be noisy. Rhonda's response to a comment about her class being noisy was, "Yes, but keep in mind she [observing teacher] has a very traditional view of classrooms...where students are silent and you can hear a pencil drop. I don't have that view! To her my classroom was loud and to me it was normal." Rhonda's feelings sum up those of the other CTL novice teachers, that constructive noise is considered to be normal and is valued in the classroom.

Similar to the noise level, there was an increase in the activity level in the classrooms of the CTL-trained novice teachers as well. Not only did the CTL-trained novice teachers encourage students to engage in "constructive noise," they also encouraged "constructive activity." In all of the classrooms, collaborative inquiry was used. This required that students move about and be more active than in a traditional classroom. Students were encouraged to take an active role in their own learning, including choosing learning material and completing hands-on projects. Susan's classroom provided several examples. First, Susan often used stations in her teaching. These stations required the students to get up and move around the room in order to access the different stations. Second, Susan encouraged students to choose a designer in whom they were interested for a research project in the fashion merchandising class. This choice implied that the students should take an active role in their own learning. Susan also required students to work in groups to complete projects. For example, when the marketing class began to look at market research,

The class was divided into two groups: a survey group and a focus group. The survey group developed a survey and each group member administered the survey to five students throughout the school....The focus group conducted its activity with classmates, with one member tabulating results. These two groups then switched roles, so everyone would be able to participate in each activity. This enabled every student to see not only two examples of how market research works, but also have the perspective of both the market researcher as well as the provider of data for market research.

These activities, and active learning, provided the students with experiences that they could relate to real world situations. Susan's classroom provided a glimpse of the activity level in the CTL-trained novice teachers' classrooms.

David's classroom often provided examples of this increased activity as well. When asked about why his students were moving about in a drafting class, David replied, "I do allow students to render assistance to each other so long as they do it in a quiet manner. They are responsible for individual work on some assignments in classes but students generally prefer to work and learn from one another. I believe students learn effectively from each other and believe that they should develop this sharing practice when they become workers." In this example, the students were moving about the room to work with other students. Again, students were comfortable asking questions and seeking assistance from other class members. They moved about freely in order to complete their assignments.

As previously mentioned, the tone was often that of "focused chaos." Yet, this "focused chaos" allowed the students to gain valuable insights into the subject matter being covered. Whether it was math or drafting, noise and activity levels were increased. Students seemed

comfortable asking questions and requesting assistance. The classrooms seemed active and vibrant based on the interaction and movement observed.

### **Positive Classroom Environment**

The CTL-trained novice teachers emphasized a relaxed and positive classroom environment. In general, the classrooms were uncluttered and emphasized the subject matter being taught. Sarah's classroom provided an example, "The classroom climate was quite positive. It impressed us as a safe, secure, relaxed environment for learning." The description continues, "We also observed that Sarah places emphasis on affective learning and the creation of a positive classroom climate." Sarah indicated, "It is very important to me that my classroom be a friendly, inviting, and welcoming learning environment."

Rhonda's classroom provided an example as well. In Rhonda's classroom, "Mathematics posters and cartoons as well as student projects decorated the walls. On the blackboard were the days and times Rhonda was available for extra help. For that week she was available on Monday at 8:00 a.m. and 3:40 p.m.; Tuesday at 3:40 p.m.; and Thursday at 8:00 a.m. The room was not cluttered and felt relaxing." These examples illustrate how the CTL-trained novice teachers were concerned with the atmosphere in their classroom. The CTL-trained novice teachers in this study felt it was important for the classroom to project a relaxed and safe atmosphere in which learning could be maximized. This atmosphere contributed to the sense of community and ownership that the students took in their learning and the learning community.

The position of the teacher in the classroom was also a difference noted by both the researchers and the novice teachers. In traditional classrooms the teacher is the center of attention, both literally and figuratively. In many traditional classrooms, the teacher's desk is situated in the front of the room, and the teacher will remain there for a large portion of the time.

In the CTL-trained novice teachers' classrooms, the classroom arrangement was often not traditional. In other words, the teacher's desk, and by association the teacher, was not generally the focal point in the classroom. In some instances, the teacher's desk was in the rear of the room, some classrooms only contained a podium for the teacher, and some were more traditional in their set-up. For example, in describing Cindy's classroom it was said,

The teacher has a desk in the back of the classroom. However, she never used it during class time. Although minor, it is an issue as a CTL-trained teacher. A practice of CTL is that the teacher acts as a facilitator of student learning and to do that a teacher must be actively engaged with students.

The classrooms were structured to allow more interaction and hands-on learning. It was common for the CTL-trained novice teachers to be mobile within the classroom. In other words, the CTL-trained novice teachers were active participants in their own classrooms. They did not only sit at their desk or stand at the podium to give instruction. They moved about and interacted with the students on a regular basis.

These differences in the layout of the classroom and the focus on atmosphere indicated that the CTL-trained novice teachers thought it was important for students to feel comfortable in the classroom. The CTL-trained novice teachers in this study focused on keeping the classroom a positive place for students. Additionally, by decreasing the focus on the teacher, students were allowed to increase their input into the learning equation.

### **Community of Learners**

Researchers reported that the novice teachers had developed a learning community in their classrooms. Teachers and students shared in the responsibility for learning. Learning was not solely directed by the teacher; students were accountable for what occurred in the classroom

as well. This not only meant that the teacher shared the responsibility for what occurred in the classroom with the students, it also meant that the novice teachers gave some choices to their students about assignments, projects, and assessments. It was noted of David's classroom, "It was clear to me that students do feel a sense of community and share ideas and information with each other without being disruptive." Researchers also noted that the novice teachers had an excellent rapport with their students based on the trust and responsibility that was shared in the classroom. Additionally, it was found that through a community of learners approach, the teacher tended to act as a facilitator of learning rather than the source of knowledge. The CTL novice teachers treated the students as collaborators in the learning process.

In the community of learners that was established, students were expected to respect and render aid to other members of the community. Cindy utilized the community atmosphere in her very diverse classroom. She reportedly asked students to select a food from their country and demonstrate it to the class. In this way the student is actively engaged and simultaneously teaching his or her peers through the demonstration. According to the teacher, "a girl from Russia did a Russian cooking demonstration and a girl from Mexico did a Mexican cooking demonstration. They (students) feel like they are part of the class when I incorporate their country." Based on the respect that students had for other members of their learning community, they were attentive to these presentations and viewed them as learning opportunities.

Sarah provided another example of how a community of learners was established:

Her lessons were usually student centered. Rather than establishing herself as the primary source of knowledge for students, she acted instead as a facilitator of students' learning. In the observed lessons, she often treated her students as collaborators in the learning process. She shared decision making with them and respected the decisions they

made. Sarah also ensured that her students learned in an active, hands-on fashion and she encouraged them to discover knowledge through their own initiatives. Often, these initiatives were group initiatives because, she said, she valued social interaction during the learning process.

Sarah believed that her middle-school students should be involved in the learning process and made attempts to see that this happened. She collaborated with her students and encouraged small group collaboration as well. These activities served to build a classroom learning community.

The students seemed to value the community atmosphere that was created in the classroom. While students were relaxed and talkative, they remained on task. For example, in Cindy's classroom, "Students were given an opportunity to study for a quiz and worked together at tables and even moved from table to table in an effort to ensure correct answers and understanding. At first glance, this may appear to be disorderly, but it was not." The students studied for their quiz and worked with all members of the community of learners to ensure understanding. Additionally, the students took ownership for their classroom. One researcher reported that students greeted her and asked who she was as she entered the classroom. Based on the observations, it seemed that students in the CTL-oriented classrooms felt that they were important members of the learning community. Another researcher reported a classroom where the students and teacher worked together to find the answers. In this example, the teacher was drawing a line on his computer screen and made an error that was noticed by one of his students. The student called this to the attention of the teacher. The novice teacher acknowledged his error and thanked the student for pointing it out to him and stated "I am not perfect and make mistakes

also. I don't profess to know everything and am a learner just like you." The students clearly saw their teacher as their ally, someone who worked with them in the learning process.

This sense of being a community of learners encouraged the students to believe in their own abilities. As a community of learners, the students and teacher worked together to achieve learning outcomes and goals. Learning was more student centered and collaborative. Students took ownership in their learning and in the classroom environment.

### **Student Focused**

Understanding the needs of the students, and their contexts and communities, was a major difference noticed in the CTL-trained novice teachers' classrooms. This is in contrast to a subject oriented foci often associated with more traditional approaches to teaching. The novice teachers went out of their way to understand all of their students and then plan lessons and activities accordingly. As Rhonda noted,

I think it is very important to get to know your students. However, it is not only important to get to know them inside the classroom, but outside the classroom as well. If you can find out what their interests are and what they want to do eventually it can help you gear the lessons towards those students, and even keep their interest in the subject higher. I would also get to know my students well enough to find out what type of mathematics they are going to need to know to help them reach their maximum potential.

She further elaborated,

I would make sure I get to know the community I am teaching in and what demands that the community places on those students. I would see what types of jobs are offered in the community and what types of college students in the community go to, to help prepare them for what is ahead. If I know I have a class full of students who are not going to go

to college, but they are going to go back and work in that community, then I would gear my lessons to real life mathematics that they can apply to their lives outside of school. However, at the same time if most of my students were going to go to UGA, I would make sure I teach them not only what is applicable outside of the classroom but also what they will need to be competent in to be successful at UGA.

Lynn too felt the need to understand where her students were coming from. Lynn attended many extracurricular activities in an attempt to better understand her students. She was “generous in her time before and after school when students asked for help.” She tutored her students. She felt that her students needed to see her as approachable in order for her to be effective in the classroom. “I sat with my students that give me the hardest time, kind of blend [in]... That kind of thing, so they know I was interested in what they were doing.”

Julia also made attempts to understand her students’ needs. As a new teacher, one of Julia’s first goals was to get to know her students and their lifeworlds outside the classroom. “I need to have an understanding of students’ prior experiences and knowledge, of what interests and excites them. It means I have to try to understand their cultures and take time to go into their communities.” Instead of relying on prepared modules dealing with the science they were learning, Julia created activities that were focused on their lives, such as looking at dog breeding when studying genetics. Dog breeding was important in the community and was therefore relevant to the students’ everyday lives. This allowed the students to understand the concepts and make connections with their own lives.

The CTL-trained novice teachers made extraordinary efforts to understand the needs of their students and the communities in order to better meet student needs. CTL-approaches allowed the novice teachers to incorporate this information into the classroom.

## **Multidisciplinary**

The CTL-trained novice teachers incorporated a multidisciplinary approach into their teaching practice by encouraging students to use skills and applications they had mastered in multiple courses over a period of time. David's classes provided clear examples of this. In his courses (technology, drafting), students were often observed to be using communication, math, and science skills. The nature of the courses David taught required students to utilize multiple disciplines to be successful. However, David capitalized on this and actively sought to include math, science, and writing skills in his assignments.

Sarah also provided a solid example of a multidisciplinary approach. In the lesson *Planning and plotting a garden*, students were required to use math skills to solve a problem. Sarah's researcher noted, "Strictly speaking, Sarah was not responsible for teaching mathematics, but because science often involves mathematics, she routinely incorporated it into her lessons and took it into account in her assessments."

Nancy and Lynn also utilized a multidisciplinary approach in their CTL practice. Nancy, who was student teaching high school biology, and Lynn, who was a first year math teacher, both incorporated writing assignments in their classes. In Nancy's class, students were required to keep laboratory notebooks and to create a project notebook. Lynn specifically had students find newspaper and magazine articles that contained mathematical information and then write about the information they located.

This multidisciplinary approach drew on various subjects and contexts to simulate more closely the real world of problem solving and uses of knowledge. Throughout many CTL-focused lessons, students were learning about the connectedness and interrelatedness of English, mathematics, communications, science, technology, and other school subjects. Additionally, a

multidisciplinary approach reinforced prior learning and allowed students to build on the knowledge they had accumulated.

### **Repertoire of Constructivist Strategies**

The novice teachers in this study utilized a repertoire of strategies based on constructivist principles; that is, their focus was on working with the students to build new knowledge in ways that were most meaningful to the students. The novice teachers built upon students' prior knowledge to facilitate constructing new meaning. Making connections across the curriculum and learning in context were also stressed in meaning making. The novice teachers, in general, facilitated learning as opposed to standing as the center or authority on the subject.

The novice teachers also tended to see learning as a social construct, and encouraged this by their use of collaborative learning. The novice teachers understood that students could learn from each other, as well as from the teacher. Based on these and other constructivist principles and techniques, the CTL-trained novice teachers employed specific strategies in the classroom. These strategies will be discussed in depth in the following section.

### **Summary**

The teaching practices of the eight CTL-trained novice teachers in this study differed significantly from more traditional teaching approaches. First, there was increased activity and noise in the classrooms. This "focused chaos" referred to both the noise level and the activity level. Students were encouraged to ask questions and contribute to the learning process in the classroom. Students were also encouraged to take an active role in their learning, including moving around the classroom, actively choosing research topics, and participating in projects. Second, the CTL-trained novice teachers created an open, supportive, and friendly atmosphere in the classroom. The participants in this study made an effort to ensure that their classrooms were

“safe, secure, relaxed” to maximize learning potential. Additionally, the CTL-trained novice teachers in this study were cognizant of their position and movement in the classroom; they actively engaged with the students, moved about the classroom, and offered constant assistance and encouragement. This focus on a comfortable and relaxed classroom environment allowed students to focus on learning and not the classroom atmosphere. Third, learning communities were visible in the CTL-trained novice teachers’ classrooms. These learning communities were created based on mutual trust and respect. Students were treated with respect and given the opportunity to contribute to their own learning. Teachers were in turn seen as allies in the learning process. Fourth, the CTL-trained novice teachers made every attempt to make their classrooms and the learning environment student focused. The CTL-trained novice teachers in this study took the time to understand their students and their needs. The novice teachers then included topics familiar and of interest to the students in the classroom. Additionally, the novice teachers made time to assist their students out of class by being involved in extracurricular activities and being available before and after school to answer questions. Fifth, the multidisciplinary focus of the CTL-trained novice teachers allowed students to use their new-found knowledge across the curriculum and experience the inter-related aspects of subject matter. Finally, the CTL-trained novice teachers utilized a repertoire of constructivist strategies as discussed in the next section.

### **Strategies**

Contextual teaching and learning approaches involve many different strategies. The CTL-trained novice teachers who participated in this study employed several strategies which were integral to the CTL implementation process. Strategies utilized included: 1) hands-on activities, 2) collaborative learning, 3) community involvement, 4) real world connections, 5) project-based

learning, 6) problem-based learning, 7) inquiry-based learning, 8) self-directed learning, 9) authentic assessment, and 10) technology-assisted instruction. Table 2 provides a detailed visual representation of the findings in this area. These strategies provided the basis for the differences that were noted earlier. These strategies were the foundation for the novice teachers' use of CTL.

**Table 2. Strategies**

|                                 |                        |                         |                    |
|---------------------------------|------------------------|-------------------------|--------------------|
| <b>Strategies</b>               | Hands-on Activities    |                         |                    |
|                                 | Collaborative Learning |                         |                    |
|                                 | Community Involvement  | Guest Speakers          |                    |
|                                 |                        | Field Trips             |                    |
|                                 |                        | Doing-it (Real Science) |                    |
|                                 | Real-world Connections | Work-based Learning     |                    |
|                                 |                        | Service Learning        |                    |
|                                 |                        | General Education       |                    |
|                                 | Problem-based Learning |                         |                    |
|                                 | Project-based Learning |                         |                    |
|                                 | Inquiry-based Learning |                         |                    |
|                                 | Self-directed Learning |                         |                    |
|                                 | Authentic Assessment   | Rubrics                 | Oral Presentations |
|                                 |                        | Portfolios              | Following Protocol |
|                                 |                        | Journals and Notebooks  | Lab Experiments    |
|                                 |                        | Writing Assignments     | Team Work          |
| Technology-assisted Instruction |                        |                         |                    |

### **Hands-on-Activities**

Hands-on activities allow students to perform tasks in reality, e.g. using the hands by “digging in and doing it,” instead of simply reading or learning about a task. Hands-on activities were a common strategy employed by the CTL trained novice teachers who participated in this study. Examples included a biology lab, taste test, rocket launch, and a survey of the school. In Nancy’s biology class, the students dissected fetal pigs. After learning about organ systems, the students were able to see the systems as they dissected the fetal pigs. Cindy provided several hands-on activities for her culinary arts students. One example is the lettuce taste test, where students were asked to taste and describe a variety of greens. David provided his students with

hands-on activities as well. In one of his classes, students designed rockets that were to carry a live egg payload to an established height in the sky and return to earth using a parachute system without breaking the egg. In an example provided by Lynn, students were asked to calculate angles of stairs around the campus. In each of these activities, the teacher required the students to put their knowledge into action.

### **Collaborative Learning**

Collaborative learning uses small groups in which students work together to maximize their own and each others learning (Berns & Erickson, 2000). Collaborative learning suggests a way of dealing with people that respects and highlights individuals. With collaborative learning, there is a sharing of authority and acceptance of responsibility among group members for the group's actions. The underlying premise of collaborative learning is based upon consensus building through cooperation among group members.

Collaborative learning was another strategy employed by all of the CTL-trained novice teachers in this study. The teachers felt that student collaboration was a very effective tool in the classroom. However, there were multiple rationales for its use. According to David, "In the real world, individuals work in teams in most production jobs. I feel that it is important for them to build trusting relationships and teamwork skills." David emphasized the importance of being a team player and being able to work well with others. Cindy also recognized the importance of working together. She stated that "in college and business world there are group projects and activities all the time." While Cindy recognized the value of group work for its value in the business world, she also found collaborative learning to be an asset in her diverse classroom. By focusing on the cooperative aspects of collaborative learning, Cindy allowed all of her students to contribute strengths to the group. Collaborative learning and the resulting group grading was

one instance where the teacher stressed collaboration and the group product, to the benefit of all students. All of the novice teachers in this study indicated that collaborative learning helped to prepare their students for the real world where teamwork is often required.

### **Community Involvement**

Community involvement dealt with involving community members in education and drawing on the community culture in the learning environment. This included guest speakers, field trips, using examples from the community, and conducting “real” science in the environments surrounding the community.

Julia provided a particularly interesting example of community involvement. Julia pointed out that her students struggled with the concept of instantaneous velocity. She said, I wanted students to see the application of this concept in their everyday lives. What came immediately to mind is the idea of speed traps. I invited a local police officer to my classroom. As a class, we went outside and stood next to the road that runs parallel to our school. Officer Martin showed us how to use laser speed guns to determine the average velocity of cars traveling between two points. He then placed students at each end of the road to time cars. Students were really interested in this practical application of an abstract concept. This activity really served as the basis for them understanding the whole idea of instantaneous velocity.

This activity also allowed the students to interact with the officer on an informal basis.

Cindy wanted her students to see how their course work could be useful in the future, either in their career choice or personal life. Cindy was aware that some of her students would utilize the knowledge gained in her class in future jobs and planned for this. For example, knowing that some of her students would someday pursue a career in the culinary world, Cindy

took her class on field trips to local restaurants and had chefs come to class to serve as guest speakers and to provide demonstrations. Additionally, Cindy pointed out that good nutrition is always important. She referred to buying and cooking food and told her students, “You are always going to have to eat . . . so buy and or cook well.” Cindy involved the community in her classroom to enrich her students’ learning.

Sarah also provided examples of community involvement. Both Cindy and Sarah utilized field trips to expose their students to the community around them. Sarah explained,

We have field trips to the local nature center in which the students are able to use prior knowledge and skills in real situations. An example could be on a recent field trip to Elachee Nature Center, the students were able to look at various plants, insects, and water creatures that we have been studying.

Doing real science was another example of involving the community in the classroom. Students were encouraged not just to observe but also to do. As Nancy’s researcher noted, “Student engagement was apparent in the classroom, and student engagement was achieved by connecting science to student lives, community, and world and by having them constantly ‘doing science.’” Nancy’s students observed a myriad of nature and science in a field in their community. This allowed the students to see that “real” science exists and is done outside the classroom.

Involving the community in the learning environment allowed students to see that learning extended beyond the classroom. Bringing community members in as guest speakers, whether in person or by video, gave students a person to relate to in the community. Field trips allowed students to see how what they were learning in the classroom was applicable in the

community. Doing real science helped students to see the impact of their actions on the community.

### **Real-world Connections**

Helping students to integrate what they were learning in the classroom with their life outside the classroom was important to the CTL-trained novice teachers in this study. The teachers were concerned that the students remain interested in the material that was being covered in the classroom. They tended to believe that one of the best ways to do this was to make the instruction relevant to the students' lives outside of the classroom. Additionally, the CTL-trained novice teachers wanted students to learn subject matter and skills that would be applicable in the real world, in college, and in the workplace. For example, several teachers discussed the importance of collaborative learning not only as a learning strategy, but as a skill that would benefit the students in post-secondary education and on the job.

The CTL trained novice teachers were concerned with work-based learning. While the work-based learning observed in the course of this research was not the more formal work-based learning such as an internship or apprenticeship, work-based learning was a component of CTL implementation. For example, Cindy was concerned that her students realize that they could have a career in the culinary world. To illustrate this point, she invited chefs into the classroom and took her class on fieldtrips to local restaurants. Additionally, Susan went into the community and interviewed entrepreneurs in order to make academic concepts more meaningful and real to her students. Rhonda also wanted her students to be able to apply the math skills they were learning in her class to their future lives. She elaborated,

I will make sure to include real world applications for the mathematics that is being learned. I want to always be able to answer the questions, "why are we learning this?" I

feel that students will be more interested in learning if they can see where they are going to use this in real life. This will help them prepare for other activities because I will have trained them to always apply what they learn to other subjects or areas of interest. Then no matter what they are learning they will always be able to transfer that knowledge to something that interests them.

Sarah provided her students with an opportunity to learn to solve problems, a skill that will prove beneficial in the workforce.

Science is a course where numerous problems can be solved on a daily basis. I try to teach my students to ‘think outside of the box’ so that they can devise more than one possible solution to any problem in life. When problem solving, students learn to work to achieve a goal and to think openly about a possible outcome. They also seem more interested when they have a “problem” to figure out.

This focus on problem solving focused on future work. Each of the novice teachers mentioned clearly had workplace connections in mind and focused on work as a basis for learning.

Service learning was another example of connecting to the real-world. An activity in which Nancy’s class participated was visiting an old field site to observe vegetation succession. This visit was linked to the environment and the effects of pollution on the environment.

Making general connections with classroom learning and the real-world was also important to the novice teachers. Julia provided an example dealing with bacteria. In this example, Julia’s students were able to see how relevant their class work was to their everyday lives.

On Monday I used a slide show to facilitate discussion about bacteria. At the end of the day, students left with the thought that bacteria could be present anywhere. Then

yesterday we tested our theories about bacteria using blood agar that I obtained from the hospital. We tested either a hand or a mouth for bacteria (knowing that it would be present there). Because many of the students asked about the difference between bacterial and anti-bacterial soap, we decided to wash our hands using one type of soap or the other and then retest the same area. If a student had selected the mouth they compared Listerine with water in terms of cleaning. Today you saw us take this one step further by testing for bacteria at sites we had selected throughout the school. Some of the most popular selections were the lock on the bathroom stall, the water fountain, desk tops, tables in the cafeteria and locker doors. Students used one of three cleaners to clear the area they had washed and re-swab it.

This strategy allowed Julia's students to see that bacteria surrounded them. Using the cleaners allowed students to see the impact these agents had on the bacteria. This activity was interesting to the students in Julia's class, but also had real health and well-being implications as well.

Real-life applications allowed students to make meaning of material that might have otherwise had no meaning or held no interest for them. The novice teachers in this study believed that real-life applications were important to the learning process and attempted to include real-world scenarios in their teaching.

### **Problem-based Learning**

Problem-based learning was another strategy that the majority of the CTL-trained novice teachers in this study utilized. Problem-based learning is defined as an instructional approach that uses real-world problems as a context for students to learn critical thinking and problem-solving skills (Berns & Erickson, BGSU, 2000). Theoretical underpinnings of problem-based learning include the use of prior knowledge to understand and structure new information, using

context to make the transfer of learning more likely as it reflects real-life situations, and the elaboration of knowledge that occurs through discussion, answering questions, peer teaching, and critiquing. Nancy and Sarah provide excellent examples of this strategy.

Nancy utilized problem-based learning in each of the units she taught. In her classroom, student problem-solving skills were developed as a direct result of practicing science. Students were provided with an open-ended problem and asked to construct a plausible explanation. For example, one of the problems assigned dealt with the human population fluctuation problem on an imaginary island. The objective of the lesson for each group of students was to provide an explanation for the data in a population table which was provided to the students. They needed to relate island events with fluctuations in population size. They needed to propose a hypothesis explaining their observations, and they employed the scientific method to test the hypothesis. Formulating a scientific hypothesis meant applying concepts such as carrying capacity to the situation and distinguishing among the different kinds of growth limiting factors that may or may not affect population size.

Sarah, too, often utilized problem-based learning. She provided this rationale for utilizing this strategy,

Science is a course where numerous problems can be solved on a daily basis. I try to teach my students to ‘think outside of the box’ so that they can devise more than one possible solution to any problem in life. When problem solving, students learn to work to achieve a goal and to think openly about a possible outcome. They also seem more interested when they have a “problem” to figure out.

Sarah also enjoyed making the problem one that had immediate meaning for the students. An example is her lesson dealing with balanced diets. Sarah posed the following problem to her

students, “Does our school lunch menu provide a balanced diet?” In order to solve the problem, the students used actual school lunch menus, placed items in food groups, listed nutrients (carbohydrates, fats, and proteins), and distinguished between animal and plant products. Integrating science with mathematics, the students analyzed various combinations and proportions to solve the problem.

Problem-based learning allowed students to use their knowledge to solve the given problem. This strategy focused on students using knowledge and skill across the curriculum to focus on one challenge. The novice teachers also indicated that problem-based learning helped students to maintain interest in the material being presented.

### **Project-based Learning**

Project-based learning was also observed in the classrooms studied. Project-based learning is a comprehensive approach to classroom learning designed to engage student investigation of authentic problems. This might include an in depth study of a topic that is valued by the learner. Project-based learning typically engages students in complex, real-world activities through which they develop and apply academic skills and knowledge. Students are required to draw from many information sources and disciplines to solve problems and manage and allocate resources such as time and materials. David and Susan utilized project-based learning to interest and motivate their students.

David presented his students with a problem to solve in the course of their project. This project required the students to design, construct, and test a completed product – the construction and launching of a rocket to carry a raw egg payload into the sky and return it to earth safely. David presented information to the students on the project. The researcher then observed students working in teams using the computer to search the internet for rocket specifications and

designs that could be used to help them design their rocket body. They were engaged in trying to apply math and science principles to the design of the rocket body to reduce drag while making the rocket stable. The students had to determine where the fins would be placed to stabilize the rocket in flight and to design a parachute system that would engage once the rocket began to fall to the ground. Additionally, the students had to design a packaging system to protect the raw egg from breaking on impact with the ground on the return flight. Students were working in teams of two but the researcher occasionally observed teams consulting with each other. David further described the project,

We took the class out to the soccer field where we set up the launch pad and then each team of students had an opportunity to fire their rockets. As each rocket was launched, I had students use the altitude checker to see if it went high enough to meet specifications and then watched as some of the rockets fell to the ground with a crash because the parachute failed to open or opened only partially. If you recall, the rocket was carrying a real egg as cargo so it was rather messy with those rockets that failed to operate properly. Only one team successfully launched their rockets and that was a team of two girls who paid more attention to my guidelines and specifications and took care of details. Their rocket was beautifully colored but it was not the best looking design. It functioned properly, however, and the girls were very pleased with their work. Some of the other teams were disappointed but hopefully they learned from their mistakes. Following the launching, teams had to write up a report on their projects to include in their portfolio.

Susan also utilized project-based learning in her classes. For example, her fashion merchandising class was in charge of all aspects of the school's annual fashion show. The entrepreneurship class groups had to put together a video sales presentation. The

entrepreneurship class also required groups to develop business plans. For the business plan assignment, students in groups began by deciding on what type of business to start and then had to develop the marketing mix, identifying the four P's of marketing: product, place, promotion, and price. A handout provided a topical outline, but it was entirely up to the students to be as creative as they'd like in the project. Once the marketing mix was completed, students then progressed to develop their business plan. These business plans also provided clear evidence of critical thinking as these students chose clever store names, developed logos, considered management organization and philosophies, and projected a needed revenue stream.

The use of project-based learning allowed students to apply the academic knowledge acquired to real-world situations. In order to be successful, the students had to utilize several different information sources and transfer knowledge across disciplines. The use of project-based learning also allowed the students to apply their knowledge in ways that interested them, thus keeping them involved and motivated.

### **Inquiry-based Learning**

Inquiry-based learning was another strategy that the CTL-trained novice teachers utilized. "Inquiry based learning engages students in 'what if' scenarios and investigations to construct mental frameworks that adequately explain their experiences" (<http://www.coe.uga.edu/ctl>). This strategy was used alone and in conjunction with other strategies.

Nancy provided several opportunities for the researchers to observe the use of inquiry learning in her classroom. The researchers noted:

In the fetal pig unit, inquiry was directed at visible organ system identification. In the population growth unit, inquiry was directed to explaining the observed fluctuations in

island population size. The process or inquiry was discovery-driven with the students in the driver's seat.

Susan also indicated that she encouraged her students to use inquiry. In her classes, she allowed students to choose topics in which they were interested to research. She believed that this practice would encourage inquiry skills. Susan felt that it was important for her students to explore topics in which they were interested and to use this interest to keep students focused.

David also incorporated inquiry learning into his classroom. In the example of the rocket launch, it was clear that students were given the freedom to “what if” with their rocket designs. Some were more successful than others, but the students were able to play out their own scenarios and make meaning of the choices that were incorporated into the design.

Inquiry-based learning was important in Rhonda’s classroom as well. Rhonda discussed how she thought it was important for students to discover some mathematics on their own. Rhonda encouraged her students to be inquisitive. She noted, “They’ll ask why something works the way it does. We’ll stop and explore why and other ways of solving the problems.”

Inquiry-based learning allowed students to make meaning of their experiences. This type of learning encouraged students to question “what if” and to explain the scenarios. Inquiry-based learning pushed students to a deeper understanding of the material being covered.

### **Self-directed Learning**

Self-directed learning as a CTL strategy was mentioned by half of the novice teachers in this study. Self-directed learning refers to students being responsible, at least in part, for their own learning. In this case study, the degree of self-direction varied.

Sarah discussed her concern that students learn to learn on their own, or become more self-directed in their learning. She elaborated,

I believe it is important for students to learn to achieve their own goals. It creates responsibility. I, for one, do not want my students to grow up to think that things must always be handed to them when they don't feel like getting it themselves. Therefore, I encourage my students to be self-motivators and to achieve their own goals in science and in school in general.... When teaching a class of 30 students, it is extremely difficult to monitor each and every student's learning and comprehension. Therefore, it is extremely important that the students learn to direct their own learning in the classroom...if students do not understand a particular concept, it is very important that they recognize the difficulty and ask for help. The ability to recognize an area of difficulty is a requirement to be a self-regulated learner.

For Sarah, it was important that her students understand that they had the capability to learn on their own. She also felt it was important that her students know that learning required some personal effort. She also believed that asking for help was a part of this process.

Other novice teachers viewed self-directed learning differently. The novice teachers in this study often allowed students to be somewhat self-directed. That is to say, the students were assigned a project and then allowed to choose the particular subject matter of the project. For example, Susan assigned students in her fashion merchandising class a research project. The assignment required that students research a fashion designer. Susan provided suggested topics to cover, questions to answer, and websites to consult. However, she did not assign the designer. It was up to the student to choose a designer and to research the points of interest regarding him or her. The student not only had to write a paper on the designer, but also had to give a presentation to the class on the selected designer. While Susan did provide structure for the

assignment, she left it to the student to decide who to research, how to gather the necessary information, what information to gather, and finally, how to present the information.

The use of self-directed learning required the teachers to give up some of their control of the classroom and to place faith in the students' ability. The self-directed learning also required the students to take responsibility for their own learning. By utilizing this style of instruction, the novice teachers were both showing their faith in their students and preparing their students for real-world situations where they would be forced to learn on their own.

### **Authentic Assessment**

Assessment is authentic when it directly examines student performance on worthy intellectual tasks. Authentic assessments tend to measure whether the student can craft polished, thorough and justifiable answers, performances, or projects. Assessments should represent a history of learning, an organized progression of accomplishment, a direct and valid outgrowth of the standards and objectives set for the curriculum or learning event, and input from multiple human resources. Learners should have input into the assessment processes and some selection of assessment instrument ([www.coe.uga.edu/ctl](http://www.coe.uga.edu/ctl)).

Authentic or meaningful assessment was a strategy employed by seven of the eight CTL-trained novice teachers in this study. Rubrics were commonly referred to by the teachers. David provided several examples of utilizing rubrics in his implementation of CTL practices. David has students complete portfolios, learning logs, and video tapes, depending on the particular class.

According to the researcher,

Nearly all projects now have scoring rubrics. Most projects have performance guides and models of exemplary completed projects that are used to guide instruction. Students are required to reflect on their learning experiences in reflection papers. Students are

encouraged to learn from their mistakes and to correct their errors. Assessment of performance projects is the main strategy for determining student achievement.

Julia also indicated that authentic assessment was important to her understanding of CTL.

As noted by her researcher:

Julia felt that assessment of student learning should match the way in which science is taught. This type of seamless assessment can be illustrated by describing a lesson that Julia taught on force and motion. As part of a force/motion lab, Julia had students brainstorm examples where they could see different principles of force and motion both in the laboratory and outside the classroom. As part of this lesson, Julia incorporated an alternative form of assessment which required students to build a roller coaster containing two hills, two loops, and two banked curves. As a form of assessment, students had to explain at least seven principles of force and/or motion present in their roller coaster and the importance of these principles to the functioning of the roller coaster. Later, as a summative assessment at the end of the unit on force/motion, Julia showed a video of one of the school's football games. Students had to explain what principles of force and motion were used in the context of this football game.

Julia's assessment did indeed match the way in which she taught science. The assessments that Julia chose were also meaningful to her students. In other words, the students could understand the applicability of the concepts because Julia placed the concepts in contexts that the students understood and enjoyed (roller coasters and football).

Nancy and Lynn also utilized authentic assessment in their CTL practices. Nancy, who was student teaching high school biology, and Lynn, who was a first year math teacher, both had their students complete writing assignments. In Nancy's example, students were required to keep

laboratory notebooks during the fetal pig dissection. Additionally, students were required to create a project notebook. Lynn also incorporated notebooks and writing in her statistics class. Students assembled portfolios “at least two or three times.” For the portfolios, they collected “different activities that we had done, up to that point that were involved in the chapter that they did” including homework, the articles, and projects. Additionally, Lynn had students complete writing assignments.

Lynn used two different kinds of writing assignments: articles and poems. For the articles, students had to find mathematical information outside the classroom, for example in a newspaper or on the web, and then write an article about the information they had identified. . . . “The first time I assigned that I said, you’re going to have to find an article in a magazine. I want you to write about the math involved, write about the statistics involved. Make sure it has numbers in it because that will help you out a lot and see if they’re talking about averages or different things like that.” . . . Lynn was particularly impressed by the work of one student who had analyzed the information on the back of a baseball card and had written his essay about the stats on the card. She was impressed because he brought things to her attention that she had never thought of before. Lynn also allowed her students to write poetry for extra credit. The poetry had to include at least ten vocabulary words from the chapter. The Statistics Haiku poem, included below, was written by a student who was president of the drama club and who intended to be a drama major in college.

*Statistics Haiku*

An observation  
of the double-blind cricket  
reveals subtle joy

The distribution  
of thin, variable clouds—  
random, much like life

Each event, like the  
hand's independent digits,  
is disjoint, perfect

And in addition:  
what's the probability  
of enlightenment?

The use of authentic assessment, especially rubrics, allowed students to understand on what criteria they would be assessed and to have input into that process. The authentic assessments illustrated in this study measured the students' ability to apply the knowledge they had gained and to show their thorough understanding of the topic and its applicability to other situations.

### **Technology-assisted Instruction**

Technology integration was another way in which the CTL-trained novice teachers in this study implemented CTL practices. The novice teachers felt that the appropriate use of computer and other technology assisted greatly with learning in context. The nature of technology integration varied. The use of PowerPoint presentations, both by students and the novice teacher, was present in three classrooms during researcher observations. Lynn used the web to have students search for newspaper articles and poems that contained mathematical information.

Sarah provided an example of the importance of technology integration by pointing out the role that technology played in her teaching by connecting lessons to real-life contexts. She said, "Computers and other electronics are quite handy in the classroom...TVs and VCR also provide excellent opportunities for learning in context." The technology availability allowed Sarah to present material that might otherwise only be read about. Students could see the material being discussed in context via TV or through the internet.

Technology played a larger role in David's classroom. As the media, technology education, and drafting instructor, technology was central to David's instruction. Not only was the technology integral to his instruction, the technology resources also allowed his students to associate what they were learning in the classroom with future careers. The media production lab has the sophisticated equipment (such as cameras, VCRs, and broadcast equipment) needed to produce, edit, shoot, and re-shoot TV commercials and programs; the drafting lab has several computers and printers, including a blue-print printer; and the technology lab contains numerous computers. This equipment is similar to what the students would use on the job in such content areas as manufacturing, construction, power or electronics, and communications. The use of the technology allows the students to apply their knowledge to real-world and workplace scenarios.

### **Summary**

The CTL-trained novice teachers in this study utilized several strategies in classroom teaching contexts. These included hands-on activities, collaborative learning, community involvement, real-world connections, problem-based learning, project-based learning, inquiry-based learning, self-directed learning, authentic assessment, and technology-assisted instruction. The manner in which these strategies were implemented varied with the eight novice teachers. However, each of the novice teachers used the strategies with which they were most comfortable, which best fit their teaching philosophy, and which they believed to be the best match for their subject matter.

### **Facilitators**

Participants in this study were enthusiastic about CTL practices and principles. Based on their experiences, there are several factors which facilitated their implementation of CTL. These included 1) teacher philosophy, 2) positive student response, 3) time (block schedule), 4)

support, 5) technology, and 6) good training from the university. This section will describe the facilitators to CTL implementation as indicated by the eight novice teachers who participated in this study. Table 3 provides a visual representation.

**Table 3. Facilitators**

|                     |                               |                                |  |
|---------------------|-------------------------------|--------------------------------|--|
| <b>Facilitators</b> | Teacher Philosophy            |                                |  |
|                     | Positive Student Response     |                                |  |
|                     | Time (Block Schedule)         |                                |  |
|                     | Support                       | Administrative and Collegial   |  |
|                     |                               | Financial                      |  |
|                     | Technology                    |                                |  |
|                     | Good Training from University | Experience with Subject Matter |  |
|                     |                               | CTL Focus                      |  |
|                     |                               | Internships                    |  |

### **Teacher Philosophy**

Nearly all of the eight novice teachers discussed how their own philosophy of teaching impacted their CTL implementation. Their philosophies changed somewhat as they grew professionally and experienced “real” classrooms as teachers. However, the way in which they viewed teaching obviously had an effect on the teaching strategies they chose to employ.

Sarah, a middle school science teacher, believed that CTL practices were more useful than traditional teaching strategies. She said,

In my opinion, CTL teaching practices are far more interesting and helpful than traditional teaching practices. Students have the opportunity to learn concepts through hands-on methods that bring concrete understanding to them. Also, students are more engaged in their learning when they are taught through CTL methods. This is especially true in science, when hands-on experimentation is readily available.... It is much easier to learn about the steps of scientific method when one can perform an actual experiment... than learning through rote memorization.

Sarah, like many of the other novice teachers, believed that CTL strategies were beneficial to her students. She believed that CTL strategies would keep her students more interested and give them a clearer understanding of the concepts being presented.

Julia, who taught middle-school science, discussed how her concept of CTL changed through the course of her teaching. Julia explained,

While I have been struggling with my definition, I have come to view CTL as an approach used to identify student needs and then use students' real-life experiences to teach science lessons in the classroom. It's based on the idea that both students and teachers can engage in and have ownership for their learning. They can learn to reflect more deeply on their learning.

Clearly, Julia's philosophy of CTL evolved to encompass the needs of the students and more real-life experiences. She also began to see the need for students to take more ownership of their learning.

The teaching philosophies of the novice teachers impacted how they implemented CTL practices in their classrooms. For some, it was more about how CTL practices would assist in subject matter retention. For other teachers, it was about how CTL practices could help the student not only with the class material, but throughout life as well. Additionally, it was interesting to note, that in some cases, the philosophy and the strategies utilized changed over time.

### **Positive Student Response**

Two of the eight participants specifically reported that the level of student involvement was important to their implementation of CTL. In other case studies, it was apparent that students' positive responses to the CTL strategies encouraged the novice teachers.

Student involvement in the classroom was important to both Rhonda and David. Rhonda, who taught high school mathematics, spoke of teaching honor students and the impact they had on her teaching and the strategies she chose. When asked about facilitators to CTL implementation, she replied, “I can think of a few (facilitators). First, there are the students. They give me ideas. They’ll ask why something works the way it does. We’ll stop and explore why and other ways of solving the problems.” David, who taught technical classes, also felt that his students had a positive impact on his CTL implementation. David pointed out that many of his students were very capable and were interested in the subject areas (drafting, technology, and media production) as future careers. David’s students tended to have a high interest in the subject matter and worked hard to do quality assignments in his classes.

While only Rhonda and David spoke specifically of their students’ ability and interest as facilitators to CTL implementation, positive student responses could be seen as facilitators in other case studies. For example, Lynn found that her students’ reports on articles containing math were very good. She was impressed and encouraged by this. Susan also seemed impressed by her students’ ability. The level of creativity that the students exhibited in their business plans was a pleasant surprise to Susan. Additionally, she mentioned that her students did not think of her classes as learning, they enjoyed the classes. Even though the students did not think of the classes as “learning” they clearly did learn, and learned enthusiastically, based on their responses and achievement in the courses.

The positive response of students was important to the novice teachers who participated in this study. The novice teachers seemed to judge what worked well by their students’ response. When students were positive about a strategy or CTL in general, the novice teachers were encouraged.

## **Block Schedules**

Time was another issue impacting CTL implementation. While several participants mentioned lack of time as a barrier to implementation, three of the novice teachers, Rhonda, Cindy, and Nancy, specifically mentioned block schedules as a facilitator to their CTL implementation.

Cindy, who was the family and consumer sciences teacher at Riverwood High School, felt that the block schedule allowed her to better implement CTL strategies. At Riverwood, the block classes meet for an hour and forty minutes every other day. Cindy pointed out, “The block schedule definitely helps. It gives the time to accomplish a task especially when we’re doing cooking labs or when we’re doing different projects and we have to get out supplies.” For example, on the day of the lettuce taste test, students had enough time to taste, fill out the information sheet, and then assess their learning in class with the teacher. Thereby, the lesson on lettuce was not disjointed by starting the lesson one day and completing it the following day; students were able to see the big picture on salad greens in one class setting. This would not have been possible in a 55-minute class period.

For Nancy, a high-school science student teacher, the block schedule allowed time for the students to explore and solve problems on their own. Nancy enjoyed using case studies as an instructional method. The block schedule allowed students sufficient time to work on the case studies. If the class had only been 55 minutes in length, students would not have been able to explore the material in depth.

Block schedules seemed to facilitate the use of CTL strategies. The extended time students had to spend on the material allowed them to explore in more depth what was being presented. Also, the extended time allowed for learning to take place in a more contextual

situation. Teachers felt free to use more problem-based learning, project-based learning, and real-life scenarios in their presentation of the materials.

### **Support**

Support — administrative, professional, and financial — was important to the implementation of CTL strategies. Half of the participants reported the support of their peers and supervisors as being an asset in the implementation of CTL practices and strategies. David indicated that one of the greatest facilitators to the implementation of CTL strategies during the spring semester was an experienced technology education colleague. He also mentioned that the support he receives from his school administrators and the county career and technical education coordinator is very beneficial. One final support that David enjoyed during the period of this study was the assistance and encouragement that he received from other technology education teachers in the county and area as well as from his peers who met regularly in the CTL seminar at UGA. David believed that this support helped him have the confidence to implement CTL strategies into his teaching.

Rhonda and Nancy also mention support of supervising teachers as important to their implementation of CTL strategies. Rhonda spoke very positively of the influence Lois, her supervising teacher, had on her practice. She felt that she and Lois were able to take different viewpoints and offer suggestions to each other. Nancy, too, seemed to have a very collegial relationship with her supervising teacher. This allowed Nancy and Mrs. Bailey to work together to enhance teaching strategies.

Financial support was also important in the implementation of CTL practices. The use of technology was listed as a facilitator to the implementation of CTL practices. This required that financial resources be invested into the appropriate technological resources. Additionally, David

and Cindy both mentioned the supplies (software, salad greens, etc.) they were able to obtain because they had sufficient budgets to do so.

Support was an integral factor in CTL implementation for the novice teachers in this study. The support of peers and supervisors gave the novice teachers confidence in what they were doing and in their own abilities. Financial resources were also an asset in implementing CTL strategies in that the novice teachers could purchase materials that allowed for more hands-on learning opportunities.

### **Technology**

Technology was another area listed as an asset in CTL implementation. The novice teachers utilized technology in the classroom to provide students with hands-on experiences and multiple contexts for learning. David utilized technological resources in his classes. In his technology education and drafting classes, students did many hands-on assignments. Additionally, in the media production class, students were required to use technology in order to produce a show.

Nancy also provided an example of the appropriate use of technology in her student teaching. Nancy utilized a PowerPoint presentation on whales and whale feeding behavior while presenting a unit on ecosystems. Additionally, the use of this technology allowed Nancy to bring in pictures and sounds of her experiences while whale watching.

Sarah provided another example of technology use and how it facilitated CTL implementation. Sarah's classroom was well equipped and good use of technology was made by her and her students. Sarah recognized the role that this technology played in her teaching by allowing her to connect lessons to real-life contexts: "Computers and other electronics are quite handy in the classroom...TVs and VCRs also provide excellent opportunities for learning in

context.” In other words, even if the class could not go on a field trip, the field trip could come to the class through the TV and VCR. Susan provided a clear example of this. For a unit on accessories and jewelry in the fashion merchandising class for which there were few resources available, Susan contacted jewelry stores and asked if she could visit them and videotape their places of business. By going into the community and videotaping the business owners in their places of business, Susan was exposing her students to information they would otherwise not have had the opportunity to access.

Technology was important in the CTL implementation for the novice teachers in this study. The teachers used technology to expose their students to knowledge that, otherwise, could generally be gained only by taking field trips or having guest speakers. Additionally, the teachers in this study utilized technology to give students hands-on experience.

### **Good Training from the University**

The CTL training that the novice teachers received was also of benefit in implementing the CTL strategies. Each of the eight mentioned their CTL classes positively. Even one principal attributed the high quality of teaching to “(Sarah’s) good training at the university.”

Some recalled specific classes and the impact those classes have had on their teaching and philosophy. David spoke of certain CTL classes and the strategies he learned. For example, David mentioned Dr. Schell’s class, “I remember what Dr. Schell taught us about a community of learners and I like that concept. I believe strongly that one of the best ways to learn is to teach,” and David was observed utilizing this strategy in his classes. Lynn commented specifically on the value of the field trips during teacher education preparation, the guest speakers, the InterMath project, contextualized activities in her math education curriculum classes, and the service learning project. As reported by her researcher, “this service learning

project gave Lynn a lot of confidence, and it reassured her in her chosen career. It also extended her image of a teacher, in that this image now included extensive use of technology.” Cindy especially praised her business internship which “helped enormously to prepare her to teach foods classes [in] high school.” Rhonda emphasized learning the use of strategies, including “concept maps, surveys, chalk talk, brainstorm, think-pair-share, mapping, field trips, documentation, reflection, KWL, problem solving, share, inquiry, research, flow chart, diversity, and public demonstration of learning.” She especially valued learning how to use the community as a source of knowledge: “Most importantly we learned where to find out information about our community and different ways to have our students learn about the community.” Others spoke more generally about their positive experiences with CTL preparation at UGA.

Additionally, it was apparent from the case studies that, in general, the novice teachers were comfortable and confident in their role. Their education had prepared them to teach in a variety of contexts, to recognize what strategies would work best, and to implement those strategies. Rhonda even commented, “I learned more in my (CTL) classes about teaching than any other classes at the university.” It was apparent that the training these novice teachers had while in the preservice teacher education program had dramatically affected the way they viewed teaching and learning.

### **Summary**

This cross-case analysis found that there were several areas that impacted CTL implementation. These included teacher philosophy, positive student response, block schedules, support (both professional and financial), technology, and training. The teacher’s philosophy affected how CTL was implemented in the classroom. A positive student response encouraged the novice teachers and assisted them in knowing what worked with their particular students.

Block schedules allowed time for more in-depth and contextual learning opportunities. The support that the novice teachers received encouraged and enabled them to implement CTL strategies. Availability of technology also allowed the novice teachers to be more flexible and creative in their CTL implementation. Also, training the novice teachers received while at the university assisted them in knowing what strategies to implement and how and when to apply those strategies. Each of these facilitators provided the novice teachers with the confidence to step out of a traditional mindset and implement CTL strategies in the classroom.

### **Barriers**

This section will focus on the barriers, or factors, that inhibited implementation of the various CTL strategies in the actual classroom. Participants specifically mentioned: 1) subject matter; 2) time; 3) lack of support; 4) student apathy/lack of preparation; 5) curriculum, textbook, and high-stakes testing requirements; and 7) classroom management. Table 4 details the findings for this section.

**Table 4. Barriers**

|                 |  |                              |                   |
|-----------------|--|------------------------------|-------------------|
| <b>Barriers</b> | Subject Matter   |                              |                   |
|                 | Time   | Poor time management         |                   |
|                 |  | 55-minute class periods      |                   |
|                 | Lack of Support  | Administrative and Collegial | Crisis Atmosphere |
|                 |  | Financial                    | Parental          |
|                 | Student Apathy/Lack of Preparation                         |                              |                   |
|                 | Curriculum, Textbook, and High-stakes Testing Requirements |                              |                   |
|                 | Class Management   |                              |                   |

### **Subject Matter**

Subject matter had a large impact on the implementation of CTL practices. Half of the participants in this study reported difficulty in contextualizing their approach to the subject matter, particularly in math and science. For example, Sarah noted, “. . . sometimes it fits better

to one subject area rather than another” and revealed her belief that CTL does not work equally well across the curriculum. Sarah elaborated,

In science there are just some activities that have no CTL strategies to use. Sometimes students have to know scientific concepts so that they can use it later for testing or just because they need to know it. These particular concepts prevent the application of CTL strategies.

Sarah indicated that some areas of science were, in her opinion, just not conducive to CTL approaches. She believed it is easier to implement CTL in social studies than in science which, in turn, is easier than mathematics. Julia echoed Sarah’s concerns with her comment, “The nature of the topic is a big determinant in terms of how well it lends itself to a CTL approach.” Sarah and Julia both had concerns about contextualizing the science they were teaching.

Rhonda and Lynn, both high school math teachers, shared similar concerns about contextualizing math. Rhonda commented, “Sometimes it’s hard to find or think of activities that go along with the math that I am teaching. It is especially hard when I have to teach a certain topic when I don’t really like it or understand why they have to learn it.” Lynn shared how she struggled to find real-world connections,

If you just give these kids just random functions that are abstract and only exist or are alive on a Cartesian plane . . . that’s it. There is no Cartesian plane that those kids can touch and feel and relate to on a daily basis . . . It’s much harder to find . . . in the real world.

These four teachers struggled with finding ways to contextualize the math and science they were teaching. While they believed in CTL, they found it difficult to make real-world connections with the subject matter.

## Time

Time was definitely a factor in implementing CTL practices. Six of the eight participants in this study indicated that time restriction, either limited class time or limited planning time, was a barrier to fully implementing CTL strategies in the classroom. Several participants indicated that there was not enough class time to effectively put CTL strategies into use. In other words, while CTL strategies were effective and appropriate for the students, these strategies were too time consuming to be implemented in the normal 50-minute class period. For example, David indicated that the one-hour class schedule limited the amount of work his students could put in on projects, especially considering the equipment set-up and materials necessary to complete them.

Planning time was another issue mentioned by the majority of the novice teachers in this study. In general, the teachers felt that it took more time to plan and implement CTL strategies. Rhonda indicated, "It takes more time to plan CTL in the classroom." Sarah also felt that it was difficult to plan to implement CTL in the classroom. She said, "In being a first year teacher, it is sometimes difficult to use CTL strategies; however, I'm becoming accustomed to the required preparation.... Some activities take weeks to prepare for and build prior knowledge for student learning." The researcher observing Lynn's implementation of CTL in mathematics classes commented, "The lack of thorough planning was one of the factors that interfered with a more comprehensive implementation of contextual teaching and learning."

Time management, both class time and planning time, was identified as an issue by most of the participants in this study. Participants believed that the 50-minute class period detracted from fully implementing CTL strategies. Participants also felt that planning for CTL activities took longer than planning a more traditional approach.

## **Lack of Support**

A perceived lack of support was a barrier to implementation for novice teachers in this study. This lack of support included not only emotional and professional support from administrators and colleagues, but financial support for CTL activities as well. At least three of the novice teachers reported specifically a lack of support and mentoring from their supervisors and peers in the school setting. Nancy's supervising teacher commented that the CTL strategies as practiced by Nancy "were an inefficient use of time." Four of the participants also reported limited funds for labs, field trips, and other teaching strategies. Two commented that their schools operated in a "crisis management atmosphere."

The lack of support varied. Sarah simply felt that her principal did not understand CTL. While this did not directly discourage Sarah, his lack of knowledge or interest did not provide her with encouragement. Julia, on the other hand, commented directly on the lack of support she found. In her words, "the CTL approach requires a lot of creativity—it is difficult to come up with novel ideas or workable projects without the input of other teachers." Julia would have preferred to discuss her ideas with others who shared a similar philosophy. Not only did Julia find it difficult to find collegial support, there were also few experienced teachers in her school, making it difficult to find support or mentoring of any kind. As in Sarah's situation, this lack of support did not directly discourage Julia in her CTL implementation. However, the lack of support and mentoring left her with little encouragement or assistance. Nancy's supervisor presented a double helix; on one hand, she labeled CTL projects Nancy was conducting as an "inefficient use of time," but also went on to state she supported "more application of CTL methods to content instruction." She admitted she knew very little about "this approach into teaching strategies."

The lack of financial support was also a concern. The limited funds available for labs, field trips, and other strategies constrained the implementation of CTL practices in the classroom. The novice teachers would have liked to plan more field trips. However, the limited budgets prevented this. Additionally, the novice teachers mentioned the expense associated with lab assignments and the need for more up-to-date equipment in the labs.

Lack of parental support was another area for concern. Julia mentioned, “for our team’s open house, only 15 out of 200 parents attended.” She further elaborated,

Most parents, because of their work schedules, can only come in for one class period of the day. This does not fit with the way in which our middle schools are set up. Only one group of students will have the opportunity to benefit from the parent’s knowledge.

Julia also noted that she couldn’t always count on students participating in some projects as they did not have resources at home (books, newspapers, transportation to library, computers) from which to gather information. David mentioned contacting a student’s parents to little avail. Sarah commented, “I have had several parents complain about the cooperative learning that takes place in my classroom.” Without the support of the parents, key resources, assistance, and guidance were unavailable to the novice teachers.

Thus, lack of support - collegial, financial, and parental - was a concern for the novice teachers in this study. An increase in support from all levels would have assisted in more complete CTL implementation.

### **Apathetic Student Response and Poor Preparation**

Student apathy was another barrier faced by the CTL-trained novice teachers. At least five of the eight novice teachers in this study specifically mentioned student apathy or other student-related challenges as a barrier to CTL implementation. Others alluded to the impact of

students who were less than prepared or motivated. Rhonda commented that many of her students had “inaccurate prior knowledge – mostly from previous classes and teachers.” Julia’s science simulations were based on an assumption that students possessed a grade-level average mathematical skill. However, many of her students lacked even basic math foundation knowledge and skills, such as division.

Lynn and Cindy both mentioned the lack of motivation they found in their students. Lynn discussed students who wanted to finish the course with the least amount of work possible. Cindy discussed student apathy and commented, “That’s just how high school students are but sometimes it’s hard to get them motivated to get up and move around and do labs and do projects and be excited about it.” This lack of motivation on the students’ part made it more difficult for the teachers to implement the CTL strategies.

David had an interesting perspective on the lack of motivation he encountered. In his words,

Some of the students who were taught by the previous teacher were not expected to do much except complete worksheets associated with the modules (e.g., more “traditional” teaching). They were not expecting to have to assume responsibility for their own learning, work individually and in teams to solve problems, design, construct and test projects, and complete authentic assessments.

David encountered students who were accustomed to very traditional methods of teaching that required very little from them. This was not David’s style of teaching, and he struggled with the attitudes he encountered. He later found that most students adjusted quite well to his style. However, the fact that he required them to take some responsibility for their own learning was stressful in the beginning.

Several novice teachers pointed out that their classes included large numbers of students with limited or even no English-speaking ability who were ill-prepared to study and master the content. Others described some of their students as “special needs,” “wannabe dropouts,” and “lost boys.” Although much discussion and content about diversity occurred in their college teacher education classes, nearly all of these novice teachers mentioned diversity – in its many manifestations – as a challenge to effective teaching. The teachers found that there were some students who had little invested in their education.

### **Curriculum, Textbook, and High-Stakes Testing Requirements**

Several of the novice teachers in this study struggled with balancing CTL principles and strategies and keeping up with the required curriculum. The novice teachers wanted to utilize more CTL strategies, but found the curriculum and the need to teach to the state-mandated test in their subject area to be confining. The novice teachers were concerned that the students score well on the state’s standardized tests and wanted to make sure that they covered the QCCs (Quality Core Curriculum) to enhance their doing so. Julia put it this way,

A question that I have no answer for right now is how to balance what I believe my students need to know in their lives right now with what they need to know to pass the CRCT (criterion-referenced competency test) at the end of the year. I am struggling to bring the QCC’s to their lives in a way that they do not resist. However, it is taking me some time to work through what they need to know, what they want to know, and how we will struggle together.

Julia struggled with covering all the material needed for her students to do well on the science CRCT. She knew specific information had to be presented, but Julia wanted to present it in ways that would keep her students interested and the material meaningful to them.

Covering all the required materials was a concern for at least three of the participants in this study. Sarah indicated that she was struggling with covering all the material mandated in the state curriculum. She indicated, “However, in [this state’s] curriculum requirements for a school year, it is nearly impossible to put forth that much effort and time into one or two activities when you have 14 other chapters to cover.” Her research team of science educators noted, “. . . new teachers and veteran teachers alike must cope with current educational reforms that call for greater and greater amounts of content to be covered – this frequently forces teachers to resort to a traditional method of instruction that emphasizes lecture and rote learning.” In Sarah’s mind, it was very difficult to cover all the material and still have time to come up with creative and innovative ways of presenting the material, creating real-world problems, developing projects, and keeping the students interested.

Rhonda, too, mentioned the need to stay on track with the curriculum. In the county where Rhonda taught, there was a requirement that all teachers follow a mandated and scheduled curriculum with a very specific time-on-topic allocation. Rhonda found that she would have liked to vary the structure and schedule but, based on school system requirements, she could not add activities or spend more time on certain topics. Rhonda was concerned with the lack of student understanding on some topics and would have liked to spend more time, with different teaching strategies, and varied assignments to help more students better learn the material. However, she moved on in keeping with the county requirement.

Nancy also felt under pressure to “cover the material.” She indicated that she knew certain units had to be covered, but was having a hard time keeping up with the curriculum. She desired more autonomy over choice of content and didn’t want to “have to follow a state-mandated curriculum on a specific day.”

These three examples show how the novice teachers in this study felt that a strict curriculum directed toward the content thought to be tested by the state made it difficult to implement CTL strategies in the classroom. This focus on keeping up with the “same day same page” curriculum plan and “covering” all of the content detracted from the novice teachers’ desires to meet the individual needs of the students in their classrooms.

Related to the curriculum is the topic of required textbooks, also mentioned as a barrier to CTL approaches. The CTL-trained novice teachers reported that the texts were often not appropriate for use with CTL practices. For example, Julia felt that the required science textbook did not provide contextually appropriate content for learning. Julia described the school district’s science-adopted textbook as,

... consisting of guided reading and a study workbook. Essentially, students are supposed to write out definitions, and then copy sentences from the textbook into the workbook.

Basically, this book does not seem to promote student thinking or transfer of knowledge to real-life situations.

Julia found the textbook to be lacking in context and only providing statements and terms to be memorized. There were no critical-thinking exercises, problems to be solved, hands-on activities, or real-world applications.

Lynn also specifically mentioned textbooks as being detrimental to CTL implementation in mathematics. She stated, “Both algebra classes used traditional textbooks . . . the lessons follow . . . small steps and few, if any challenges. In short, work from most traditional textbooks can be boring.” Lynn noted that there was nothing that made the textbooks exciting or allowed the students to relate the material to their own lives.

David and Susan both pointed to modules and “learning activity packages” (LAPs) which did not meet the needs of their students. In some cases, modules were not complete; in others, the packages simply did not contain material that was relevant or interesting to the students. These two career and technical teachers also commented that the traditional modules and LAPs were boring.

Keeping up with curriculum requirements, using textbooks or LAPs that did not include CTL strategies, and ensuring that students were prepared for standardized tests were concerns and huge pressure points for some of the novice teachers in this study. As one researcher phrased it, “The tension of high stakes testing in the current era of reform seems to stand in stark contrast to the kinds of assessment called for in contextual approaches to teaching and learning.” The teachers were concerned that the students do well. They also wanted the students to understand the material being presented. Teachers in this study felt that they often had to move ahead using less than interesting materials, in order to cover the required material, even if students had not gained a clear understanding of the material being presented.

### **Class Management**

Five of the novice teachers, David, Susan, Lynn, Rhonda, and Nancy, reported classroom management as a barrier to CTL implementation. For these novice teachers, demands of managing the classroom undermined their implementation of CTL strategies. Lynn provides a very clear example of the struggle with classroom management. Lynn felt that she had the most classroom management issues in an Algebra I class. She saw several factors that contributed to her difficulties. First, with 32 students, this was the largest class she had to teach. The room was filled to capacity, and Lynn felt she had only limited options to rearrange the seating and accommodate students who wanted and needed to be in the front of the room. Second, most of

the students were seniors who needed the class to graduate, and they simply wanted to finish it with the least amount of work. Third, Lynn felt her age and her tendency to be very casual contributed to her difficulties in this particular class. She stated,

I'm so casual and, and the way I am. The students I'm working with are mostly seniors and so they don't look at me as teacher a lot of times—which they should, they look at me as a big sister or as a college student, or someone who is there who knows a lot about math. But they don't take instruction very well.

Nancy felt that classroom management was an issue as well. She indicated that she was “meaner” in some classes than in others. Nancy reported that she was often “putting out little fires.” Nancy felt that managing her classroom detracted from her ability to focus on teaching.

It was pointed out to several novice teachers by supervisors and mentors that classroom management tends to improve with experience. Perhaps true, but for these novice teachers, the need to focus on classroom management took away some of the focus on CTL implementation.

### **Summary**

Barriers to implementing various CTL strategies by the novice teachers included: subject matter; time; lack of support; student apathy; curriculum, textbook, and testing requirements; and classroom management. Subject matter was an issue that was listed as a barrier to CTL implementation by novice teachers of the state's core academic subjects. Participants also indicated that some subjects (e.g., math and science) were more difficult to contextualize. Lack of time was another factor. Shorter class periods inhibited deep exploration of major topics and teaching strategies thought to result in higher levels of learning. Participants also indicated that it took longer to plan the CTL activities. The lack of administrative and collegial support left some novice teachers discouraged. Apathetic student response was also a concern for a few of the

teachers in this study. The focus on standardized testing and “one size fits all” curriculums left the novice teachers (i.e., those in academic subjects) struggling with how to cover the required material and still keep it interesting and meaningful for all of their students. Classroom management also detracted from CTL implementation. Several of the novice teachers felt they spent a great deal of time on managing their students and the classroom. All of these factors, individually and combined, served as barriers to CTL implementation.

### **Student Achievement**

A question asked of all novice teachers and examined by researchers was, “what effect does use of CTL strategies have on student achievement?” As shown in Table 5, four themes surfaced: Through use of CTL strategies, middle and high school students 1) were more engaged with their learning and subject matter, 2) performed better on assessments, 3) were empowered to take some responsibility for their own learning, 4) were developing metacognition; that is, they were applying what they were learning in new and different ways and acquiring skills themselves to better process higher-level subject matter and its applications.

**Table 5. Student Engagement/Mastery**

|  |                                   |                          |
|--|-----------------------------------|--------------------------|
| <b>Student<br/>Engagement/<br/>Mastery</b> | Active Engagement                 | On-task                  |
|  |                                   | Connected                |
|  |                                   | Attentive, interested    |
|  |                                   | Motivated                |
|  | Better Recall                     | Better Assessment Scores |
|  |                                   | Better Grades            |
|  | Ownership of Learning/Empowerment |                          |
|  | Metacognition                     |                          |

#### **Active Engagement**

The novice teachers believed that CTL strategies encouraged students to be more engaged with the subject matter than did traditional teaching methods. For example, during

Nancy's student teaching experience, the researchers observed that student engagement was high during the fetal pig unit. During the unit,

One student commented, "See chittlins that you eat?" Another student commented, "Is that what we look like? Gross." The material caught and held the students' attention. As Nancy noted in the interview after class, "The fetal pig was new. Cutting it open engaged them. They have been anticipating this. They keep asking about the pig."

This hands-on activity allowed the students to engage the subject matter on several different levels. All the students were involved in this unit. They stayed on task and got into it. They were interested and attentive. They made connections between the pig and what they ate. They made connections between the pig and their own internal structure. They were all actively engaged in "doing science" and incorporating this knowledge and work into applications beyond the classroom.

Students were highly engaged in David's classes. The researcher noted that students were engaged in their assigned projects, worked in teams to complete their assignments, and were "turned on" to learning in David's classes. David felt that students like problem-based and project-based learning approaches because they like to be actively engaged in learning experiences that involve the application of knowledge and opportunity to use their hands as well as their minds. He also believes students are less likely to be absent from school because they don't want to let their team members down and cause their team to get behind in completing performance projects in class. David felt that CTL strategies had a positive impact on student engagement in his classroom.

Rhonda felt that by allowing students to be actively involved in the learning process, they not only learn the content, they also learn how to learn. Rhonda stated that in her classes:

You would definitely see a lot of student involvement, no matter what day you came. . . I try not to be sole provider of information. I try to let my students discover a lot on their own, without my feeding it to them - or if one student understands a problem and another doesn't, I'll let that student explain it to the class. I don't want my students to see me as all knowing. I want them to see me as learning with them. You'll also see a lot of student interaction and I'll just kind of sit back to the side and interject when appropriate, like if they get a term wrong, I'll interject a question to see if they correct themselves.

Through this example, Rhonda illustrated that the students in her classes take an active role in their learning and discover knowledge on their own. She also indicated that she allows the students to struggle with the material so that they will not only come to understand the mathematics involved, but also the learning process. Julia, in a related observation with her research collaborator, commented on the increased ownership in learning: "what strikes me most is that students seem to have a genuine ownership in their learning. They are actually involved in making decisions about what, how and why they will learn particular science concepts."

Consistently throughout the case study reports, researchers noticed that students were interested in the content and materials being presented to them in classrooms where CTL strategies were implemented. The students seemed to enjoy the lessons, to learn the concepts well, kept more on-task, and showed interest in the material they were learning. The motivation to learn and to understand the content seemed higher with greater contextualization of teaching strategies.

### **Better Recall**

The novice teachers who participated in this study felt that CTL strategies and practices had a positive impact on student achievement, by citing improved test scores and higher grades

on projects and portfolios as examples. Sarah provided a good example of how she felt her students' achievement was high, not only because of their test scores, but also based on other measures of achievement. She indicated,

Aside from standardized test scores, our student's science achievement is measured in different ways. I assess a student's achievement through traditional testing, but also through lab experiments, projects, journals, daily assignments, and other ways. I think that by using a variety of assessment methods, which is recommended by CTL, it is possible to see all students' weaknesses and strengths...Because CTL uses authentic assessment techniques, it allows me to identify different needs of students. Because I teach students at an age that they are just learning to think for themselves, they need reassurance of their abilities and capabilities. Therefore, through the use of CTL, my students know that they can and do excel...they have the ability to be an excellent student (sic) in science and in school in general.

Researchers commented that "During CTL-intensive lessons, her (Sarah's) students were motivated and achieved well, as evidenced by our observations, the students' test performances and work products, and the observations of Sarah's principal and fellow teachers." Not only did Sarah believe that CTL-strategies helped her students succeed, but her principal and fellow teachers verified that her students did achieve through the application of CTL strategies.

CTL also encourages the use of multiple methods of assessment. This allows students who might not score well on standardized or "objective" tests to achieve as well on other assessment measures. In addition to Sarah's example above, another example of excellent achievement was illustrated well by Cindy. In her classes, Cindy has many students for whom English is their second language which makes standardized and other paper and pencil test-

taking difficult. Cindy found that her students performed better on projects than on traditional quizzes or tests and that the project-based activities she often utilized helped her students both master and retain the material. Susan also provided an example of solid student achievement. For a test in one class, Susan gave her students a blank concept chart and had them list the steps of the sales process and include all the characteristics of each. There were “lots of terms to remember” but they had literally acted out many through role play, and “I think that helped them to remember. And they all did really well with it [the test].” Susan believed that the CTL strategies she had employed helped the students retain the material and do well on the test.

The novice teachers in this study indicated that student recall was enhanced by CTL strategies and practices. The teachers believed that the use of multiple assessment methods and other CTL strategies helped the students to learn and retain the material far better than if they had used more traditional teaching methods.

### **Ownership of Learning**

The CTL-trained novice teachers indicated that students had more ownership of their own learning when CTL strategies were implemented. Students also seemed to feel more empowered in the CTL environment. Julia indicated that ownership of learning was central to her definition of CTL, “It’s [CTL] based on the idea that both students and teachers can engage in and have ownership for their learning.” She further elaborated, “What strikes me most is that students seem to have a genuine ownership in their learning. They are actually involved in making decisions about what, how and why they will learn particular science concepts.”

Ownership was important in other classrooms as well. In Nancy’s classroom it was noted, “Each student received a notebook copy containing all of the reports. This gives the students a sense of ownership for the work and rewards their individual efforts collectively. This notebook

represented a history of what each student had learned over the course of the academic year.” Rhonda also discussed the sense of ownership that her students felt. She said, “By guiding the students to finding their own solutions to problems on their own, they can feel ownership of the problem. When students feel ownership of something they usually treasure it more.” Both Nancy and Rhonda believed that their use of CTL strategies encouraged students’ ownership of and pride in their learning.

David’s classroom also provided a sense of how CTL strategies impacted students. According to the researcher, David’s students were observed to be “‘turned on’ students who were empowered and who were assuming responsibility for their own learning” as a result of CTL strategies.

### **Metacognition**

Metacognition was also observed when CTL strategies were used in the classroom. Metacognition refers to higher order levels of thinking and includes self regulation of cognitive processes. Metacognition is sometimes simply defined as thinking about thinking. It often takes the form of an internal conversation where the student predicts outcomes, explains concepts to himself or herself to improve understanding, notes failures to understand, activates background knowledge, plans ahead for further learning, and thus learns to prompt and monitor his or her own comprehension with minimal teacher support (National Research Council, 2000). Through CTL strategies, it was noted that students were able to reflect on what they were learning, process the material, and incorporate the new knowledge into a larger scenario.

David’s students provided a clear example of this. According to David’s researcher:  
I think his students have developed a higher level of learning process skills as they have been required to utilize the Internet for resources, utilize computer software programs,

make oral presentations, become independent thinkers, and use their talents and abilities in creative ways to solve problems confronting them. . . . I believe they are more engaged in learning how to learn, to solve problems, to use their talents and skills, to use their creativity to design products, and to learn the most important principles and concepts that make up the subject matter of each course.

Metacognition was also observed in Cindy's classroom.

Regarding students retaining the subject matter, during my first visit, students were communicating to each other about the breakfast projects that they had completed the week earlier. Student alluded to the breakfast project technically (food science) and knowledgeably (economics/management).

In this example, it is clear that students have had the opportunity to reflect on the assignment and have broken the assignment into components, illustrating their complex understanding of the assignment, the methods they used to retain the material, and how it fits into a larger picture for them related to the science of food preparation and economics.

Rhonda also illustrated the development of metacognition in her concept of CTL:

I think it is important that students discover some of the mathematics on their own. By guiding the students to finding their own solutions to problems on their own, they can feel ownership of the problem. When students feel ownership of something they usually treasure it more and get higher expectations of themselves and they will strive to keep discovering things. Also, by letting the students discover the mathematics I will be preparing them for the type of thinking they will need when they are out of high school, whether they go to college or straight out into the real world. In addition, when students

come up with something on their own they are more likely to remember that information because they found it in the first place.

Rhonda felt that it was important for students to sometimes struggle with content, to reflect on material and think about ways to learn it on their own, and then figure out how it is needed or used for the next step in learning or in the education process (e.g., college or a workplace). She believes this allows students to master a deeper understanding of the content and its applications.

### **Summary**

The novice teachers in this study believed that CTL implementation had a positive impact on student engagement, recall, ownership of learning, and the development of higher levels of learning process and thinking skills (i.e., metacognition). The teachers indicated that students performed well on measures of achievement, retained the material, and went beyond the traditional classroom learning when CTL strategies were employed.

### **Other Findings**

The primary focus of this study was on better understanding the applications of CTL strategies in actual teaching contexts. Four research questions framed the data collection and analysis and have been discussed throughout this paper. Other findings emerged from the data as well. These included 1) CTL strategies were applied differently in academic and elective courses; 2) CTL strategies held great appeal for students from minority cultures; 3) opportunities were often missed; 4) higher level of teacher performance; and 5) transferability of CTL approaches to nonschool sectors. Table 6 provides a visual representation.

**Table 6. Other Findings**

|                       |  |
|-----------------------|--|
| <b>Other Findings</b> | Applied differently in academic courses and elective courses |
|                       | Appeal to minority cultures                                  |
|                       | Opportunities often missed                                   |
|                       | Higher level of teacher performance                          |
|                       | Transferability of approach                                  |

**Applied Differently in Academic and Elective Courses**

Based on the data collected for this study, it appeared that the relative perceived usefulness and frequency of use of CTL strategies by novice teachers depended on the subject matter. For example, many more CTL strategies were observed in elective classes such as family and consumer sciences, marketing, and technology education. The novice teachers who taught either science or math reported a more difficult time incorporating CTL strategies into their classrooms and especially strategies identified with the far right side (see conceptual framework, [www.coe.uga.edu/ctl](http://www.coe.uga.edu/ctl)) on the UGA CTL continuum; for example, work-based and service learning.

In academic courses, CTL strategies seemed to be viewed within the school culture as a "nice to do" or an add-on to the content that was to be taught. As noted by several researchers and novice teachers throughout this study, the academic subjects were regulated by specific curricula and testing requirements. Teachers in math and science were not encouraged, and in some cases were forbidden, to go outside of more traditional approaches to teaching the material. For example, Rhonda was told that she was not to deviate from the curriculum that she was given. Even though she attempted to implement CTL strategies in her classroom, she could only include a few without straying from the designated curriculum. By and large, instructional strategies in the academic subject classrooms, math and science in this study, were more traditional in nature with CTL incorporated as much as possible.

Conversely, use of CTL strategies in the elective courses was, in effect, the norm. Cindy, David, and Susan made extensive use of CTL strategies with each unit, on a daily basis, and incorporated them into the assessment process (e.g., evaluation of group work, use of multi instruments and student work typically found in portfolios, ability to apply content to real-world contexts). David's classes provided the clearest example of CTL integration. CTL strategies were interwoven throughout David's curriculum and instructional delivery. He concentrated on establishing a community of learners and was concerned with working with all of his students. Hands-on activities, collaborative learning, work-based and other real-world connections, project/problem-based learning, self-directed learning, and meaningful assessments were all visible in David's classroom and the artifacts reviewed for purposes of this study. The students were active, yet focused on the task at hand. While there were specific guidelines and standards for the courses David taught, as a technology instructor, he had more freedom to implement the CTL strategies and principles throughout his courses.

Further, the frequency of use, or lack thereof, could have to do with the novice teachers' comfort level with some of the strategies or simply their lack of deep knowledge about how to use CTL with academic subjects. A rationale that was often given by the academic teachers was that it was difficult to think of a context for the material. And, obviously, the barriers discussed earlier in this paper contributed significantly to the relatively infrequent use of CTL strategies, especially those involving the use of off-campus resources, by math and science teachers.

### **Appeal to Minority Cultures**

The novice teachers involved in this study indicated that CTL strategies were particularly important when working with students from minority cultures. Cindy, Sarah, and Julia gave specific examples of how CTL strategies helped their students succeed. Cindy, who worked in a

magnet school that specialized in international issues, noted that — through the CTL strategies — all of her students from the high achieving to the ESL students could be successful. Sarah, who worked in a school that had a significant population of Hispanic students noted:

I teach students from a variety of socio-economic backgrounds. Due to the various communities my students come from, I feel it is important to not only recognize but also implement teaching and learning in these various contexts. Almost 50% of our schools' population is Hispanic, and many of these students are from places other than Georgia. Due to the close family relationships that Hispanics have, many of my students take trips during the school year to visit other states and countries. During these trips, I ask my students to look at various things in their hometowns and compare them to what we have in Georgia. This can especially be interesting when my classes are studying animals and plants due to the varieties of species across America.

For Sarah, CTL strategies allowed her to meet the needs of all of her students.

Julia also noted that CTL strategies were especially appropriate for her low socioeconomic students. Julia provided several examples of how she was able to relate the science she taught to the lives of her students. She indicated,

Most of my students come from the Nellie Dee housing projects and the surrounding trailer parks. My students are the ones that hang out in the 'Iron Triangle' (a part of the community where the selling and buying of drugs is pervasive). These students are consumed with worry about who they will have to fight in order to maintain a status which keeps them safe within this community. They could care less about the scientific method or the different kinds of cells that can be found in blood, what we know as QCC objectives.

Instead of relying on the established curriculum, Julia sought activities that would be more real to her students. One activity that was particularly successful was a dog breeding activity. Instead of focusing on traits of humans, Julia discovered that breeding dogs was popular in the community and used this in a unit on genetics. This connection with the everyday lives of the students would not have been possible without CTL.

Cindy, Sarah, and Julia each indicated how CTL strategies helped them to reach all of their students, particularly the students from minority cultures, by utilizing strategies such as meaningful assessments, project-/problem-based learning, and making real-world connections.

### **Opportunities often Missed**

The novice teachers who participated in this study often missed opportunities to implement various CTL strategies. As noted previously, the novice teachers were often under pressure to teach from standardized curriculum or to teach to a test. In these instances, the novice teachers did not feel that they had the flexibility to implement CTL strategies on a large scale. Additionally, several of the novice teachers discussed time constraints and the difficulty they had in implementing CTL strategies.

Beyond the general, there were specific incidents where the novice teachers missed opportunities to use CTL in the classroom. For example, Nancy completely missed the opportunity to incorporate service learning (i.e., clean up the field) in her unit on vegetation succession, and her case study researcher also commented on the missed opportunities to discuss clean-up of pollution (units on ocean ecosystems and whales). Sarah believed that only specific strategies were useful in the science classroom and did not seem open to nor attempt to use any others. As noted by her research team:

She is very adamant in her belief that some science topics cannot be taught using CTL strategies. This is a considerable limitation to Sarah's implementation of CTL.... Sarah understands CTL, but is not able to implement it in some lessons. Unlike Sarah, we believe that CTL can be implemented significantly in all lessons and we noted many lost opportunities in the lessons she taught.

One specific example was Sarah's statement that the CTL strategy "anchoring teaching in diverse life contexts" was not useful. Her research team noted that many of her students were Hispanic, and they even spoke about cultural foods in the lesson, *You are what you eat*. Since Sarah considered this strategy not useful, she missed the relevance of anchoring her food in the diverse cultures of her students.

Also, Rebecca was so focused on her other responsibilities that she often missed ideal opportunities to incorporate CTL practices into her lessons. For example, she was doing a lesson on blood types in her statistics class at the same time there was a blood drive at the school. This would have provided a perfect opportunity to make connections between the classroom content and service learning. However, Rebecca did not take advantage of this opportunity.

A few of the researchers pointed out other instances of where opportunities were missed to incorporate CTL strategies in the classroom; i.e., the novice teachers didn't realize opportunities existed or failed to make a connection until it was too late to include it in the lesson. Opportunities for CTL are abundant; however, incorporating them in lessons does take some knowledge of and experience with content application and the time to plan for their inclusion within the curriculum.

### **Higher Level of Teacher Performance**

The researchers conducting the case studies were in solid agreement that these CTL-trained teachers performed well above expectations for novice teachers. Wherever deficiencies were noted (which wasn't very often), the explanation was always due to the novice teachers' inexperience, the typical challenges of a new teacher, and circumstances beyond control of the teacher.

A few examples of plaudits include the researchers' comments about Sarah: "conscientious and dedicated teacher" who was found to "... make excellent uses of community resources in teaching her students, often involving local businesses, organizations, and institutions in her activities." Further, "she seems to have more confidence in her teaching ability than is typical of other science teachers early in their careers." David's researcher noted:

I am pleased with the knowledge and skills of teaching demonstrated by David... In many ways, David is performing at a level much higher than would be expected by a first-year teacher... It is my prediction that David will become a National Board for Professional Teaching Standards certified teacher soon after his third year of teaching. I believe he will become one of the best technology teachers in Georgia and his program will become a model for others to follow.

### **Transferability of Approach**

Finally, CTL strategies and principles were transferable by the novice teacher from schools to other settings. The novice teachers in this study found that they were able to use the skills, techniques, and strategies that they had learned in the course of their studies to other situations. Susan, who found employment in the business sector, had already been asked to help train other employees based on her performance, her knowledge of fundamental concepts (e.g.,

her content areas of business and marketing), and her experience with teaching and learning. Nancy, who interned with a governmental agency, also found her CTL training to be helpful when designing curriculum. Others found internships and summer employment in nonschool sectors, largely because of their qualifications underpinned by knowledge and experience with CTL.

### Summary

This report presents results of an extensive investigation into applications of CTL strategies in actual teaching contexts by eight novice teachers. This work details differences between CTL-infused and traditional classrooms, CTL strategies utilized, facilitators to implementation, barriers to implementation, and the effect the CTL strategies have on student achievement and mastery of subject matter. Table 7 provides a visual representation of the findings.

**Table 7. Summary of Findings from Cross-Case Analysis**

| <b>Novice Teacher Implementation of Contextual Teaching and Learning Approaches in the Classroom: An Analysis of 8 Case Studies in Classrooms</b> |   |                         |                    |
|---|---|-------------------------|--------------------|
| <b>Positive Differences</b>   | Increased Activity/Noise                |                         |                    |
|   | Positive Classroom Environment          |                         |                    |
|   | Community of Learners                   |                         |                    |
|   | Student Focused                         |                         |                    |
|   | Multidisciplinary                       |                         |                    |
| <b>Strategies</b>   | Repertoire of Constructivist Strategies |                         |                    |
|   | Hands-on Activities                     |                         |                    |
|   | Collaborative Learning                  |                         |                    |
|   | Community Involvement                   | Guest Speakers          |                    |
|   |   | Field Trips             |                    |
|   |   | Doing-it (Real Science) |                    |
|   | Real-world Connections                  | Work-based Learning     |                    |
|   |   | Service Learning        |                    |
|   |   | General Education       |                    |
|   | Problem-based Learning                  |                         |                    |
|   | Project-based Learning                  |                         |                    |
|   | Inquiry-based Learning                  |                         |                    |
|   | Self-directed Learning                  |                         |                    |
|   | Authentic Assessment                    | Rubrics                 | Oral Presentations |
|   |   | Portfolios              | Following Protocol |
| Journals and Notebooks  |   | Lab Experiments         |                    |
| Writing Assignments   |   | Team Work               |                    |
| Technology-assisted Instruction   |   |                         |                    |
| <b>Facilitators</b>   | Teacher Philosophy                      |                         |                    |

|  |  |  |                                  |
|--|--|--|----------------------------------|
| <b>Facilitators</b>  | Positive Student Response                                    |  |                                  |
|  | Time (Block Schedule)  |  |                                  |
|  | Support  | Administrative and Collegial<br>Financial                  |                                  |
|  | Technology   |  |                                  |
|  | Good Training from University                                | Experience with Subject Matter<br>CTL Focus<br>Internships |                                  |
|  | <b>Barriers</b>  | Subject Matter   |                                  |
| Time   |  | Poor time management<br>55-minute class periods            |                                  |
| Lack of Support  |  | Administrative and<br>Collegial<br>Financial               | Crisis<br>Atmosphere<br>Parental |
| Student Apathy/Lack of Preparation                         |  |  |                                  |
| Curriculum, Textbook, and High-stakes Testing Requirements |  |  |                                  |
| Class Management   |  |  |                                  |
| <b>Student Engagement/<br/>Mastery</b>                     |  | Active Engagement  | On-task                          |
|  | Connected  |  |                                  |
|  | Attentive, interested  |  |                                  |
|  | Motivated  |  |                                  |
|  | Better Recall  | Better Assessment Scores                                   |                                  |
|  |  | Better Grades  |                                  |
| Ownership of Learning/Empowerment                          |  |  |                                  |
| Metacognition  |  |  |                                  |
| <b>Other Findings</b>                                      | Applied differently in academic courses and elective courses |  |                                  |
|  | Appeal to minority cultures                                  |  |                                  |
|  | Opportunities often missed                                   |  |                                  |
|  | Higher level of teacher performance                          |  |                                  |
|  | Transferability of approach                                  |  |                                  |

Based on the data presented in this study there were six key differences in the CTL classrooms and more “traditional classrooms.” First, the CTL classrooms had increased levels of activity and noise due to hands-on activities, collaborative assignments, use of multiple resources in the classroom, and other CTL strategies. Second, the CTL-trained novice teachers provided a positive, comfortable, and relaxed classroom environment for learning. Third, the CTL-infused classrooms were structured, in content, activities, and physically, to encourage a community of learners. Fourth, the CTL-trained novice teachers and their classrooms were student focused; diversity in student needs, prior experiences, cultures, and learning styles were recognized and attended to. Fifth, the CTL-trained novice teachers used a multidisciplinary approach to teach their subject matter. Finally, the CTL-trained novice teachers utilized a repertoire of constructivist techniques to assist students in making meaning of the material being presented.

The novice teachers utilized many specific CTL strategies to strengthen, enrich, and contextualize the content. Most prominent included a myriad of hands-on activities; collaborative learning; community learning (e.g., guest speakers, taking field trips, and going into the community to do “real science”); making connections between classroom learning and the real-world by including work-based learning, service learning, and contexts for general education; problem- and project-based learning; inquiry-based and self-directed learning; authentic assessments, including use of rubrics, portfolios, notebooks, writing assignments, oral presentations, specific protocols, lab experiments, and teamwork; and considerable use of technology to enhance instruction.

Participants identified several facilitators to CTL implementation, including teacher philosophy and belief in the value of CTL, positive student response, and sufficient time when the school day operated on block schedule of about 90-minute classes. Encouraging and positive support from administrators and colleagues and financial support for activities and resources were also important to CTL implementation. Technology enabled the novice teachers to present lessons in multiple formats. Finally, the good education and training from the university was mentioned by novice teachers and their supervisors as providing rigorous subject matter training, CTL focus, and experience with community and workplace contexts.

Data also pointed to significant barriers to CTL implementation. The novice teachers indicated that subject matter, specifically in math and science, made contextualizing learning more difficult. Time, specifically poor time management and 55-minute class periods, made including CTL strategies more difficult. Lack of support — from parents, administrators, peer teachers, and little or no funding — discouraged the novice teachers in CTL implementation efforts. Student apathy and lack of preparation provided challenges for some of the novice

teachers. Curriculum, textbook, and high-stakes testing requirements inhibited the amount of CTL strategies that novice teachers felt comfortable implementing. Classroom management also required much focus and effort from the novice teachers in this study. These barriers were detours, not road-blocks, on the road to CTL implementation. Even though the novice teachers found these concerns disheartening, each implemented CTL strategies and practices to the best of his or her ability in the given situation.

Student achievement was a topic of interest in this study. Teachers perceived that their students achieved better due to the contextual teaching and learning strategies. The novice teachers reported that students were more engaged with their learning and subject matter. When CTL strategies were used, the novice teachers believed their students stayed on task better, were much more attentive and interested, and seemed more motivated to learn and connected with the subject matter. Students also seemed to perform better on assessments. Data indicated that students had a greater ownership of learning and some sense of empowerment or control over their learning. Students also appeared to use metacognition as a result of CTL implementation, in that they were learning in new and different ways, reflecting on their new knowledge, and making connections across the curriculum and with prior learning. Based on the data presented in this study, CTL strategies and practices have a positive influence on student achievement, mastery of content, and engagement with school and with learning.

There were several additional interesting points that came to light during the course of this study. Data indicated that CTL strategies were applied more freely and frequently in elective courses than in academic courses. CTL strategies also seemed to be important to minority cultures because they allowed for culture and unique contexts to be incorporated into the curriculum. Opportunities to include CTL into the classrooms were often missed. Data also

suggested that that the CTL-trained novice teachers in this study exhibit a higher level of teacher performance than would be expected of novice teachers and that they transferred their knowledge and experiences with CTL to nonschool sectors.

Overall, the novice teachers implemented CTL principles and practices to the best of their ability and in the contexts in which they found themselves. And, in general, all of the researchers concluded that they did it well. Some novice teachers found it easier to contextualize the material than did others. All found facilitators and barriers to the implementation process. All reported that CTL strategies worked to improve student engagement and mastery and they all believed CTL strategies collectively comprise the best way to teach. Even those who have chosen careers outside of education found CTL approaches to be beneficial when working with others and, in fact, “the norm” in nonschool settings.

## References

- Bogden, R.C., & Biklen, S.K. (1998) *Qualitative research for educators: An introduction to theory and methods (3<sup>rd</sup> ed.)*. Boston: Allyn and Bacon.
- Creswell, J.W. (1998). *Qualitative inquiry and research design: Choosing among the five traditions*. Thousand Oaks, CA: SAGE Publications.
- Glaser, B.G., & Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine Publishing Company.
- Merriam, S.B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
- National Research Council (2000). *How people learn*. Washington, DC: National Academy Press.
- Patton, M.Q. (1990). *Qualitative evaluation and research methods (2<sup>nd</sup> ed.)*. Newbury Park, CA: SAGE Publications.
- Patton, M.Q. (2002). *Qualitative research and evaluation methods (3<sup>rd</sup> ed.)*. Newbury Park, CA: SAGE Publications.
- Seidman, I. (1998). *Interviewing as qualitative research: A guide for researcher in education and the social sciences*. New York: Teachers College Press.