Authentic Interactive Presentations in a Graduate Education Research Class

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A content analysis of nineteen interactive final presentations by graduate students in an education research class highlights effective models for others wanting to implement authentic learning activities as culminating class presentations. These presentations were categorized into the following six themes of cognitive involvement: simulation, case analysis, inference making, evaluation of ideas, self-evaluation/reflection, and creative thinking. Also analyzed were 1,088 audience comments about the presentations. Simulations were recognized as the most effective format, although other presentation modes also were found engaging. Most enjoyed were game-like presentations and those involving creative synthesis. Presentations based on self-evaluation and reflection were most frequently identified as accessing prior knowledge. Suggestions for improvement of the presentations reflected audience enthusiasm by calling for more details of the proposed research, handouts of information about the topic, more examples, and an extension of the presentation time. Participants also requested more audience participation in some presentations and time to share ideas generated and prior related experiences.
Keywords: Education research, research presentations, cognitive involvement.

In this article, we describe a content analysis of the nineteen presentations at the end of a graduate course in education research that allowed active participation from the class audience. We present evidence of their efficacy in exciting curiosity and active engagement with the diverse assemblage of research topics. Our purpose is to provide models of authentic learning experiences that can serve as examples for student presentations in future graduate research courses.

Authentic learning experiences are those that engage students in "self-directed inquiry, problem solving, critical thinking, and reflection in real world and creative contexts" (State University of New York at Oswego School of Education Conceptual Framework, 1998). Authentic learning situations mimic the work of professionals in the field so that students make connections between school and their future careers (Maina, 2004). The graduate research course for students pursuing Master of Science degrees in Curriculum and Instruction or Special Education described here provided many authentic learning experiences in which students read the literature on research topics of choice and proposed viable research studies, as in the teacher-researcher model in education (Babkie & Provost, 2004). Studies of this model's implementation have shown an increase in student performance, adoption of improved and innovative teaching practices, more dialog between teachers about

instruction, and increases in critical thinking along with objective evaluation of results (Grimmett, 1996; Langerstock, 2000; Torres, 2001; and Welch & Chisholm, 1994).

A traditional culminating activity for the graduate research course described here has been presentation of research proposals to class members. This was originally planned for the last two three-hour class periods. However, colleagues who also teach graduate research courses pointed out that nine or ten research presentations in a row from nervous novices might be "deadly"; they suggested that encouraging students to work together to give fewer group presentations might be a solution.

The instructor suggested this to students during class, but students objected, stating they had all worked on separate, distinct topics and synthesis during out-of-class collaboration at this time would be burdensome. Another reason that students protested was that they felt their original research topics were important and that combining loosely related topics would detract from them.

One last idea occurred to the instructor that involved the scheduled individual meetings with students to discuss the research methodology of their proposed studies. She decided that a part of this time would be devoted to a discussion of how each student's final presentation could be made interactive, thereby avoiding the tedium of listening to multiple presentations of the same format.

Review of Literature Related to Graduate Research Courses

In this section we review previous work from the literature concerning student attitudes in research courses, in particular, self-efficacy, factors associated with course achievement, and aspects that influence anxiety about research. These emotional factors are very important to learning how to conduct research and influence a student's performance in a research course.

Many graduate students display negative attitudes and fear toward research, and take research courses only because their degree programs require them (Onwuegbuzie, DaRos, & Ryan, 1997). Positive outcomes in attitude and skills for students enrolled in research courses are particularly important for these reasons: a graduate-level research course may be students' only formal exposure to research methodologies, students' experiences in such courses cement attitudes toward consuming and producing research, and research-based decision-making for legislation is required by the No Child Left Behind Act (U. S. Congress, 2001).

Research self-efficacy refers to a student's confidence in being able to perform research. According to Bandura (1994), a student with high self-efficacy will display more interest in challenging tasks with more persistence and task completion. This student will be more self-assured, will view mistakes as learning opportunities rather than failures, and will continue to face new challenges.

In contrast, a student with low self-efficacy will have low expectations, low aspirations, and little task-commitment. He or she will be inclined to give up when obstacles or setbacks are encountered. This behavior is a self-fulfilling prophecy, exacerbating the causes of low self-efficacy.

Additionally, self-efficacy in general is an important factor in choosing and persisting in one's career (Lent, Brown, & Hackett, 1994). The current widely accepted model of teachers as researchers requires teachers to analyze and solve classroom problems through action research. Those who shrink from investigating problems in the classroom will not be effective teachers

and may not persist in their careers. Research course instructors who find authentic ways to interest students in research, such as the presentations described in this paper, can help motivate students and increase research self-efficacy.

Research self-efficacy is a strong predictor of graduate student interest in conducting research (Bishop & Bieschke, 1998; Kahn & Scott, 1997; Phillips & Russell, 1994), and is a large factor in subsequent research involvement (Brown, Lent, Ryan, & McPartland, 1996; Kahn, 2001; Kahn & Scott, 1997). Forester, Kahn, and Hesson-McInnis (2004) identified four dimensions of researcher self-efficacy: data analysis, research integration, data collection, and technical writing. After analyzing pre- and post-course self-efficacy scores of 109 students enrolled in graduate research courses, Trimarco (1997) found that students had improved significantly in both self-efficacy and skills. She recommended that instructors help students build self-confidence and change students' expectations with regard to research. Szymanski, Swett, Watson, Lin, and Chan (1998) found increases in perceived research ability and decreases in test anxiety when instruction was contextualized: when the skills, knowledge, and attitudes developed in the course were applied to conducting and analyzing research. In the research course on which this paper focuses, students chose a research problem and applied the course topics to it as the course unfolded, thereby contextualizing their learning.

Wilson and Onwuegbuzie (2001) reported results from open-ended surveys of 70 doctoral students. Students noted the following factors increased their anxiety in a research course: dissatisfaction with the professor's teaching style, group work with less-motivated peers, feeling unprepared to take a class at this level, the workload, anxiety of classmates, time management issues, work pressures, testing, difficulty in comprehending the text, and lack of needed technology skills. Factors that decreased student research anxiety included: meeting individually with the professor, assistance and support from classmates, previous experience with statistics, practice, clear explanations, and extensive feedback from the professor. The research course in this study incorporated many of these positive factors as identified above, such as class brainstorming of ideas, peer editing of work, feedback from the instructor on ideas and writing, and individual conferences.

Onwuegbuzie and Daly (1998) studied 137 graduate students enrolled in research courses. They found that students who are most similar to their instructor with respect to tendency for persistence at tasks, level of desire for collaboration/ work with peers, auditory preference and multiple perceptual preferences tend to have greater conceptual knowledge about research and higher achievement in evaluating journal articles and writing research proposals.

The aforementioned ideas suggest that a course format that is engaging to students and that matches their learning styles will lead to higher student achievement. Because achievement in a research course is so intertwined with attitude, it is important that course material be presented in an interesting, interactive format. The research course highlighted in this study incorporated many creative, engaging activities and quality peer interaction. Students worked at least part of each three-hour class period in cooperative groups, discussing ideas or critiquing each other's writing.

Two class activities were particularly notable for creative engagement. In the first, the instructor provided a recent journal article titled, "Teachers as researchers" (Babkie and Provost, 2004). Each pair of students was assigned a portion of the article

to summarize using a page of four cartoons. Popular cartoon drawings with captions removed and empty speech bubbles were provided for students to modify to suit their needs. The sets of cartoons were collected and made into a booklet. Each page was interpreted for the class by a different pair of students than those who created it, providing additional learning by analyzing the work of peers. Class members were impressed by how cleverly their peers changed the given cartoons to convey the main ideas in the assigned portion of the article.

Another innovative course activity was used to convey the main ideas of the Belmont Report, a summary of the basic ethical principles for the treatment of human research subjects, as identified by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979). Teams of four participants were assigned a portion of the text to portray using shadow puppets cut from file-folder cardboard. The instructor provided a shadow theater with a light focused on the back of a white screen, and, during a half-hour time period, students wrote scripts and created shadow puppets. Then each group presented their dramatization, discussing the main ideas with the class. Students found this approach to a somewhat "dry" document very engaging.

As celebrated creativity researcher E. Paul Torrance (1968) said, "Creative ways of learning have built-in motivation that make unnecessary the application and reapplication of rewards and punishment. If we keep alive the creative processes of students and sensitively guide them, we shall have all the motivation we need." Extending the creative class activities to students' final research presentations was important because it showed students they could proficiently convey their research topic knowledge to class members in a well-received presentation and enjoy the research presentations of peers, thereby improving self-efficacy.

One final way the course in this study helped students increase their research self-efficacy was to present research proposal writing as a succession of separate tasks. As one graduate student remarked, "If [the instructor] had told us to do the whole thing at once it would have been overwhelming, but because [the instructor] had us find articles, then write the introduction, then write the literature review, and then meet to discuss the method, etc., I saw that the research process was not impossible. Because it was presented this way, it was a lot less daunting."

Method

Participants

Nineteen graduate students (17 F, 2 M) enrolled in an education research course at a mid-sized public college in central New York State participated in the current study. During the course, each student chose a topic of interest, conducted a review of the pertinent literature, and wrote a research proposal for conducting a feasible study related to the topic. As a culminating class activity, each student facilitated a ten- to fifteen-minute class activity involving peers in issues directly related to the research question.

The course instructor met for a half hour with each student three to four weeks prior to the presentation to suggest changes in the introduction and literature review of the research proposal, discuss the methodology for the study, and assist in generating ideas for the final presentation. The goal for final presentations was to involve the audience in principal issues related to the presenter's research question. The methodology of the presenter's proposed study was secondary to this, but

was conveyed at least briefly during the presentation. Students ultimately decided the format and details of their activities.

The course instructor made the initial conceptualization of this research study and article after the individual meetings with students had been completed and before the final presentations were made. The instructor discussed her ideas for a journal article based on the presentations with the students and the class reached a consensus to pursue the project, resulting in this article.

Research Questions and Design

Two main analyses were conducted in this study. The first was a qualitative content analysis of the nineteen presentations to answer the question, "What are the general types of interactive final presentations given in this research class and how do these engage the audience?" Each presentation was analyzed to determine the main cognitive processes occurring for the participants. Presentations were classified into categories based upon the general type of activity occurring.

The second analysis was a "triangulation mixed methods design" (Creswell, 2005, p. 514), which involved simultaneously collecting both qualitative and quantitative data to understand the research problem with one data-collection form supplying strength to augment the other form. The research question being answered here was, "What is the effect of these research presentations on the audience?"

After each presentation, class members wrote three observations and one suggestion for improvement for each presenter. Sometimes they wrote more or less than the requested four comments. These were recorded on a spreadsheet with the presentation to which they referred noted. Some long comments containing several ideas were broken into two or more

statements when recorded on the spreadsheet, so that each statement contained just one main idea. In the qualitative analysis, the main point of each statement was written in the spreadsheet cell next to it and these were collected into categories (by writing category names in the next cell on the row) and often, super-categories. As themes emerged, the statements were sorted so that the number of comments in a particular category or theme for each presentation could be counted — the quantitative aspect of the analysis. This consideration of comment frequencies allowed the relative effects of different aspects to be compared between the presentations or categories of presentations.

Results and Discussion

Six general themes for cognitive involvement were identified in the nineteen presentations: simulation, case analysis, inference making, evaluation of ideas, self-evaluation/ reflection, and creative thinking These are described and discussed below, followed by the results of an analysis of students' reactions to the exercises. A brief literature review accompanies each type of presentation to provide some background information.

Simulations

Simulations provide the opportunity for authentic learning by duplicating aspects of real world experience. Simulations have yielded positive outcomes in the medical field for many years. Roberts, While, and Fitzpatrick (1992) found that instruction via simulation facilitated the development of higher cognitive skills. More recently, Cioffi, Purcal, and Arundell (2005) found that midwifery students taught through simulation collected more data and reached final decisions more quickly as compared to a control group taught through lectures.

As shown in Table 1, presenters chose three settings for simulations: scribing for a student with a disability, team work to determine how a prize should be awarded, and reading/using a social studies text marked with graffiti and highlighting. In the

Table 1. Presentations involving simulations

Student's Chosen Topic / Research Question / Desired outcome of presentation for audience	Description of Presentation	Active Engagement or Inquiry
Paraprofessional scribes for students with disabilities **How closely does the work submitted by a scribe represent the abilities of the student?** **Awareness of the factors involved when scribing for another**	The presenter described the job of paraprofessional scribes who serve as one-on-one aides in schools, assisting students with disabilities. There are more than half a million paraprofessionals employed in public schools nationwide (Giangreco, Edelman, Luiselli, & MacFarland, 1997). The presenter paired students and gave each person a sheet of paper listing ten unusual animal facts to read. One paper was labeled "scribe" and presented facts clearly. The other paper was labeled "student" and gave the same information with grammatical errors, missing words, and some factual errors. After each person had read the given paper, each "scribe" turned over his/her paper and attempted to scribe five facts that the "student" dictated from his/her paper. Written work was then analyzed to see if the scribes had corrected errors because of their expert knowledge. Many scribes found that they had unintentionally corrected the grammar as they wrote.	• Simulation of a real world situation • Analysis of data generated during simulation • Reflection on inadvertent changes
Team teaching **What types of team interactions are most effective at the upper elementary level (including interdisciplinary planning)?** **Knowledge of characteristics of effective team processes**	The presenter showed a "prize" (a bag of candies) and asked students to form four teams. She gave teams four minutes to determine how the prize should be awarded or distributed. After teams had reached a decision, they were each given a handout describing characteristics of effective teams. She also discussed team dynamics stages of forming, storming, norming, and performing (Rottier, 1996). The students marked the positive characteristics exemplified by their team. The team with the greatest number of effective processes decided the fate of the prize (donate it to a food pantry). The presenter then explained her research project related to team teaching in middle school.	• Simulation of team work on a problem • Analysis of team processes
Effects of graffiti in textbooks **Does the amount of graffiti in a social studies text affect student motivation or performance?** **Understanding of the effect of graffiti on students reading and completing text work**	The presenter distributed copies of a section of text and an assessment question photocopied from a social studies textbook. He asked students to read the excerpt and attempt to answer the question at the bottom by filling out a chart. He also requested that as soon as a student completed the exercise, he/she turn in the paper to the presenter. Although not mentioned by the presenter, half of the pages were heavily decorated with graffiti, underlining, or highlighting that did not obstruct the text, but was very distracting to many participants. When all papers had been handed in, the presenter revealed the nature of the experiment and examined the order of papers completed. The first four completed were without graffiti. He then facilitated a discussion with class members to elicit their reactions to the trial. He noted that Christenburg and Kelly (1994) had examined the usefulness of textbooks but had not addressed the quality of the physical book with regard to graffiti. This is a new area for investigation.	• Simulation of a classroom situation • Analysis of results of experiment • Determination of effects of a problem

first example in which one student dictated a text with errors to the "scribe" (who had just read an error-free text), many scribes found they had inadvertently corrected the dictated text, the thesis of the presenter's research problem. In the second example, students noted their team processes after they solved the problem of determining how to award a candy prize. In the last example, participants experienced the distracting effects of markings in the text as they attempted to read and answer a question.

In the next section, we discuss presentations involving case analysis, another format that allows students to approximate real world experience.

Case Analysis

A case creates an authentic learning experience by providing students with real data for analysis. Golich (2000) explains, "Cases recount - as objectively and meticulously as possible - real (or realistic) events or problems so that students experience the complexities, ambiguities, and uncertainties confronted by the original participants in the case." Jacobowitz and Onore (2004) suggest a structured approach to working with a case: first, students explain the case in their own words from different viewpoints; then, students identify as many dilemmas as possible; lastly, students generate and discuss approaches/ solutions to the dilemmas. According to these two writers, this teaching methodology increases the likelihood of nurturing democratic character in students. The case method approach has been used extensively and successfully in business and law schools for over fifty years (McNair, 1954; Hunt, 1951), and has more recently been used in preparation of engineers (Fitzgerald, 1995).

Henry, Castek, Roberts, Coiro, and Leu (2004) report the use of Internet-based case videos of classroom reading teachers as a new model for early literacy teacher preparation. These cases allow students to observe virtual exemplary instruction, enhanced by interviews with the classroom teachers. The focus on the twelve principles of effective literacy learning can be easily maintained during this type of instruction. Otherwise, a student would need to amass many hours of actual classroom experience to see all the features highlighted in these case vignettes. Similarly, to make the most of the short presentation times, graduate student presenters chose a short case exercise focusing on the main ideas they wished to convey.

The first two case exercises, described in Table 2, asked students to assume different people's roles in a situation. Because the graduate students enrolled in this course were working on their initial certifications in education, these school-based scenarios represented situations that they would likely encounter during their careers.

The third presentation in this category addressed the readiness of students affected by a disaster to attend to school matters. However, instead of having participants think of solutions to the problem, students were asked to empathize with the child in the scenario and generate a list of feelings this student might have. This activity is an example of one of the *Talents Unlimited Thinking Skills* (Schlichter, 1997; Schlichter & Palmer, 1993), the Communication Talent skill of using and interpreting both verbal and nonverbal forms of communication to express ideas, feelings, and needs to others.

Now, we turn to the cognitive skill of inference making and examine presentations that focused on using this skill.

Table 2. Presentations involving case analysis

Student's Chosen Topic / Research Question / Desired outcome of presentation for audience	Description of Presentation	Active Engagement or Inquiry
Parent involvement in elementary years — How can schools encourage more parent involvement? — Awareness of some effective approaches for involving parents	The presenter discussed the correlation between parent involvement and a child's academic success (U. S. Department of Education, 1998). She presented a true scenario about a second grade girl struggling in mathematics with a single-parent mother whose lack of math skills prevents her from assisting her daughter. Students worked in groups to discuss ways the teacher could work with the parent to assist the student. Then groups shared their ideas.	• Analysis of a true case. • Generation of possible solutions
Community involvement in a newly reorganized urban middle school — What community and school issues are involved? — Awareness of problems facing urban school teachers	The presenter briefly described community issues at an urban school in the region. Sheldon (2003) found that students at schools in low-income urban areas score higher on standardized tests when schools establish partnerships with the community and confront parents with factors that limit student achievement. She read a true case scenario of two students with histories of disruptive behavior fighting in a classroom. Then students formed three groups, each of which took on one of the following roles: the administrator, the teacher, and the teacher next door. The groups generated and discussed approaches to the problem from these perspectives. The presenter then shared the solutions of the actual principal, teacher, and teacher-next-door.	• Analysis of a true case. • Generation of possible solutions
Impact of disasters on students — How do local and national or world disasters affect students? — Appreciation of the impact of disasters on students	The presenter reminded students of recent disasters: Hurricane Katrina, the tsunamis in Indonesia, 9/11 attacks in New York and Washington, DC, among others. She relayed the paucity of research in this area. The presenter paired students and gave them a true story of a child who had experienced a loss through a disaster. They listed as many adjectives as they could that described the way the child might feel and speculated on the child's interest and attention at school.	• Analysis of an individual case study • Creative generation of ideas

Inference Making

Inference making is an important logic, mathematics, science, and reading process skill. The primary way people gain new information is through observations from their senses or vicariously through hearing or reading facts. However, this information must be interpreted for it to be useful. A student interprets ― makes inferences from ― a set of observations or facts by classifying, summarizing, drawing conclusions, or making predictions. Activities that require students to make inferences engage them in practical critical thinking skills.

The two presentations, described in Table 3, used a game-like format to involve students in making inferences from verbal or dramatic visual clues. The friendly competitive aspects of these games were effective because they excited many students to laugh, joke, call out answers and

become intensely involved with the activity. In the first presentation, three teams were given current event clues that could be used to support science topics. The object of the game was to guess the science topic by making inferences. In the second presentation, students portrayed an extracurricular activity in which they participated during high school, while the audience guessed. Then each actor told the significance of the activity to his/her life.

In the next section, instead of focusing on a specific process skill, we discuss the highest level of cognitive operations, that of evaluation.

Table 3. Presentations involving inferences.

Student's Chosen Topic / Research Question / Desired outcome of presentation for audience	Description of Presentation	Active Engagement or Inquiry
Current events in science class Does the incorporation of current events improve learning? Understanding of ways science topics can be supported by current events	The presenter introduced the idea of teaching science topics through current events and social perspectives (Laposata, 2002) to increase connections between classroom science and everyday life (Riss, 1991; Timmerman, 2002). Students were divided into four teams. Each team was given a secret science topic and a list of three current events that supported it. Each team began by reading one of the current events out loud and asking members of the other teams to guess the science topic. Other current event clues were read to help students uncover the topic.	• Making inferences and guessing science topics from current event clues
Elimination of extracurricular activities What effect does the cutting of extracurricular activities have on students? Awareness of the variety of extracurricular activities and their importance	The presenter explained that structured after-school activities are associated with higher academic achievement (Cosden, Morrison, Gutierrez, & Brown, 2004). Olszewski-Kubilus and Seon-Young found positive academic effects of extracurricular activities for low income, urban, or high-risk students. She discussed their elimination in many districts because of budget cuts. Students then played "Charades," during which one student acted out an extracurricular activity in which he/she had participated during high school. After the activity was guessed, the student explained its personal significance. Activities presented included crew, field hockey, ballet, debate, quilting, band, and color guard.	• Making inferences and guessing activities from dramatizations • Reflecting on personal experiences

Evaluation of Ideas

Bloom and colleagues (Bloom, 1984; Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) developed a systematic hierarchy of the levels of cognitive operations that are used in education settings (Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation). Bloom's taxonomy has withstood the test of time, transcending age, type of instruction, and subject matter (Kottke & Schuster, 1990).

The most complex level is *Evaluation*, in which students compare and discriminate between ideas, assess value based on criteria or reasoned argument, and determine the value of evidence, recognizing subjectivity. This level is the highest because it contains elements of the preceding levels and requires value judgments based on criteria. Granello (2001, p. 297) recognized the usefulness of evaluation-based activities for graduate students reviewing the professional

literature: "Students who master the evaluative level recognize that there are certain pre-established criteria that are used to evaluate source writings. They make distinctions between research and conceptual articles and between conclusions drawn from research, from experience, or from opinion."

The three presentations that focused on evaluation, shown in Table 4, addressed widely different topics in unique ways. The first presenter asked students to rank photographs of reading areas in real classrooms according to the level of "reading friendliness." Participants had to establish criteria and make judgments based on those ideas. During the second activity in this category, the presenter provided images of foods typically found in school lunches. Students had to create different meal combinations and determine which would be the most nutritious. Students quickly discovered the difficulty of the task when most protein sources were high in fat. The

Table 4. Presentations involving evaluation of ideas.

Student's Chosen Topic / Research Question / Desired outcome of presentation for audience	Description of Presentation	Active Engagement or Inquiry
Reading-friendly elementary classrooms How do teachers encourage reading through classroom set-ups? Understanding of the characteristics of a reading-friendly classroom	After the presenter introduced the importance of a reading-friendly classroom (McKay, 2001), each small group received a set of five photographed classroom scenes from a local school. Students discussed ideas for evaluating classrooms' conduciveness to reading, ranked them, and reported their ideas. The presenter shared effective characteristics of the physical environment noted in the literature as well as her ranking of the classrooms.	• Generation of ideas for possible characteristics • Analysis and ranking of photographs of real classrooms
Childhood obesity and nutrition content of school lunches How nutritious are school lunches and what part do they play in childhood obesity? Awareness of nutrition problems with school lunches	The presenter explained that childhood obesity is increasing at an alarming rate with 30% of children being overweight and 15% being obese (American Obesity Association, 2002). The presenter noted that larger portion size is a factor in this problem (Young, 2002), and asked students to [also] consider the role of school lunches. Students worked in small groups to try to assemble a healthy lunch from a set of images of food choices taken from actual school lunch menus. Students observed that the protein choices were mostly high in fat and experienced the difficulty of producing a low-cost, appealing, healthy meal. Students shared their lunch ideas.	• Sorting and evaluation of different lunch choices • Discussion of issues related to school lunches
Children of divorce in school How does divorce affect children's school performance? Appreciation of the many effects of divorce	The presenter shared some statistics about divorce. Almost fifty percent of children experience the divorce of their parents (Brady, 2000). Many children of divorced parents suffer emotional, academic, and social problems (Garvin, Leber, & Kalter, 1991). The presenter then divided the class into two teams. Each team was given a set of arguments either for or against divorce and asked to debate the issue with the other team. Students presented reasons for and against divorce, and then discussed the effects of divorce on students. Students told personal stories of their difficulties during divorce.	• Examining and debating the logic of statements • Discussion of personal experiences

final presentation involved a debate of reasons for and against divorce. Students were assigned to two teams and given typical arguments for each side. They chose arguments to support their given stance and tried to find faults with the opposing team's arguments. During this debate, many issues affecting children of divorcing parents were addressed, allowing participants to become more aware of the problems and needs of students with divorced/divorcing parents.

In the next section, evaluation is turned inward to become self-evaluation and reflection.

Self-Evaluation and Reflection

Self-evaluation is a necessary component of acquiring new knowledge according to the constructivist model based on Piaget's developmental learning model of assimilation, accommodation, and organization (Renner & Merek, 1990). The first step occurs when students examine a new concept and relate it to previous experience through self-evaluation or reflection. Students confronted with new ideas not in their experience encounter disequilibrium. This psychological dissonance causes students to question their old ways of thinking, making them receptive to new learning. Students recognize those aspects of the new ideas that fit with their patterns of thinking (assimilation), and then alter their thinking to include the new learning (accommodation). After practicing the new learning, it becomes a part of their view of the way the world works (organization).

Metacognition — thinking about one's thinking — is an important aspect of learning. Metacognition includes knowledge of one's own learning strengths and weaknesses, self-regulation of learning such as monitoring success and correcting errors,

and reflecting on one's performance. Students adept at metacognition are able to choose strategies that best fit the problem situation, and determine when they need more practice or information (Commission on Behavioral and Social Sciences and Education, 1999).

The first two presentations listed in Table 5 asked students to attempt to answer true/false or multiple choice questions about what the current professional literature reveals about the presenter's topic. Many students experienced disequilibrium as they responded and were curious to learn the correct answers. The third activity required participants to produce a sketch of a scientist, which was then scored for stereotyped characteristics, causing many students to question their attitudes toward science. The final presentation listed had a unique game-like format in which participants attempted to fill their "BINGO" boards by obtaining signatures of classmates who had experienced specific hands-on science or inquiry activities. Reflection on the most memorable high school science experiences caused students to realize the impact of scientific inquiry.

The final category of presentations involves creative thinking, a highly motivating cognitive activity.

Creative Thinking

Creativity in every aspect of education, including a graduate research class, is important. New ideas, approaches, solutions to problems, and inventions/innovations, all depend upon creativity. As our world becomes more technological and continues to change rapidly, students will need creative thinking skills to adapt to and thrive in new environments with new problems.

Table 5. Presentations involving self-evaluation and reflection

Student's Chosen Topic / Research Question / Desired outcome of presentation for audience	Description of Presentation	Active Engagement or Inquiry
Effects of ability grouping on student performance Do students in heterogeneous classrooms perform better in groups of similar ability or in heterogeneous groups? Awareness of current research findings concerning ability grouping	The presenter gave participants a set of seven statements about ability grouping and asked them to rate them as true or false. Ability grouping allows the instructor to teach a more focused lesson to meet the ability level of a particular group (Zimmer, 2003). As Feidler, Lange, and Winebrenner (2002, p. 6) indicate, "If all other students watch from the sidelines while the smart one provides all the answers, their perceptions of themselves as competent, capable learners suffer." The presenter then defined ability grouping and compared/ contrasted it with tracking. She explained her interest in ability grouping and discussed each statement, clarifying misconceptions or myths.	• Evaluating prior knowledge and misconceptions
Death of a student's parent How can teachers help bereaved K-8 students through the loss of a parent? Knowledge of current research on teacher efficacy in student bereavement	The presenter explained her personal interest in the topic as an individual whose mother died when she was seven and then presented recent research information about teachers' preparedness to help a student through the death of a parent. Teachers with professional preparation are more comfortable addressing death (Dixon & Reid, 1999). Bereaved individuals' resilience is related to family and teacher support and communication (Greef & Human, 2004; Hurd, 2004). Questions were given through a quiz show format. Students chose the best response from four choices and were awarded "prize money."	• Evaluating prior knowledge and misconceptions
Gender gap in science Is the gender gap in high school/ college science biological or environmental in origin? Awareness of stereotyped views of scientists	The presenter distributed paper and asked students to draw a detailed drawing of a scientist. When students had completed their drawings, they scored them for stereotyped characteristics such as wild hair, pocket protector, lab coat, or eyeglasses: all images that serve to discourage females and minorities from participating in science (Newton, 1998). She also described how media images affect young females' images of scientists (Steinke, 1996). Then the presenter initiated a discussion of gender issues in science education.	• Analysis of and reflection on one's own stereotyped views about science
Efficacy of inquiry science Do students retain information learned through inquiry science better than traditional methods? Awareness of characteristics of high school science activities that were most memorable	Students reflected on activities from their high school science courses. Each student was given a "BINGO" board with nine boxes containing categories of experiential or inquiry activities, such as "science-based field trip," "observed/grew living plants," and collected science data outdoors." Each student spoke to classmates about science class memories and obtained nine different signatures of other students who had participated in these activities during high school. The presenter ended by leading a discussion of whether the inquiry activities were the most memorable science activities. Most participants found that they were, confirming the importance of inquiry science as supported by the National Science Education Standards (National Research Council, 1996) and Benchmarks for Science Literacy (American Association for the Advancement of Science, 1993).	• Reflection on personal experiences • Discussion with others of personal experiences in science

The four creative thinking exercises shown in Table 6 can be divided into two sub-categories: activities involving generation of ideas (the first two activities) and activities requiring creative synthesis of ideas to produce a product. In the first

Table 6. Presentations involving creative thinking

Student's Chosen Topic / Research Question / Desired outcome of presentation for audience	Description of Presentation	Active Engagement or Inquiry
Encouraging reading in secondary classrooms What classroom set-ups foster interest in reading? Knowledge of ways secondary teachers can foster reading interest	After the presenter described the challenges of fostering secondary students' interest in reading, each participant was given a photograph of a sparsely furnished classroom and asked to add details to make the room more conducive to reading, a skill important to academic and career success (Wilson & Ara, 2005). Then students shared ideas in small groups and the presenter gave characteristics of effective secondary classrooms from the literature. The positive effects of a "Book Bistro" (Kasten & Wilfgong, 2005) were discussed.	• Generating ideas and drawing classroom features • Discussion of ideas with others
Alternative assessment in social studies classrooms What effective alternative assessments might be used? Appreciation of the ease of generating creative alternative assessments	The presenter asked students what forms of assessment they experienced during secondary social studies classes. Lockledge (1997) suggests that a variety of assessment procedures will better show students how to be problem solvers. Authentic assessments shift teaching away from teacher-centered to student-centered approaches (Avery, Carmichael-Tanaka, Kunze, & Kouneski, 2000). Students generated alternative assessment ideas for a social studies topic (i.e., World War I) that started with a given letter, such as "T". After sharing ideas, the presenter reminded students of the large number of interesting alternative assessments available and encouraged them to think beyond paper and pencil tests.	• Generation of creative ideas for alternatives to multiple choice or short answer tests • Discussion of ideas
Voting among college-age students How do civics classes in high school affect voting habits of recent high school graduates? Reflection on personal reasons for voting	The presenter relayed statistics showing a drop in voting participation of people aged 18-24 from 50% in 1972 to 25% in 1998 (National Association of Secretaries of State, 1999), with only 15-20% of college education majors seeing voting as an important aspect of citizenship (Chiodo, 2005). Then she gave each student a piece of paper with a color photograph (political figure, American symbol, or non-political image) and asked students to use crayons to transform the image into a voting poster accompanied by a slogan that would encourage younger voters. Volunteers posted their products and students voted on the best poster.	• Reflection on stimulus for voting • Creative application of ideas to produce an effective poster • Sharing of ideas and judgment of best ideas
Using music/song to teach science to students with ADHD Do students with attention problems learn science better through song? Appreciation that factual information can be conveyed through song	The presenter explained that students with attention deficit problems may benefit from a Multiple Intelligences approach (Gardner, 1997; Schirduan, Case, & Faryniarz, 2002) to science instruction. She introduced the idea of using song and music to help students remember science content (Grote, 1997). She played an example song relaying facts about planets in our solar system. Students worked in small groups to create a new science song using a familiar tune that taught either vocabulary/ facts about the water cycle (i.e., evaporation, transpiration) or food chains (i.e., producers, omnivores). They shared their songs with the whole class.	• Creative assembling of science facts to make an original song

activity, students thought of ways to improve a secondary classroom to encourage reading, while the second activity required students to generate creative ways of assessing social studies knowledge. In the latter two projects, students transformed a given photograph into a voting poster with a slogan to appeal to young voters, and created lyrics to a familiar tune that would teach the given science content.

Student Reactions to the Nineteen Exercises

The instructor asked students to write three observations and one suggestion about each presentation immediately after the conclusion of each presenter's work. Because one student was absent for some of the presentations and several students wrote more or fewer comments than expected, this resulted in 1,088 statements that were sorted according to main content using a spreadsheet. The comments that were not speaker-specific are tabulated in Table 7 in order of frequency of comment type. The average number of comments in each category of comment type is shown at the bottom of the table along with the standard deviation.

The data provide some interesting general information about the presentations. Although the personality, organizational skills, and knowledge levels of the presenters affected the participants' reactions to presentations, some trends about presentation format can be discerned. Each presentation received at least four positive comments about its effectiveness. Presentations in the simulations category received the most comments about their effectiveness, although several other presentations received many favorable comments. Simulations may have been regarded as most effective because they provided numerous connections to the real world experience of the participants.

Most presentation formats conveyed the main ideas of the presenters' topics. Most notably, the presentation involving idea generation via a game-like format for alternative assessments and the Draw-A-Scientist Test for discovering stereotypes resulted in numerous comments about the topics' ideas, but the hands-on sorting activity related to the nutrition of school lunches and the dramatic charades of extracurricular activities prompted the audience to frequently write about those topic ideas as well. These presentations all involved a high degree of audience engagement. The activities requiring participants to create a voting poster, improve the design of a secondary classroom to encourage reading, and use a graffiti-marked text, effectively conveyed the importance of the topics.

Students in the audience also commented about practical and new information learned through the activities. The elementary classroom reading-friendliness presentation provided students with abundant practical information, as did the parent involvement case analysis, the two creative idea generation presentations, the activity on improving the secondary classroom environment to encourage reading, and the generation of ideas for alternative assessments. Students stated they learned the most new information from the presentation on ability grouping and the presentation on paraprofessional scribes, perhaps because these specific topics were less familiar than the others.

Four activities stand out as receiving the most comments about being "fun" or "loved," as in, "I loved doing this!" The game show format of guessing the science topic supported by current events provided much friendly competition between class members who shouted out possible answers and applauded each other's clever responses. Students also reported enjoying the two

creative projects of writing a science song to teach content and making a voting poster that incorporated a given image. The drawing of a scientist, also a somewhat artistic and creative endeavor, received the next-highest number of enjoyment

Table 7. Number of participant comments related to aspects of the presentations

Category of Presentation Format	Research Topic of Presentation	Comments remarking on effective format of presentation	Comments stating main ideas of topic conveyed	Comments on importance of topic conveyed	Comment stating practical information was learned	Comments stating new information was learned	Comments reporting the activity as "fun," or "loved"	Comments stating that real world connections were made	Comments saying excitement or desire to learn more	Comments stating that prior knowledge was accessed
Simulation	Paraprofessional scribes	18	12	0	0	13	1	1	0	0
	Team teaching	20	10	2	3	2	1	2	3	0
	Graffiti in textbooks	17	9	15	0	4	0	1	4	0
Case Analysis	Parent involvement	7	8	0	17	2	0	0	0	0
	Community involvement	12	11	0	8	0	0	10	1	0
	Impact of disasters	15	10	0	1	1	0	5	1	0
Inference Making	Current events in science	7	2	5	1	6	13	10	2	0
	Extracurricular activities	16	14	12	0	2	5	1	2	0
Evaluation of Ideas	Elementary reading	4	7	0	21	2	2	0	1	0
	Obesity and school lunch	12	15	0	1	3	0	0	0	0
	Children of divorce	12	12	6	0	4	4	0	4	0
Self-evaluation and Reflection	Ability grouping	8	12	2	0	18	0	3	4	2
	Death of a student's parent	13	9	12	0	3	4	0	3	2
	Gender gap in science	9	17	5	0	3	7	1	8	2
	Inquiry in science	14	7	8	1	0	3	0	3	5
Creative Thinking	Secondary reading	6	11	16	14	0	2	0	2	0
	Alternative assessments	5	18	0	11	0	4	1	0	0
	Young voters	11	2	20	3	1	8	1	1	0
	Science songs	16	9	6	5	4	8	6	0	4
Mean		11.7	10.3	5.7	4.5	3.6	3.3	2.2	2.1	0.8
Standard deviation		4.7	4.2	6.4	6.5	4.6	3.6	3.2	2.0	1.5

comments. This latter activity also resulted in the most comments about wanting to know more about the topic. Most students were surprised to find that they stereotyped their scientist drawings and wanted to know more about the drawings of others and the research in this area.

Students reported the greatest number of real world connections for the case method activity on urban schools and, not surprisingly, on current events in science and the impact of disasters on students. Another easily understood finding is that the activities generating the most use of prior knowledge were those in the category of self-evaluation and reflection. The only exception was the science song activity, which required students to recall their knowledge of the water cycle or food chains.

Many audience comments provided suggestions for improving the presentations. These have been sorted and reported in Table 8. Several suggestions reflect audience enthusiasm by asking for more details, a handout of information, more examples, and more time to delve deeper into the presenter's topic. This is a strong indication of the motivating aspects of the presentations and their positive effect on increasing the participants' interest in research.

Another trend was the call for more audience participation in several of the presentations. A few of the presenters asked students to reflect on answers to questions, but did not allow the audience to share their ideas; instead they provided correct answers. This is further evidence of the motivating effects of interactive presentations.

Other participant comments reflected typical presentation problems of organization, pacing, assigning tasks, quality of materials, and noise level, as shown in Table 8.

Table 8. Constructive suggestions from the audience for improving presentations

Suggestion	N
Give more details of research project, more statistics from the literature	21
Improve organization of activity; stay focused and don't expand topic too far	18
Provide handout with scenario or information; give handout to everyone	14
Shorten or allow more time for the activity	14
Request that participants share their ideas and/ or products	13
Provide additional examples such as menus, songs, graffiti-covered texts	12
Have more than one case or scenario	10
Provide larger, clearer images for the exercise	9
Involve the audience more in the answers to the questions or problems	9
Assign roles to participants or give participants more choice	8
Reduce noise level during the activity	6
Adjust pacing of the presentation or activity	5

Conclusion

The preceding content analysis has identified six cognitive involvement formats that are effective in providing authentic learning experiences during graduate presentations in a research class: simulation, case analysis, inference making, evaluation of ideas, self-evaluation/reflection, and creative thinking. Participant comments show that these presentations stimulated interest in the topics through active audience

participation, prompting students to request more information about the topics and more time for continuation of the activities. Aspects that promoted the enjoyment of the activities include higher degrees of interaction, more sharing of participant ideas, a game-like format with friendly competition, and construction of a creative product.

A tremendous amount of enthusiasm was shown by the presenters and audience during the nineteen presentations, evidenced by people shouting answers, hurrying to complete drawings, and gleefully responding; or, taking care to read and follow supplied directions, analyze the provided materials, and discuss issues seriously. Audience comments also support this assertion. This positive reaction certainly raised the self-efficacy of the presenters as they realized they were able to competently present a well-received research problem and involve their peers in an aspect of it.

This enthusiasm carried over into the many revisions of this manuscript submitted by students after the course had concluded. Another indication that self-efficacy improved was the continuing interest shown by several students in their proposed projects. The program in which these students were enrolled did not require students to complete research projects. However, during the next semester, the instructor met with three former students from the course to help them file applications for review of proposed research by the Human Subjects Committee, or outline the next steps in the research projects so that data could be gathered.

It has been well established that student performance in research courses is closely tied to emotion. In this paper, we have provided numerous examples of how research issues can be offered in a consumer-friendly, exciting way, while still

conveying main ideas, importance of the topic, practical or new information and real world connections. The graduate students enrolled in this course reacted very favorably; we anticipate that use of these techniques by others will have a similar positive outcome, perhaps helping to overturn the negative reputation of research courses.

The authors hope that readers will use the presentations described here as examples for graduate students planning final presentations in a research course. Additionally, these presentations may serve as models for interactive lessons in other settings, such as K-12 or college classrooms in a variety of subject areas.

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