The influence of an integrated course cluster on the communication skills, technical content knowledge, and problem-solving skills of upper-level college students

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The influence of an integrated course cluster on the communication skills, technical content knowledge, and problem-solving skills of upper-level college students

by

Cynthia Carolyn Crawford Barnett

A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Agricultural Education and Studies (Agricultural Extension Education)

Program of Study Committee:
Gregory S. Miller, Co-Major Professor
Thomas A. Polito, Co-Major Professor
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Iowa State University
Ames, Iowa
2006

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Dedication

To Christianna White

no other words are needed
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Abstract

The purpose of this quasi-experimental study was to determine if upper-level college students who participated in AgPAQ, an integrated course cluster learning community, would demonstrate enhanced learning in the areas of oral communication, written communication, technical content knowledge, and problem-solving.

The population (N=182) consisted of students who participated in AgPAQ, the treatment group (n=33), and five comparison groups: the AgEdS 450 farm management class (n=57); the Agronomy 356 class (n=36); the Agronomy 356/English 309 integration (n=35); the paid AgPAQ volunteer group (n=7); and the paid non-AgPAQ volunteer group (n=14). Students in these six groups worked in teams to generate the data for the study, team written reports and oral group presentations. The reports and presentations that were generated between 1999 and 2006 were scored by trained raters. AgPAQ and comparison group scores from Heppner’s Problem Solving Inventory (1988), the Group Oral Communication Rubric (Barnett, 2006), the Written Communication Assessment Rubric (Barnett, 2006), and the Technical Content Assessment Rubric (Gibson, et al., 2006) were analyzed.

Analyses showed that AgPAQ participants scored higher on measures of oral and written communication than did comparison group participants. Also, AgPAQ participants scored higher on measures of technical content knowledge than did students in the non-AgPAQ paid volunteer group and the Agronomy 356 group. While AgPAQ participants achieved higher technical content knowledge scores than students who participated in the 356/309 integration group, the difference was not statistically significant. AgPAQ participants did not achieve higher problem-solving scores than the AgEdS 450 comparison group on three scales of the
problem solving inventory: 1) individual confidence in problem-solving abilities; 2) problem approach or avoidance; and 3) control of emotions and behavior.

AgPAQ fostered enhanced learning in specific areas, so upper-level learning communities—designed specifically for students in agriculture—should be continued and used as research sites. For example, compare an AgPAQ-like learning community with technical content/communication linked courses to simultaneously test multiple skill sets—written/oral communication, technical content knowledge, and problem-solving. Incorporate qualitative methods to investigate group processes and problem-solving behavior (leadership, participation, and conduct). Further, implement an introductory seminar to demonstrate AgPAQ’s benefits to future agriculture professionals.
Chapter 1
Study Context

This chapter includes background information about the study reported here, an introduction to the study, a statement of the problem, the significance of the problem, the limitations of the study, and definitions of key terms.

Background

In 2003, faculty in the College of Agriculture at Iowa State University received a USDA Higher Education Challenge Grant, *Integrating an entire semester to make connections for cross-disciplinary collaboration and communication*, (grant number IOW05066) to study the impact of a learning community within the college. The main project investigator, Thomas Polito, Ph.D., headed up a team that included five co-project investigators and one graduate research assistant. These people took on roles such as designing, planning, teaching, and researching the AgPAQ (*Agriculture students Providing integrated solutions to Agronomy and farm business management Questions*) integrated course cluster learning community. Table 1 shows the grant project investigators and other participants and how each participated in the project. The information about the roles and functions are articulated in full in the grant proposal.
<table>
<thead>
<tr>
<th>Person</th>
<th>Department(s)</th>
<th>Role(s)</th>
<th>Function(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas A. Polito</td>
<td>Agronomy; Agricultural Education and</td>
<td>Project investigator; Project team leader; Agronomy 356 instructor;</td>
<td>Integrate course syllabi with other instructors, liaise with college and university administration, execute cross-disciplinary collaboration, and identify measurement tools. Provide archived data for the 356/309 integration and the 356 stand-alone comparison groups.</td>
</tr>
<tr>
<td></td>
<td>Studies</td>
<td>Co-advise graduate researcher</td>
<td></td>
</tr>
<tr>
<td>Lance Gibson</td>
<td>Agronomy</td>
<td>Co-project investigator; Agronomy 312X instructor; AgPAQ webmaster</td>
<td>Organize and design Agronomy 312X, collaborate and integrate course syllabi with other project instructors, and assist with administering the grant.</td>
</tr>
<tr>
<td>Randy Killorn</td>
<td>Agronomy</td>
<td>Co-project investigator; Agronomy 356 co-instructor</td>
<td>Collaborate and integrate course syllabi with other project instructors.</td>
</tr>
<tr>
<td>David D. Roberts</td>
<td>English</td>
<td>Co-project investigator; English 311X instructor</td>
<td>Design English 311X and collaborate with other project instructors to integrate course syllabi.</td>
</tr>
<tr>
<td>James Kliebenstein</td>
<td>Economics</td>
<td>Co-project investigator; Economics 330 instructor</td>
<td>Collaborate with other project instructors to integrate course syllabi.</td>
</tr>
<tr>
<td>Gregory S. Miller</td>
<td>Agricultural Education and Studies</td>
<td>Co-project investigator; Co-advise graduate researcher</td>
<td>Helped the graduate research assistant identify and select the measurement tools, design and construct hypotheses, and analyze data.</td>
</tr>
<tr>
<td>Cynthia C. Barnett</td>
<td>Agricultural Education and Studies</td>
<td>Graduate research assistant</td>
<td>Identify, select, and administer measurement tools. Gather and analyze data and maintain all project records. Establish and maintain contact with the Institutional Review Board. Generate and submit interim reports to the USDA. Prepare final project report.</td>
</tr>
</tbody>
</table>
This research report focuses on AgPAQ, a fully integrated course cluster for junior and senior students that was initiated in the fall of 2004 in the College of Agriculture. AgPAQ integrated one English class, one Economics class, and two classes in Agronomy and centered on one theme: Integrating knowledge and skills from each of the linked courses so students could successfully solve a professional work-based agriculture problem. In addition to the faculty members who cooperated to design the AgPAQ curriculum, the AgPAQ students interacted with another important individual: an area farmer with a real problem. A major aspect of the AgPAQ learning community is the consultant relationship students develop while tackling the local farmer’s problem. Figure 1 shows the AgPAQ structure.

Figure 1. AgPAQ Learning Community Model
The AgPAQ learning community model addresses the need for students to use knowledge they acquire in college to solve real-world problems that have multidisciplinary dimensions (Overtoom, 2000). Researchers from Iowa State University and elsewhere (Zeleznik, Burnett, Polito, Roberts & Shafer, 2002; Edmunds, 1993) have argued that, unlike traditional pedagogy, the more progressive a teaching model—such as an integrated learning community—is, the more effective teaching methods are in terms of preparing students for professional careers.

**Introduction**

Higher education historically has sought to graduate adults through coursework that delivered information in a highly structured, repetitive fashion with little or no social interaction on the part of the students. However, when students originally set off for college, they brought their experiences and goals. Highly structured, repetitive pedagogy did not readily account for these experiences and goals, which were individual and tightly-held. This dissertation research investigated doing something different, what celebrated educational philosopher John Dewey called “development from within” (Dewey, 1938, p. 1), the notion that learners bring prior knowledge and experiences to learning situations. Dewey suggested that education was meaningful when it fosters interaction between the prior knowledge and experiences of the learner and what is being learned. Dewey and other scholars (Cremin, 1962; Ravitch, 1983; Zilversmit, 1993) proposed progressive education—education that sought to encourage integrated understanding through unrestricted investigation. The proposal was meant to be an antidote to traditional education. Dewey's dream has been partially implemented. Administrators, scholars, and staff within our nation’s colleges and universities have adopted many of Dewey’s precepts and related findings of contemporary
scholarship. Some contemporary pedagogy now offers progressive learning experiences that privilege experience over rote learning, interaction over silence, applied learning over isolated experimentation and lecture, and courses that integrate rather than isolate the academic disciplines.

Increasingly, higher education is called to provide opportunities for students to actively use—as well as formally demonstrate—the knowledge and skills they learn in their courses (Boyer, 1998; Kolb, 1984; Taylor, Moore, MacGregor, & Lindblad, 2003). In addition to people who teach and research higher education, potential and current students, their parents, and their potential employers request that universities offer courses designed to provide these kinds of interactions. All of these groups of people are concerned about identifying the essential attributes necessary to create an effective and efficient integrated learning experience for those pursuing a degree at an institution of higher education (SCANS, 1991) which emphasizes curriculum reform and charges universities with the responsibility to develop courses that incorporate and integrate concepts that enhance students’ learning (Brewer, 1999). Parents and employers join faculty and administrators in calling for an environment within higher education that is more challenging to its students, that better prepares the students to deal with a rapidly changing world (Smith, MacGregor, Matthews, and Gabelnick, 2004). Some of the people outside of higher education who clamor for educational reform do so from a sense that the system isn’t working as well as it could or should. This functional, results-based call for reform ebbs and flows.

Others base the call for reform on the results of research and scholarship. Scholarship may take the form of reports about reform in higher education, such as Greater Expectations (2002); Project 2061—Science for All Americans (1993); Reinventing Undergraduate
Education: Three Years after the Boyer Report (2002); Report on the Reports: Recommendations for Action in Support of Undergraduate Science, Technology, Engineering and Mathematics (2002). These reports analyzed the challenges facing higher education and identified several important concerns, such as students who were not offered opportunities to learn and practice oral communication skills; students who entered the university with low writing skills (and whose skills did not improve before they left); and a system that provided only minimal experiential learning situations.

Experiential learning was—and continues to be—supported by various researchers (Freire, Kolb, and Brookfield, to name a few) who all “stressed that the heart of learning lies in the way we process experience, in particular, our critical reflection of experience” (Kelly, 1997, n.p.). Kolb (1984) asserts that in order for learning to take place, experience provides “the foundation for an approach to education and learning as a lifelong process that is soundly based in intellectual traditions of social psychology, philosophy, and cognitive psychology” (pp. 3-4). This forward thinking resulted in new theory that pinpointed exciting ways to make learning stimulating for students: learning that incorporates work-based experiences and that can be applied to other pertinent situations.

Scholars like Smith et al. (2004) explored undergraduate education with an eye to providing optimal learning experiences for students. They join others (Brewer, 1999; Cove & Love, 1996; Laufgraben & Shapiro, 2004) who echo Dewey’s (1938) explanation that acquiring knowledge does not come from the reception of information; instead, understanding develops when the student has developed a mentorship with an educator, and through mutual discovery, the student attains knowledge. These contemporary researchers argue that universities and colleges nationwide must understand not only what their students
learn, but also how they learn. These scholars call for an extension of the partly-implemented tenets of Dewey's educational philosophy.

Armed with these understandings, universities can employ a variety of strategies that embody a philosophical vision of progressive education. In progressive education, students continue to learn outside of the classroom; they develop broad leadership, interpersonal, and communication skills; and they are actively involved in learning (Cove & Love, 1996). Cove and Love describe learning communities as one pedagogical strategy that is consistent with the philosophical and practical vision.

Today colleges and universities around the nation are restructuring curricula to provide learning communities to fulfill the progressive learning experience vision. These institutions inherently assume that the new curricula foster accountability for building positive learning environments among students, faculty, and administrators alike (Drake & Burns, 2004).

According to Brewer (1999), some colleges and universities have made curriculum changes that enable faculty to teach students how to apply the course concepts and skills to projects that mirror their future professional activities. Overtoom (2000) stresses that innovative teaching approaches, such as learning communities, tend to result in students developing proficiency and aptitude in their major area of interest. Further, Gabelnick, MacGregor, Matthews, and Smith (1990) report that members of a learning community that incorporates integrated classes as part of its design will experience learning at a new level of intensity. Gabelnick et al. define a learning community as

any one of a variety of curricular structures that link together several existing courses—or actually restructure the curricular material entirely—so that students have opportunities for deeper understanding and integration of the material they are
learning, and more interaction with one another and their teachers as fellow participants in the learning enterprise. (p. 19)

Brewer (1999) writes that the integration of technical and academic education reflects the paradigm shift from an emphasis on teaching to an emphasis on learning only when students become active participants in the construction of their own knowledge, architects of their own education. In the same vein, Kellogg (1999) argues that “students who are involved in learning communities show an increased level in academic achievement, retention, motivation, intellectual development, learning, and involvement within the community” (p. 4). Kellogg also contends that encouraging students to build a support network, form friendships, and connect with their specific institution supports students’ successful learning.

In addition to the roles students play in learning communities, when universities intentionally link courses from occupational (typically courses required for a major) and general education programs, faculty members bring experience in different teaching methods and approaches to problem-solving, teamwork, and critical thinking (Edmunds, 1993). When teachers provide environments that encourages students to approach inquiry with responsibility for their own learning, they develop accountability for their own education. When students are responsible for their own searches for meaning, they develop as independent thinkers. That is to say, when students experience the various learning strategies faculty bring to linked courses, they ask questions in different ways that often require digging beyond the superficial layer of the information being delivered in order to develop integrated understandings of concepts (Brooks & Brooks, 1993). Overtoom (2000) reports that learning communities are successful in terms of meeting what many think is the ultimate goal of teaching: preparing college students to be proficient with problem-solving, critical thinking,
and interpersonal skills. When successful learning communities seek to meet this ultimate goal, they promote

- coherence,
- leadership,
- active learning,
- student retention, and
- faculty development (Smith et al., 2004).

Like many initiatives in higher education, learning communities did not arise *ex nihilo*, but, in reality, have emerged from early exploratory efforts. Subsequently contemporary learning communities have taken forms that require new visions of both the content and the process of *learning in community*, as opposed to the model of the independent scholar soaking up lecture material and scurrying off to process that material in isolation.

Universities have responded to the notion of learning in community and have, in many cases, moved from the lone-scholar model to recognizing the power of today’s learning community models. Today’s learning communities have influenced the substantial growth of and shift toward the progressive philosophy championed by Dewey and others (Brewer, 1999; Cove & Love, 1996; Laufgraben & Shapiro, 2004). This trend has been tracked in a variety of ways. Administrators, program directors who oversee these progressive initiatives, faculty who bring their experience to linked courses and learning communities, graduate students who research various aspects of learning communities, and students themselves (through exit interviews and other means) all have contributed to the body of knowledge that shapes contemporary learning communities. For example, at Iowa State University where the study reported here is situated, the various initiatives that have resulted in today’s learning
community concept have been well documented (Field, Freeman, Dyrenfurth, & Hunter, 2001; Harms, Mickelson, & Brumm, 2001; Huba, Ellertson, Cook, & Epperson, 2003).

Learning community initiatives have been extraordinarily responsive to this rich theoretical and practical background and have grown substantially over the past decade. Because the shape of what we call a learning community has shifted over time, a more current definition of *learning community* is in order. Smith et al. (2004) refer to learning communities as “a variety of curricular approaches that intentionally link or cluster two or more courses, often around an interdisciplinary theme or problem, and enroll a common cohort of students” (p. 20), which is how Iowa State University learning communities operate toward the goal of delivering graduates who are capable of successfully entering professional arenas.

In order for employers to keep up with the quickly changing nature of the workplace, they need employees to come to them directly from colleges and universities ready to immediately use their knowledge and skills (SCANS, 1991). For example, Tubbs and Moss (2000) describe rapid shifts in the electronic communication industry. In the context of such change and compounded by stiff competition within the worldwide employment market, employers demand a high level of competence; employers require that recent graduates be both able and highly motivated to bring to the workplace skills constructed by combining information with practical experience (SCANS).

Despite the best efforts of committed organizations and individuals within higher education, employers still report that recent college graduates struggle with communication skills such as knowing how to converse, how to speak clearly in front of both large and small groups, and how to write coherently (Boyer, 1998). Some graduates who enter the workplace
struggle because they are unprepared in the areas of oral and written communication, problem-solving, and team-building skills. Others may have the capacity to communicate by visual or oral means, but may still lack the overall finesse that is becoming more and more important in order to be successful in many professions (Overtoom, 2000).

As one response to the need for well-prepared employees, some prominent employers convened to explore how American society in general and higher education in particular can meet current and emerging marketplace demands (Wingspread Group on Higher Education, 1993). The Wingspread Group’s main task was to identify and develop characteristics that indicate performance qualities that college students bring to their careers. The group identified four areas as crucial for preparing students for the workplace:

- Communication skills,
- Computation aptitude,
- Technological capabilities, and
- Effective problem solving abilities.

The group echoed the expressions of demand from the global economy and called for universities to produce graduates who bring both content knowledge and skills that allow them to work effectively in a range of problem-solving and decision-making environments. More recently, Ellis and Letourneau (2001) assert that students who participate in learning communities tend to be more academically and experientially prepared for their careers compared with students who pursue a more traditional curriculum path and who do not participate in linked courses or learning communities.

Learning communities encourage collaboration between the students themselves as well as between the students and faculty. Learning communities also support students who are confronted with the responsibility for their own learning, a responsibility that, ultimately, is
inherent in all educational experiences. However, Gokhale (1995) states that in collaborative learning situations, “students are responsible for one another’s learning as well as their own” (p. 22). In addition, when these responsibilities are addressed directly, they are supported by cooperatively developed, integrated curricula. These curricula incorporate rich resources of student-centered, progressive teaching methods. Collaborative learning is one of these progressive teaching methods. In addition, students in these learning communities benefit from the “social, emotional and intellectual support for each other’s learning, and learning communities are ideal places for faculty members to implement collaborative learning strategies” (Cove & Love, 1996, p. 2).

The faculty who designed the AgPAQ learning community did so to determine whether or not students in the treatment group—who gained hands-on experience in solving real-world, multidisciplinary problems—would attain higher scores on measures of oral communication, written communication, technical content knowledge, and problem solving. The goal of this project was to investigate this argument and to better quantify and understand the performance of the AgPAQ students with regard to their communication skills and problem-solving skills (Polito, Gibson, Killorn, Roberts, Kliebenstein, & Miller, 2002).

**Statement of the Problem**

Although scholarship about progressive teaching and learning strategies has proliferated in the past decade, most of that research has focused on learning community models that differ from the AgPAQ model. For example, AgPAQ students are juniors and seniors, while many previous learning teams involved lower division students in linked common core requirements (i.e., survey courses, first-year composition, and so on). Further, AgPAQ breaks new ground in the College of Agriculture at Iowa State University in terms of combining
courses from three disciplines (i.e., two agronomy courses, one economics course, and one advanced writing course). In fact, for some AgPAQ students, AgPAQ represents their entire course load for the semester. Finally, this study carves a niche in the research about the effectiveness of course integration in solving agricultural problems in the real world. Kaltsounis (1990) identifies the need for this kind of research: “there is limited research on how to integrate various subjects in order to enhance teaching and learning . . . [which] is especially true when it comes to the teaching and learning of higher-level skills such as critical thinking, problem solving, and decision making” (p. 286).

The purpose of this study was to determine whether students who participated in the AgPAQ integrated course cluster demonstrated enhanced learning in the areas of oral communication, written communication, technical content knowledge, and problem-solving when compared to students who did not participate in the AgPAQ integrated course cluster. This quasi-experimental study is guided by the following research hypotheses:

1. Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of oral communication skills than will students who participated in the AgEdS 450 course.

2. Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of written communication skills than will students who participated in the AgEdS 450 course.

3. Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of written communication skills compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.
4. Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of technical content knowledge compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.

5. Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of problem-solving skills compared to students who participated in the AgEdS 450 course.

6. A self-selected paid group of past participants from the AgPAQ integrated course cluster will attain higher written communication scores and technical content knowledge scores when solving a multidisciplinary problem compared to a self-selected paid volunteer group of students who did not participate in the AgPAQ integrated course cluster.

**Significance of the Problem**

This study is important because, even with all we know about the history of progressive education, the development of pedagogical strategies, and the evolution of learning communities, we do not know if students in learning communities do, in fact, demonstrate improved skills in four areas: oral communication, written communication, technical content knowledge, and problem-solving. This study also is important because upper-level (junior and senior status) students make up the treatment and comparison groups.
Limitations

As with all research, this study has limitations.

- The study is limited to those Iowa State University students who enrolled in the learning community each year. The length of the study was two years, and two different groups of learning community students participated.

- The study is limited to those students who were in the comparison groups. These students enrolled in AgEdS 450, Agronomy 356, and the Agronomy 356/English 309 integration with no prior knowledge that they would be a part of this study.

- In 2004, the informed consent documents (Appendix A) were handed out to the AgEdS 450 comparison and collected at a later date, which may have accounted for low participation number from this group.

- The investigator did not use observational qualitative methods or interviews to determine problem-solving skills, but instead relied solely on quantitative methods to assess this variable.

- Professionals specializing in oral and written communication as well as agronomy were used for the rating process and brought their personal experiences to the study. These experiences may have introduced some partiality towards what the raters know and what they felt should be included in the data. Stemler (2004) explains that the “task of judging behavior invites some degree of subjectivity in that the rating given will depend upon the judge’s interpretation of the construct” (n.p.). This may have caused inaccurate results during the rating process.
Two agronomy classes that were previously conducted generated written communication data that was used in this study. Participants from these groups were not available for the pre/posttesting that was conducted for the several of the variables.

**Definitions of Terms**

*AgPAQ*: Agriculture students Providing integrated solutions to Agronomy and farm business management Questions

_Collaborative learning_: “an instruction method in which students . . . work together in small groups toward a common [academic] goal” (Gokhale, 1995, p. 22).

_Diffusion_: “A threat to internal validity that occurs when the treatment ‘spills over’ from the experimental group, and control group subjects modify their behavior because they learn of the treatment” (Neuman, 2003, p. 533).

_Integrated course cluster_: “This model links a cohort of students with several common courses. This often serves as the students’ entire course load” (Kellogg, 1999, p. 2).

_Integration_: The act of combining or incorporating two or more courses into a delivered curriculum to teach students a specific body of knowledge that is united with a learning environment enhanced with opportunities to create new relationships (Smith et al., 2004).

_Learning_: “the process whereby knowledge is created through the transformation of experience” (Kolb, 1984, p. 38).

_Learning community_: “The purposeful restructuring of an undergraduate curriculum that thematically link or cluster courses and enroll a common group of students in these courses” (MacGregor & Smith, 2005, p. 2).
Oral communication: “any type of spoken communication that uses one or more words” (Tubbs & Moss, 2000). Assessment of this construct will be done with the Group Oral Presentation Rubric (Barnett, 2006), a modification of the Oral Communication Rubric (Department of Educational Leadership & Policy Studies, Iowa State University, 2000).

Rubric: an assessment tool that “explains to students the criteria against which their work will be judged. Makes public key criteria that students can use in developing, revising, and judging their work” (Huba & Freed, 2000, p. 155).

Technical content: contains practical knowledge relating to a specific subject (Merriam-Webster Online Dictionary, 2006). For this particular study, the subject matter was agronomy and economics. The assessment of this construct was done with Technical Content Assessment Rubric (Gibson, Polito, Kliebenstein, Roberts, & Barnett, 2006).

Visual communication: any form of communication that gives a demonstration or illustration of the information being delivered. Visuals need to be audience and situation specific (Tubbs & Moss, 2000). This construct was assessed with the Group Oral Presentation Rubric (Barnett, 2006), a modification of the Oral Communication Rubric developed by ELPS (Department of Educational Leadership & Policy Studies, Iowa State University, 2000).

Written communication: any type of communication that we use to transmit messages via the written word (Tubbs & Moss, 2000). This construct was assessed with the Written Communication Assessment Rubric (Barnett, 2006), a modification of the Written Communication Rubric developed by ELPS (Department of Educational Leadership & Policy Studies, Iowa State University, 2000).
Chapter 2
Review of Literature

This literature review contains four sections. In the first section, Learning Community History, early stages of learning communities are explored, and the foundation for current trends in integrated course clusters is established. In the second section, Learning Community Theory, past research and scholarship on learning communities is examined, and the theoretical framework for this study is established. In the third section, Learning Community Models, various types of learning communities currently being used in undergraduate programs, are discussed. This section also includes a discussion of how theory influences policy and practice in higher education. The fourth section addresses learning community assessment.

Learning Community History

Modern learning communities have developed and evolved from efforts of, and experiments conducted by, early learning community pioneers. In reports on the evolution, development, and influence of progressive education, researchers and scholars agree on a lineage that begins in the 1930s with Dewey, commonly considered the father of progressive education (Burr, 1998; Zilversmit, 1993), and continues with Meiklejohn and Tussman. These forefathers didn’t identify their efforts as learning communities, but contemporary scholars agree that their efforts laid the groundwork for what we now call learning communities (e.g., Gabelnick et al., 1990; Laufgraben & Shapiro, 2004; Smith et al., 2004).

Nearly 100 years ago, higher education faculty and administrators recognized principles that shaped today’s learning communities and tested those principles in their curricula. In 1906, Herman Schneider, an engineering professor at the University of Cincinnati, “believed
that practical experience would . . . help his students in the classroom” (Stanton, 1998, p. 22).

Schneider is recognized as one of the first educators to identify and apply the social principles commonly integrated in modern learning communities.

In 1927, Alexander Meiklejohn created a two-year experimental college at the University of Wisconsin. Students read Greek literature the first year and American literature the second year. In addition to the required readings, Meiklejohn required students to consider what they were reading in light of their own experiences. Between the two years, students wrote an essay integrating their “real world” ideas with the course content (Meiklejohn, 1932).

Joseph Tussman, one of Meiklejohn’s students, applied and extended what he learned in Wisconsin. In 1965, he developed an experimental learning community program at the University of California at Berkley (Tussman, 1969). Tussman persuaded his colleagues to authorize a trial—known as the Berkeley experiment—that included restructuring the traditional curriculum. He contended that faculty needed to shift from the customary approach, which viewed individual courses as the building blocks of curriculum, to an approach where linked courses were the curriculum foundation. Faculty members were, however, concerned about using this relatively unfamiliar method of presenting courses to students. During the first year of the linked approach instructors developed interpersonal relationships with colleagues in their programs and formed kindred-spirit relationships with their teaching peers and with students.

Tussman mentioned these relationships and the students’ positive outcomes—along with a balanced report of the problems and shortcomings of the experiment—in both his preliminary report and in his final report. Tussman’s descriptions correspond with what Caine and Caine (1994) would later report about students making connections between their
academic courses and real-world problems. In his final report about the program, Tussman reflected that relationships and connections were paramount features of the program. He summarized his experiences and observations when he wrote, “Education is not entirely a private matter; it is a social enterprise” (Tussman, 1969, p. 136).

One type of social enterprise, learning communities with integrated course curricula, enables students and teachers to participate together in making connections between classroom coursework and problem-based experiences outside of the classroom (Smith, 1993). Implementing teaching approaches that use experience as a catalyst for integrating knowledge provides opportunities for students to assume ownership of the knowledge they gain. Martinello and Cook (1994) argued that creating an integrated curriculum demonstrates that teachers who develop these instructional units are asserting that students are scholars in their own right. Smith et al. (2004) echo these assertions and argue that linking theory and practice with “real-world” problems promotes gains in students’ critical thinking skills. Further, students demonstrate different attitudes and come to value their education in different ways when they have opportunities to examine complex issues and problems. Their attitudes of ownership in the learning process and their expressions of satisfaction with their educational experiences derive from being active participants, active scholars instead of being bodies in rows of desks. As active scholars, students are less inclined to gather what Whitehead (1916, in Brown and Palincsar, 1989) called “inert” knowledge, and instead are more likely to experience change, both in terms of what they understand and how they come to that understanding (p. 394). Brown and Palincsar suggest “[c]hange is more likely when one is required to explain, elaborate, or defend one’s position to others as well as to oneself;
striving for an explanation often makes a learner integrate and elaborate knowledge in new ways” (p. 395).

Subsequently, institutions have derived dozens of adaptations from Tussman and Meiklejohn’s curriculum development models and applied basic learning community principles within specific programs. Although Meiklejohn and Tussman’s programs lasted only a few years, they shaped basic principles and practices that are still used in today’s learning communities (Kellogg, 1999). One higher education institution in particular, The Evergreen State College in Olympia, Washington, has led the way in implementing learning community curricula. Gabelnick et al. (1990) reported that, since its founding in 1970, the Evergreen administration designed course delivery around year-long learning communities and coordinated studies programs. Smith et al. (2004) remark on the importance of Evergreen’s program: “Evergreen [has] become a leader in the learning community movement, finally realizing early hopes that it would play a broader role in education reform” (p. 48). Indeed, the Evergreen experience has influenced other educators who, in turn designed learning communities that restructure experiences and create rich, nurturing, and challenging environments (Smith et al., 2004). Contemporary learning communities address curriculum reform while providing a variety of program options.

Today, educators customize learning communities to meet specific institutional and programmatic goals, which is consistent with Laufgraben & Shapiro’s (2004) assertion that there is “no ‘one size fits all’” learning community model and that, in fact, learning communities “vary as needed to adapt to distinct campus cultures” (p. 2).
Learning Community Theory

Within this discussion of learning community theory, you’ll find a brief definition of the term theory, a discussion of theory about teaching and learning that provides a brief chronology of seminal thinkers and practitioners, and a look at the theories that drive the quantitative methods used in this study to track participants’ performance and compare the treatment group against other study participants.

Theory Defined

The term theory is defined by Kerlinger (1986) as “a set of interrelated constructs (concepts), definitions and propositions that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining and predicting the phenomena” (p. 9). Schunk (2004) defines theory as “a scientifically acceptable set of principles offered to explain a phenomenon” (p. 3). In other words, theory is a set of values, ideas, and assumptions that help give meaning to the relationships among empirical data.

Theory about Teaching

Today, educators and their administrators are conscious of the fact that their students do not have the same educational or personal needs as the generation before them (Hiatt-Michael, 2001). To keep abreast of the ever-changing needs of these young minds, teachers must have a working knowledge of the theories that provide a foundation to learning. Moreover, “the goal of education is better conceived as helping students develop the intellectual tools and learning strategies needed to acquire the knowledge that allows people to think productively” (Bransford, Brown, & Cocking, 2000, p. 5).
Many scholars consider John Dewey to be the father of progressive education (e.g., Gabelnick et al., 1990; Laufgraben & Shapiro, 2004; Smith et al., 2004). In regards to educational theory “that forms a philosophy of education” (p. v), Dewey (1938) writes:

> It is the business of an intelligent theory of education to ascertain the causes for the conflicts that exist and then, instead of taking one side or the other, to indicate a plan of operations proceeding from a level deeper and more inclusive than is represented by the practices and ideas of the contending parties. (p. v)

While his theories on education had little to do with curriculum structure, his contributions laid the groundwork for examining teaching and learning processes. Moreover, Dewey was very interested in how students experienced education. He believed that the main purpose of education is to prepare students for the responsibilities they will encounter in the future, as well as for success in life (Dewey, 1938). The problem, Dewey believed, was how traditional educators disseminated knowledge. Dewey was a staunch developmentalist (Gabelnick et al., 1990), and he believed that education should focus on how students develop from within themselves.

Dewey (1938) regarded schools as one of the most important places where learning occurred, and he thought schools need to build upon the individuality of students. He argued that education needed to be more than the delivery of information in the hope that students would simply absorb the knowledge like “a piece of blotting paper” (Dewey, 1933, p. 261). Instead, Dewey asserts that individuals—students and teachers—together construct knowledge. In fact, Dewey (1938) explicitly argues that true understanding comes when the student has developed a mentorship with an educator and through mutual discovery,
knowledge is attained. The importance of this idea, like many of Dewey’s thoughts about education, has been acknowledged, but implementation of the idea has been slow but steady.

Dewey’s (1938) theory of experience has had broad implications for contemporary learning communities. Dewey believed that, to be useful, experience must include selection and organization of pertinent materials and appropriate methods. He also believed that experience has a social background because it involves communication and human contact. The theory of experience is supported by the principle of the “experiential continuum” (Dewey, 1938, p. 17), the ability to distinguish between those experiences (in the educational sense) that are worthwhile and those that are not (Dewey). Smith et al., (2004) assert that linking theory and practice with “real-world” problems affects students’ intellectual conception levels, attitudes, and values and provides the student with opportunities to examine real, complex issues and problems. By accomplishing this, educators provide to students the proper environment in which they can “achieve higher levels of thought and retain information longer than students who work quietly as individuals” (Gokhale, 1995, p. 22). Gokhale also argues that it is the educator’s responsibility to ensure that the student is learning in an environment where the pupil receives instruction using non-traditional methods when she states

the teacher must view teaching as a process of developing and enhancing students’ ability to learn. The instructor’s role is not to transmit information, but to serve as a facilitator for learning. This involves creating and managing meaningful learning experiences and stimulating students’ thinking through real world problems. (p. 30)

With regard to educational experience, Smith et al. (2004) and Gabelnick et al. (1990) both reference Paulo Freire’s opposition to the “banking model” and his development of
critical pedagogy, an educational theory that has shaped learning community principles. Freire (1973) argued that, “[to] be human is to engage in relationships with others and with the world. It is to experience that world as an objective reality, independent of oneself, capable of being known” (p. 3). He contended that educated people could help change the world, but they could not effectively do so as long as they were the “repositories” of knowledge presented by teachers—as “bankers” making deposits—outside the students’ frame of reference and context. Freire’s assertions that students could learn from each other and could put their knowledge to use within their own contexts are foundational ideas for learning communities.

**Theory about Learning**

Wenger (2002) believes that “learning transforms who we are and what we can do; [therefore], it is an experience of identity” (p. 215). Additionally, many domains within the realm of human learning play significant parts in how we obtain and transform knowledge (Schunk, 2004). Schunk writes that Piaget believed that “cognitive development depend[ed] on [several] factors, [one of which was] experience with the physical environment” (p. 447). These ideas find support deep in the foundation of confluent education. Brown (1971) defined confluent education as “the integration or flowing together of the affective and cognitive elements in individual and group learning” (p. 3). Johnson (1984) writes that the term confluent refers to the process of holistic learning, involving body, mind, emotion and spirit. In educational settings the term is used to describe methods for teaching traditional subjects . . . by applying effective, introspective . . . types of activities to the lessons to be taught. (p. 38)
Experiential learning theory is important when discussing the creation of knowledge through skill-building. Kolb (1984) defines experiential learning as a means “for examining and strengthening the critical linkages among education, work, and personal development” (p. 4) and further reports that experiential learning is an important modus operandi to creating knowledge. He also writes that “knowledge is the result of the transaction between social knowledge and personal knowledge” (p. 36).

Therefore, learning is a process, and acquiring knowledge plays a factor in the formation of who we become as individuals. Kolb (1984) goes as far to say that “learning is the major process of human adaptation” (p. 32). Armed with a more comprehensive understanding of how people learn, learning community faculty can collaborate to explore different ways of delivering information in order to reach all of the students and not just those who flourished under traditional pedagogy that privileged lectures and rote memorization. Sometimes, it is necessary to “redirect” the manner in which students learn, and it is the educators’ responsibility to create new environments in which “alternate forms of participation” can occur (Wenger, p. 215, 2002).

In recent years, there has been an increase in the number of universities who have implemented the collaborative learning theory in environments like learning communities. Vygotsky (1978) writes that students who are asked to work in groups have shown increased intellectual levels, and Southard (1999) adds further support when she states that the main value of the collaborative learning theory is “the active reconstruction of a learner’s knowledge and ideas through peer-to-peer dialogues, commenting, discussing, sharing, and reconceptualizing” (n.p.). Other scholars (Bruner, 1985; Bruffee, 1999) assert that students who are involved in an environment in which learning takes place in groups, positive
improvement in problem-solving skills is attributed to the diverse experience and knowledge base brought forth by participants. All of these theories take root in the constructivist explanation of learning which says that individuals create information from what they comprehend (Schunk, 2004). Roberts (2006) explains that one element of constructivism is “the learner’s construction of knowledge is a reconstruction of what truly exists” (p. 18) and is balanced by social interaction Astin (1997) which provides support to White (2002) who writes “cognitive development is accelerated through social interactions resulting in greater depth of knowledge construction” (p. 122). The benefits of utilizing the constructivist theory are realized when the integration of “real-life problems” (Knobloch, 2003, p. 30) occurs. Knobloch posits that “one of the greatest challenges for today’s teachers and students of agriculture is to move beyond the ‘doing’ and ensure that all learning is connected to thinking and knowledge that will be easily remembered and applied later in life” (p.31).

Like Dewey, Piaget, and Vygotsky, Cove and Love (1996) proposed that higher education has struggled with the “increasing fragmentation of the learning process, disciplines and knowledge, administrative structure, and community” (n.p.). They argue that reform is obligatory. Similarly, Schuyler (1997) reports that, “increasingly, movements to consider student outcomes, to improve student assessment, and to refocus institutional missions to focus on student learning are gaining prominence” (n.p.). Schuyler goes on to contend that although most educators agree that “the primary goal of education is student achievement . . . some believe that the goal of student learning has become incongruent with the current way higher education institutions function (n.p.). Over the past two decades, higher education has focused on addressing this need for reform by providing learning
environments conducive to students participating in their own learning (Kellogg, 1999). Learning communities are examples of such environments.

**Learning Community Models**

Learning community educators typically have responded to the lack of a one size fits all, universal model for learning communities by planning, structuring, and implementing learning communities that respond to specific needs. Even though many individual learning communities have had a wide variety of defining features, similarities among the learning communities emerged to the extent that five major models can be identified. In 1990, Gabelnick et al. presented “the five major types of learning community programs” (p. 31): “Linked Courses, Integrated Course Clusters, Freshman Interest Groups (FIGs), Federated Learning Communities, and Coordinated Studies” (pp. 32–33). The following sections describe in detail the features of these five main learning community models. After discussion of the five models, the final section describes the structure of the learning community in this study.

**Linked Courses**

Linked courses are two separate courses that are connected together. For example, an introductory course centered on building skills (i.e., a writing course) is usually linked with a class that is more discipline specific (i.e., agronomy). In addition, some institutions link courses with others to address low enrollment numbers (Smith, et al., 2004). In some cases, these linked courses or clusters become the foundation of a particular major.

Faculty members meet frequently as a team before and during the semester to coordinate syllabi, develop joint assignments, and plan activities that are focused on the learning
community’s common educational goals. Credit hours can vary between courses within the learning community.

**Integrated Course Clusters**

Integrated course clusters are an “expanded form of the linked course model” (Gabelnick et al., 1990, p. 21) where three or four separate courses are linked by “common themes, historical periods, issues or problems” (Gabelnick et al., 1990, p. 32) and are scheduled together to form a “cluster.” Students within this type of learning community usually form a “pure cohort” (Smith et al., 2004, p. 77). Smith et al. state further that

> having a pure cohort of students is important for two reasons: first, the students and their faculty become a community of learners having a common experience, and second, because everyone is taking both classes (or all three or four classes), thematic connections can be made and integrative assignments are created. (p. 78)

The entire enrollment of a clustered learning community usually is composed of the students who registered for the courses in the learning community. Moreover, an integrated course cluster may comprise the entire course load for the members of the learning community. As in the linked course model, credits can vary depending on the course.

**Freshman Interest Groups**

This model, commonly known as the FIG model (Laufgraben & Shapiro, 2004; Smith et al., 2004; Gabelnick et al., 1990), is comprised of freshman students. This learning community is commonly found at large universities and “gives freshman an immediate support system for their first experience in a large college setting” (Gabelnick et al., 1990, p. 25).
Within this three course cluster, an additional seminar can be added for freshman to enhance their freshman experience. Topics for these seminars focus on specific interests students may have (Smith et al., 2004). Courses within this learning community are largely unmodified. Faculty are not asked to redesign syllabi or develop coordinated assignments.

**Federated Learning Communities**

Gabelnick et al. (1990) describe the federated learning community model as an adaptation of the linkage of three courses where a “three-credit program seminar [with] a discussion section related to all three courses led by a Master Learner” (p. 27) is added to the course structure. This arrangement requires a large amount of development by the faculty largely because a Master Learner is otherwise not involved in the learning community. S/he is required to join the body of learners and “fulfill all the academic responsibilities of a student in each course” (p. 27). The Master Learner can also help students explore and discover new ways of garnering information in the courses offered in the integrated learning community (Gabelnick et al., 1990). The benefit to faculty members participating in this type of learning community is that the Master Learner can provide them with valuable insights regarding the material being taught.

**Coordinated Studies**

Coordinated study learning communities, or team-taught learning communities as they are sometimes called, are the model closest to the Meiklejohn and Tussman experiments. Two, three, or four classes can be integrated and faculty members team-teach. Gabelnick, et al (1990) write that “faculty members … are engaged full time” (p. 28). Smith et al (2004) echo this more deeply when they state
fully team-taught programs require extensive planning both in advance of and during the program itself. Not every faculty member is prepared to commit the amount of time necessary, nor is every teacher comfortable with the intense, public nature of team teaching, the give-and-take of collaborative planning, and the demands of designing and giving students feedback on integrative assignments. (pp. 88-89)

Cove and Love (1996) stated that in any one of these learning community structures, student learning is enhanced by actively fostering social and affective dynamics among students, and between students and faculty. Acquiring and creating knowledge is an active social process which students need to practice. It is not a process in which students are spectators, sitting passively in a lecture hall. Recognizing the importance of learning communities, many institutions and educators find that choosing a single model is not as beneficial as using portions from two or three models (Kellogg, 1999). Kellogg stated that every educational institution has a particular mission—such as denomination-based schools, innovative institutions like Evergreen, or land-grant universities like Iowa State—where learning teams have become an integral part of achieving the goals set forth in the institutional mission statements. Even though models, such as those discussed here, are well researched and widely adopted, most schools adopt learning community models that are consistent with their institutional missions.

Learning Community Assessment

Since the 1980s—when several national reports demanded educational reform—governments and certification groups have required that educational institutions meet accountability standards. Administrators must provide documentation that shows how campuses are strengthening their programs by improving their “quality and efficiency”
Smith et al., 2004, p. 221). Taylor et al. (2003) write that institutions nationwide have begun to realize the relationship between “investing in assessment [so they could] invest in learning community program development” (p. 1). Effective assessment can help satisfy these requirements. Huba and Freed (2000) define assessment as:

the process of gathering and discussing information from multiple and diverse sources in order to develop a deep understanding of what students know, understand, and can do with their knowledge as a result of their educational experiences; the process culminates when assessment results are used to improve subsequent learning (p. 8).

Laufgraben and Shapiro (2004) discuss the importance of assessment when they write “[t]he expectation of student engagement in learning takes on a new dimension in today’s climate of institutional accountability, which requires campuses to demonstrate evidence of student learning” (p. 39). Because the main objectives of this study were to determine if participation in the learning community would improve oral communication, written communication, technical content knowledge, and problem-solving skills, a central and crucial feature of this study is quality assessment. In order to assess the students’ progress in terms of these objectives, the study was designed to gather and analyze data in several ways. This assessment process compared the students’ performance in accordance with the hypotheses that drove the study.

In the past, successful learning in learning communities had been observed by faculty members using student self-evaluations or self-assessments, which meant that most earlier evaluations were mostly anecdotal (Tussman, 1969). Scholars (Astin, 1991; Gabelnick et al., 1990; Smith et al., 2004) who previously wrote about assessment practices and priorities
agree that faculty members must make a deep commitment to taking the time to develop and employ measures of achievement and intellectual development. Angelo and Cross (1993) write that “Good summative assessments—tests and other graded evaluations—must be demonstrably reliable, valid, and free of bias” (p. 5). During the assessment process, researchers can utilize many resources to gather and analyze data. Many assessment practices used today include “self-reflection, prior knowledge assessments, one-minute papers, ‘inkshedding’, small group instructional diagnosis, and process evaluation” (Smith et al., 2004, pp. 239-242).

Smith et al. (2004) propose six steps that are involved when performing assessment. Those steps are:

1. “goal formulation.” This step consists of identifying objectives for a particular program or learning community. These objectives provide the foundation of the learning community. “We identify our aspirations for our courses or programs based on our understanding of needs and opportunities” (p. 228);
2. “design and planning.” This step is influenced by the goals and objectives identified in step 1, and influences ways to deliver the content of the course(s);
3. “implementation.” In this step, “we carry out our designs in the actual teaching of a course or delivery of a program, often gathering informal feedback in the process” (p. 228);
4. data collection, analysis, and synthesis. Evidence of student learning and how it aligns with goals identified in step 1 is gathered (p. 228);
5. “interpretation, reflection and judgment.” By performing this crucial step, we are lead by the “learning community experience and the information that has been distilled from it . . . to take action” (pg. 228); and
6. “decisions and revisions.” Smith et al. (2004) regard this step as crucial as well because it “relate[s] to any aspect of the program: its goals, design, delivery, and even future assessment work; here the cycle begins anew” (p. 228).
In summary, Smith et al. (2004) report that “assessment is an integral set of activities that both initiate and thread throughout the entire educational enterprise, included in all the ongoing steps of settings goals, planning and designing, implementing, reflecting, and modifying” (p. 228). Figure 2 shows the continual flow of information necessary among these steps.

Faculty members must conduct assessments to determine evidence of student learning (Laufgraben & Shapiro, 2004). Love, Russo, and Tinto (1995) assert that “assessment design be guided by the research question one seeks to answer and by the audience in which one wishes to speak” (n. p.). For this study, rubrics were used for assessment of written communication and oral communication skills of the participants. A rubric is a tool that
“explains . . . the criteria against which . . . work will be judged. [This tool also] makes public key criteria that . . . can [be] use[d] in developing, revising, and judging . . . work” (Huba & Freed, 2000, p. 155). Additionally, rubrics are different from the conventional tools typically used to evaluate student achievement (Huba & Freed). The rubrics used for this study to judge participants work are discussed further in Chapter 3.
Chapter 3
Methodology and Procedures

The purpose of this study was to determine whether students who participated in the AgPAQ integrated course cluster demonstrated enhanced learning in the areas of oral communication, written communication, problem-solving, and technical content knowledge when compared to students who did not participate in the AgPAQ integrated course cluster.

This chapter contains the following sections: research designs, target population, instrumentation, conditions of testing, and data collection and analysis.

Research Designs

Three research designs were used in this study: Campbell and Stanley’s (1963) Nonequivalent Control Group Design; the Static-Group Comparison Design; and, a Modified Static-Group Comparison Design.

**Nonequivalent Control Group Design**

According to Campbell and Stanley (1963), a Nonequivalent Control Group Design “involves an experimental group and a control group both given a pretest and a posttest, but in which the control group and the experimental group do not have pre-experimental sampling equivalence” (p. 47). This design is used in hypothesis 1, hypothesis 2, and hypothesis 5.

Internal validity factors that are controlled for by this design include history, testing, instrumentation, mortality, and selection. The one identified weak factor is regression. Interaction of selection and maturation is “a possible source of concern” (Campbell & Stanley, p. 8, 1963).
**Static-Group Comparison Design**

According to Campbell & Stanley (1963), a Static-Group Comparison Design “is a design in which a group which has experienced \( X \) is compared with one which has not [experienced \( X \)], for the purpose of establishing the effect of \( X \)” (p. 12). This design was used in hypothesis 6.

Internal validity factors that are controlled for by this design include history, testing, instrumentation, and regression. Areas of weakness include selection and mortality. Maturation is “a possible source of concern” (Campbell & Stanley, p. 8, 1963).

**Modified Static-Group Comparison Design**

The only difference between the Static-Group Comparison Design and the Modified Static-Group Comparison Design has to do with when the data was collected. However, like the Static-Group Comparison Design, the modified design compares a treatment (\( X \)) group with other groups that did not experience the treatment. This design was used for hypotheses 3 and 4.

**Hypothesis Groups**

The three research designs used in the hypotheses incorporated the following six different population groups:

\[
\begin{align*}
G_1 &= \text{AgPAQ integrated course participants} \\
G_2 &= \text{AgEdS 450 comparison group participants} \\
G_3 &= \text{Agronomy 356/English 309 integration participants} \\
G_4 &= \text{Agronomy 356 stand-alone course participants} \\
G_5 &= \text{AgPAQ paid volunteer group} \\
G_6 &= \text{Non-AgPAQ paid volunteer group}
\end{align*}
\]
**Hypothesis 1 [oral communication: AgPAQ, AgEdS 450]**

Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of oral communication skills than will students who participated in the AgEdS 450 course.

To test this hypothesis, the Nonequivalent Control Group Design (Campbell & Stanley, 1963) was used. The design looks like this:

\[
\begin{array}{c}
(G_1) & O_1 & X_1 & O_2 \\
(G_2) & O_3 & — & O_4 \\
\end{array}
\]

The treatment \((X_1)\) consisted of the AgPAQ integrated course cluster instruction and experiences in 2004 and 2005. The pretest for the experimental AgPAQ group (denoted by \(G_1\)) consisted of students’ scores on a 15-minute oral presentation (prospective client report) to the AgPAQ instructors. For the comparison group (2004 and 2005 AgEdS 450 Farm Management class, denoted by \(G_2\)), the pretest consisted of students’ scores on a 5–10-minute oral presentation titled “State of the Farm Report” to the AgEdS 450 Farm Management class and instructors. The pretest for both groups occurred during the third week of the 16-week-long fall term. The posttest for both groups was a presentation done in the 14\(^{th}\) week of the fall term. The posttest for the experimental AgPAQ group consisted of students’ scores on a 15-minute oral presentation (farm plan report) to the AgPAQ instructors, and the posttest for the comparison group consisted of students’ scores on a 15-20 minute oral presentation titled “Strategic Issues of the Farm” to the AgEdS 450 Farm Management class and instructors.

Experimental and comparison group individual pretest and posttest oral presentations were videotaped and subsequently evaluated by experts in oral communication. To minimize
bias, the evaluators had no association with AgPAQ. The evaluators used the assessment criteria identified on the Group Oral Communication Rubric (Barnett, 2006), a modified version of the Oral Communication Rubric (2000) developed by faculty in the Educational Leadership and Policy Studies (ELPS) department at ISU. The Group Oral Communication Rubric was used to determine scores on the pretest/posttest. The evaluators attended a required session where they were trained to use the rubric and tally scores of each oral communication assignment.

A threat to internal validity from the interaction of selection and maturation was controlled by selecting a comparison group that had participants with characteristics (e.g., completion of required courses and agriculture background) similar to those of participants in the treatment group in an attempt to establish a degree of equivalence and maturation consistency between the two groups. Additionally, interaction between selection and regression was controlled because groups were not chosen according to extreme scores on any measures associated with the dependent variable.

**Hypothesis 2 [written communication: AgPAQ, AgEdS 450]**

Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of written communication skills than will students who participated in the AgEdS 450 course.

To test this hypothesis, the Nonequivalent Control Group Design (Campbell & Stanley, 1963) was used. The design looks like this:

\[
\begin{align*}
(G_1) & \quad O_1 \quad X_1 \quad O_2 \\
(G_2) & \quad O_3 \quad \quad \quad O_4
\end{align*}
\]
The treatment ($X_1$) consisted of the 2004 and 2005 AgPAQ integrated course cluster instruction and experiences. The pretest for the experimental AgPAQ group (denoted by $G_1$) consisted of students’ scores on a written assignment (prospective client report) that students were assigned in Dr. David Roberts’s English 311X class. For the comparison group (2004 and 2005 AgEdS 450 Farm Management class - denoted by $G_2$), the pretest consisted of students’ scores on a written report titled “The State of the Farm Report” that students were assigned in the AgEdS 450 Farm Management class. The pretest for both groups occurred during the third week of the fall term. The posttest for the experimental AgPAQ group ($G_1$) was the final recommendation report developed for the client. The comparison group ($G_2$) submitted a strategic issues written report as assigned by Dr. Chuck Steiner, instructor of the AgEdS 450 class. This was used as the posttest. The posttests for both groups were finished by the 14th week of the fall term and were scored by external evaluators.

Experimental and comparison group individual pretest and posttest documents were evaluated by individuals who were experienced in the area of written communication and who had no association with AgPAQ. This helped minimize bias in the event that the raters were familiar with the activities and procedures in the AgPAQ integrated course cluster. The evaluators used the assessment criteria identified on the Written Communication Assessment Rubric (Barnett, 2006), a modified version of the Written Communication Rubric (2000) developed by faculty in the Educational Leadership and Policy Studies (ELPS) department at ISU. The Written Communication Assessment Rubric was used to determine scores on the pretest/posttest. The evaluators attended a required session where they were trained to use the rubric and tally scores of each written assignment.
A threat to internal validity from the interaction of selection and maturation was controlled by selecting a comparison group that had participants with characteristics (e.g., completion of required courses and agriculture background) similar to those of participants in the treatment group to establish a degree of equivalence and maturation consistency between the two groups. Additionally, interaction between selection and regression was controlled because groups were not chosen according to extreme scores on any measures associated with the dependent variable.

**Hypothesis 3 [written communication: AgPAQ, Agronomy 356, 356/309 integration, paid non-AgPAQ]**

Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of written communication skills compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.

To test this hypothesis, a Modified Static-Group Comparison Design (Campbell & Stanley, 1963) was used. The research design looks like this:

\[(G_1) \quad \quad \quad \quad X_1 \quad O_1\]
\[(G_3) \quad \quad \quad \quad X_2 \quad O_2\]
\[(G_4) \quad \quad \quad \quad X_3 \quad O_3\]
\[(G_6) \quad \quad \quad \quad X_4 \quad O_4\]

The treatment \((X_1)\) consisted of the 2004 and 2005 AgPAQ integrated course cluster instruction and experiences. The treatment \((X_2)\) consisted of the Agronomy 356/English 309 integrated course cluster instruction and experiences offered in 1999, 2000, and 2002. The treatment \((X_3)\) consisted of the Agronomy 356 course instruction and experiences offered in 1996, 1997, and 2003. The posttest for the experimental AgPAQ group (denoted by \(G_1\))
group occurred during the 14th week of the fall term and consisted of students’ scores on a written assignment (recommendation report – denoted by O₁) that the students were assigned in Dr. Tom Polito’s Agronomy 356 class, one of the courses in the integrated course cluster in 2004 and 2005.

For the Agronomy 356 stand-alone course participants (second comparison group – denoted by G₄), the posttest occurred during the 14th week of the fall term and consisted of student’s scores on a written assignment (recommendation report - denoted by O₃) that students produced for Dr. Tom Polito’s Agronomy 356 class in 1996, 1997, and 2003. For the Agronomy 356/English 309 integration participants (third comparison group – denoted by G₃), the posttest occurred during the 14th week of the fall term and consisted of students’ scores on a written assignment (recommendation report - denoted by O₂) that students produced in 1999, 2000, and 2002.

The treatment (X₄) consisted of the 2004 and 2005 AgPAQ integrated course cluster instruction and experiences. The paid non-AgPAQ volunteer group (G₆) investigated a professional work-based agricultural problem based on a problem based on the needs of the client, a local farmer. The group was given data from the investigation of the farmer’s problem and was instructed to use that data to compile and submit recommendation reports (O₄) at the end of a ten-week period.

Documents were evaluated by individuals who were experienced in the area of written communication and who had no association with AgPAQ. This helped minimize bias in the event that the raters were familiar with the activities and procedures in the AgPAQ integrated course cluster. The evaluators used the assessment criteria identified on the Written Communication Assessment Rubric (Barnett, 2006), a modified version of the Written
Communication Rubric (2000) developed by faculty in the Educational Leadership and Policy Studies (ELPS) department at ISU. The Written Communication Assessment Rubric was used to determine scores on the pretest/posttest. The evaluators attended a required session where they were trained to use the rubric and tally scores of each written assignment.

Because each group was not formed by random selection, an internal validity concern may arise. This was controlled by selecting comparison groups that had participants with characteristics similar to those of participants in the treatment group in an attempt to establish a degree of equivalence and maturation consistency between the two groups. The participants self-selected by volunteering for the project.

Experimental mortality may have been a problem if participants in the experimental or control group dropped out of the study, missed posttesting, or were absent during some class sessions. Specific records were gathered for each group regarding these extraneous variables; this factor, however, was not an issue.

It is also possible that participants may have improved simply because of their natural growth and maturity rate. Because students might become more self-confident, cognitively able, or more independent as a result of the AgPAQ integrated course cluster, a comparison group was used.

There also may have been some diffusion, a phenomenon that occurs when participants in the groups communicate to each other the dynamics of the groups to which they belong. For example, AgPAQ students might have discussed their work with students from the comparison group. This was unlikely to happen because students were not told by the researcher and project staff of each other’s participation within the different groups.
Hypothesis 4 [technical content: AgPAQ, Agronomy 356, 356/309 integration, paid non-AgPAQ]

Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of technical content knowledge compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.

To test this hypothesis, a Modified Static-Group Comparison Design (Campbell & Stanley, 1963) was used. The research design looks like this:

\[ (G_1) \quad \text{---} \quad X_1 \quad O_1 \]
\[ (G_3) \quad \text{---} \quad X_2 \quad O_2 \]
\[ (G_4) \quad \text{---} \quad X_3 \quad O_3 \]
\[ (G_6) \quad \text{---} \quad X_4 \quad O_4 \]

The treatment \((X_1)\) consisted of the 2004 and 2005 AgPAQ integrated course cluster instruction and experiences. The treatment \((X_2)\) consisted of the Agronomy 356/English 309 integrated course cluster instruction and experiences offered in 1999, 2000, and 2002. The treatment \((X_3)\) consisted of the Agronomy 356 course instruction and experiences offered in 1996, 1997, and 2003. The posttest for the experimental AgPAQ group (denoted by \(G_1\)) group occurred during the 14\(^{th}\) week of the fall term and consisted of students’ scores on a written assignment (recommendation report – denoted by \(O_1\)) that the students were assigned in Dr. Tom Polito’s Agronomy 356 class, one of the courses in the integrated course cluster in 2004 and 2005.

For the Agronomy 356 stand-alone course participants (second comparison group – denoted by \(G_4\)), the posttest occurred during the 14\(^{th}\) week of the fall term and consisted of students’ scores on a written assignment (recommendation report - denoted by \(O_3\)) that
students produced for Dr. Tom Polito’s Agronomy 356 class in 1996, 1997, and 2003. For
the Agronomy 356/English 309 integration participants (third comparison group—denoted
by G3), the posttest occurred during the 14th week of the fall term and consisted of students’
scores on a written assignment (recommendation report - denoted by O2) that students

The treatment (X4) consisted of the 2004 and 2005 AgPAQ integrated course cluster
instruction and experiences. The paid non-AgPAQ volunteer group (G6) investigated a
professional work-based agricultural problem intended to address the needs of a local farmer.
The group was given data from the investigation of the farmer’s problem and was instructed
to use that data to compile and submit recommendation reports (O4) at the end of a ten-week
period.

Documents were evaluated by individuals who were experienced in the area of technical
content within the written reports, and was performed by a group of people who had no
association with AgPAQ, which helped minimize bias in the event that raters were familiar
with the activities and procedures in the AgPAQ integrated course cluster. This group of
evaluators, comprised of agronomic and economic experts, used the assessment criteria
identified on the Technical Content Assessment Rubric (Gibson, Polito, Kliebenstein,
Roberts, & Barnett, 2006). The evaluators attended a required session where they were
trained to use the rubric and tally scores of each written assignment as it pertained to the
technical content.

Because the groups were not formed by random selection, internal validity concerns were
controlled by establishing control groups of participants with characteristics and experiences
that were similar to the participants in the treatment group to establish a degree of
equivalence and maturation consistency between the two groups. The participants self-selected by volunteering for the project.

Experimental mortality may have been a problem if participants in the experimental or control group dropped out of the study, missed posttesting, or were absent during class. Specific records were gathered for each group regarding these extraneous variables; this factor, however, was not an issue.

It is also possible that participants may have improved simply because of their natural growth and maturity rate. Because students might become more self-confident, cognitively able, or more independent as a result of the AgPAQ integrated course cluster, a comparison group was used.

There also may have been some diffusion, a phenomenon that occurs when participants in the groups communicate to each other the dynamics of the groups to which they belong. For example, AgPAQ students might have discussed their work with students from the comparison group. This was unlikely to happen because students were not told by the researcher and project staff of each other’s participation within the different groups.

**Hypothesis 5 [problem-solving: AgPAQ, AgEdS 450]**

Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of problem-solving skills compared to students who participated in the AgEdS 450 course.

To test this hypothesis, the Nonequivalent Control Group Design (Campbell & Stanley, 1963) was used. The design looks like this:

\[
(G_1) \quad O_1 \quad X_1 \quad O_2
\]
The treatment \((X_1)\) consisted of the 2004 and 2005 AgPAQ integrated course cluster instruction and experiences. The pretest \((O_1)\) and posttest \((O_2)\) consisted of students’ scores on the Problem-Solving Inventory (PSI) (CCP, Inc., 1988). The experimental AgPAQ group (denoted by \(G_1\)) was administered the test in Dr. Lance Gibson’s Agronomy 312X class during the first week of the fall term. The comparison group (AgEdS 450 Farm Management class - denoted by \(G_2\)) was administered the pretest \((O_3)\) in the AgEdS 450 class during the third week of the fall term. The posttest \((O_4)\) was conducted during the 14th week of the fall term. The PSI was hand-scored by the research assistant associated with this study, Cynthia Barnett.

Pretest and posttest scores were gathered from students after they completed the Parker Team Player Survey (PTPS) (CPP, Inc., 2003) at the beginning of the semester and again at the conclusion of the semester. Students in the experimental AgPAQ group (denoted by \(G_1\)) were administered the pretest \((O_1)\) in Dr. Dave Roberts’s English 311X class during the first week of the fall term. Control group participants (AgEdS 450 Farm Management class - denoted by \(G_2\)) were administered the pretest \((O_3)\) in the AgEdS 450 Farm Management class during the second week of the fall term. The posttests \((O_2 & O_4)\) were given separately to both groups during the 14th week of the fall term.

A threat to internal validity from the interaction of selection and maturation was controlled by selecting a control group that had participants with characteristics similar to those of participants in the treatment group in an attempt to establish a degree of equivalence and maturation consistency between the two groups. Additionally, interaction between
selection and regression was controlled because groups were not chosen according to extreme scores on any measures associated with the dependent variable.

**Hypothesis 6 [written communication, technical content: paid AgPAQ, paid non-AgPAQ]**

A self-selected paid group of past participants from the AgPAQ integrated course cluster will attain higher written communication scores and technical content knowledge scores when solving a multidisciplinary problem compared to a self-selected paid volunteer group of students who did not participate in the AgPAQ integrated course cluster.

To test this hypothesis, the Static-Group Comparison Design (Campbell & Stanley, 1963) was used. The design looks like this:

\[
\begin{align*}
(G_5) & \rightarrow X_1 \rightarrow O_1 \\
(G_6) & \rightarrow \quad \rightarrow O_2
\end{align*}
\]

The treatment \((X_1)\) consisted of the 2004 and 2005 AgPAQ integrated course cluster instruction and experiences. Both the experimental AgPAQ sub-group (denoted by \(G_5\)) and comparison group (paid volunteer group that is denoted by \(G_6\)) investigated a professional work-based agricultural problem based on a problem that had actually been created based on the needs of a local farmer. The groups were given the data from the investigation of the farmer’s problem and were instructed to use that data to compile and submit recommendation reports \((O_1 \& O_2)\) at the end of a ten-week period.

A group of evaluators, comprised of agronomic and economic experts, assessed the recommendation reports according to the following technical content criteria as detailed in the Technical Content Rubric (Gibson, Polito, Kliebenstein, Roberts, & Barnett, 2006). These reviewers had no association with AgPAQ, which helped minimize bias in the event that reviewers were familiar with the activities and procedures in the AgPAQ integrated
course cluster. The evaluators were required to attend a training session where they were trained to use the rubric and tally scores of each written assignment. Scores derived from the rubric were used to rank the assignments from worst to best.

Because each group was not formed by random selection, an internal validity concern may arise. This was controlled by selecting comparison groups that had participants with characteristics similar to those of participants in the treatment group in an attempt to establish a degree of equivalence and maturation consistency between the two groups. The participants self-selected by volunteering for the project.

Experimental mortality may have been a problem if participants in the experimental or control group dropped out of the study, missed posttesting, or were absent during some class sessions. Specific records were gathered for each group regarding these extraneous variables; this, however, was not an issue.

It is also possible that participants may have improved simply because of their natural growth and maturity rate. Because students might become more self-confident, cognitively able, or more independent as a result of the AgPAQ integrated course cluster, a comparison group was used.

**Target Populations**

All students who participated in the AgPAQ integrated course clusters, the AgEdS 450 Farm Management class comparison groups, the paid volunteer groups, the Agronomy 356 stand-alone course, and the Agronomy 356/English 309 integration were students from the College of Agriculture at Iowa State University. The entire target population is represented by twelve different groups: the 2004 and 2005 AgPAQ integrated course cluster groups, the 2004 and 2005 AgEdS 450 Farm Management class comparison groups, the 2005 and 2006
paid volunteer groups, the 1996, 1997, and 2003 Agronomy 356 comparison groups, and the 1999, 2000, and 2002 Agronomy 356/English 309 integration groups. In fall 2004, the AgPAQ population size was 19. This section will provide an overview of the characteristics for each group that was involved in the study. Frequencies and percentages by group for gender, age, grade levels, areas of study, and beginning and ending grade point averages will be reported.

**Population Frequencies**

The population \((n = 33)\) for the AgPAQ groups was comprised of students who participated in the learning community during 2004 and 2005. The population \((n = 57)\) for the AgEdS 450 groups was comprised of students who participated in the comparison group during 2004 and 2005. The population \((n = 7)\) for the paid AgPAQ volunteer group and the population \((n = 14)\) for the paid non-AgPAQ volunteer group was comprised of students who participated in the paid group during 2005 and 2006. The population \((n = 36)\) for the Agronomy 356 group was comprised of students in the Agronomy 356 class during the years 1996, 1997, and 2003. The population \((n = 35)\) for the Agronomy 356/English 309 integration group was comprised of students who participated in the Agronomy 356/English 309 course integration during 1999, 2000, and 2002. The majority of the students in this study were between the ages 21–23. The mean age for the groups ranged from 21.76 to 23.33, while the standard deviations for the groups ranged from .93 to 7.10. All of the students who participated in this study were College of Agriculture students.
The following sections describe the characteristics by frequency of the each of the groups that generated data for the study. These characteristics include gender, age, grade level and study area.

**AgPAQ**

Table 2 provides a summary of frequencies for the AgPAQ integrated course cluster learning community, the treatment group in this study. In fall 2004, 19 students registered to participate in AgPAQ, and in the fall of 2005, 14 students registered to participate in AgPAQ. Both groups of students formally enrolled in the cluster as it was offered in the schedule of courses at Iowa State University. Within each self-selected target population, students were assigned to work groups. In fall 2004, there were four groups of four students and one group of three students. In fall 2005, there were two groups of four students and two groups of three students.

The population for this group is largely comprised of males, represented by 93.9% of the group, and 57.6% of the students were seniors. Almost 82% of the AgPAQ students were studying either Agronomy or Agricultural Studies.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percent</th>
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<tr>
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</tr>
<tr>
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<tr>
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<tr>
<td><strong>Grade Level</strong></td>
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<tr>
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<tr>
<td>Senior</td>
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<td><strong>Total</strong></td>
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</table>

**AgEdS 450**

The AgEdS 450 comparison group populations were divided into groups that addressed management issues on the AgEd 450 Farm. These issues included finances, swine management, machinery, marketing, public relations, building and grounds management, and crop management. Each student was given the opportunity to provide a rationale regarding which group they would like to be a part of as well as providing any past experiences or interests they may have had that would be an asset to a particular group. Group selection was determined by the rationale submitted by the students to the professor. In most instances, the students were assigned by the AgEdS 450 professor to their first or second choice of group.

In the 2004, the AgEdS 450 Farm Management class had 33 students; however, only 20 students signed informed consent documents (Appendix A). Of these 20 students, only 7 were in groups comprised of only students who had agreed to participate (2 students in one group, 5 in the other) as assigned by the AgEdS 450 instructor. The 13 other students were involved in groups that included students who did not consent to participate, so pretest and posttest data that were collected in those groups (oral communication, written communication, and technical content data) could not be used. All 20 students did, however, participate in the pretest and posttest measurements for individual problem-solving.
In 2005, the AgEdS 450 Farm Management class had 37 students; all 37 student signed informed consent documents and were assigned by the AgEdS 450 professor to seven different groups. Pretest and posttest data that was collected in groups (oral communication, written communication, and technical content data) and pretest and posttest measurements for individual problem-solving were collected for all 37 students.

Table 3 provides a summary of frequencies for the AgEdS 450 comparison group. Eighty-six percent of this group were male students, and 96.5% of the students were seniors.

The majority of the AgEdS 450 students (91.2%) were studying Agricultural Studies.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>AgEdS 450 Characteristics by Frequency</th>
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</thead>
<tbody>
<tr>
<td><strong>Characteristic</strong></td>
<td><strong>Frequency</strong></td>
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<td>Agricultural Education</td>
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<tr>
<td>Animal Science</td>
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</tr>
<tr>
<td>Total</td>
<td>57</td>
</tr>
</tbody>
</table>

College grade point averages (GPAs) were gathered for each of the AgPAQ and AgEdS 450 groups at the beginning of the semester and again at the end of the semester in 2004 and
2005. The grade point average at the beginning of the term for AgPAQ participants ranged from a low of 1.89 to a high of 3.94. Figure 3 provides a summary, showing the distribution for the beginning grade point averages for both AgEdS 450 and AgPAQ. In Figure 3, 30.3% of the AgPAQ participants have beginning grade point averages between 2.41 and 2.80. The AgPAQ distribution was skewed with a mean of 2.93 and a standard deviation of .57. The beginning grade point average for the AgEdS 450 participants ranged from a low of 1.66 to a high of 3.83 and 49.2% of the participants had beginning grade point averages between 2.21 and 2.80. The AgEdS 450 distribution was skewed with a mean of 2.70 and a standard deviation of .52 (Figure 3).

---

**Figure 3. Students’ Beginning Grade Point Averages – AgPAQ & AgEdS 450**

The final grade point averages for both the AgPAQ learning community and the AgEdS 450 group were gathered at the end of each semester in 2004 and 2005. The ending grade
point averages for AgPAQ ranged from a low of 2.00 to a high of 3.94 showing a slight increase in the lowest grade point average. Figure 4 shows that there was a fairly even distribution between the ending grade point averages of the AgPAQ participants with 30.3% of the participants having ending GPAs between 2.61 and 3.00. The AgPAQ distribution was skewed with a mean of 2.98 and a standard deviation of .55. The ending grade point averages for AgEdS 450 ranged from a low of 1.91 to a high of 3.84. Figure 4 shows that there was a fairly even distribution between the ending grade point averages of the AgEdS 450 participants and 28.1% of the participants had ending grade point averages between 2.61 and 3.00. The distribution was skewed with a mean of 2.74 and a standard deviation of .48 (Figure 4).

Figure 4. Students’ Ending Grade Point Averages – AgPAQ & AgEdS 450
Paid AgPAQ Volunteer Group

The paid AgPAQ volunteer group consisted of 3 paid volunteer students in spring 2005 and 4 paid volunteer students in spring 2006. All 7 students signed consent documents agreeing to participate in the study. Because the students volunteered and all of the students who volunteered were part of the group, the frequencies reported here reflect the actual sample; no effort was made to construct an ideal comparison group.

Table 4 provides a summary of frequencies for the paid AgPAQ volunteer group. All of the students in this group were males. Distribution between junior and senior students was about equal while over 57% were studying Agronomy.

Table 4
Paid AgPAQ Volunteer Group Characteristics by Frequency

<table>
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<th>Characteristic</th>
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</tr>
<tr>
<td>Total</td>
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</tr>
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</table>
**Paid Non-AgPAQ Volunteer Group**

The paid non-AgPAQ volunteer group consisted of 8 paid volunteer students in spring 2005 and 6 paid volunteer students in spring 2006. All 14 students signed consent documents agreeing to participate in the study. Because the students volunteered and all of the students who volunteered were part of the group, the frequencies reported here reflect the actual sample; no effort was made to construct an ideal comparison group.

Table 5 provides a summary of frequencies of for the paid non-AgPAQ volunteer group. The population of this group was comprised of 71.4% males. A little over 57% of the students were seniors, and the majority of the students in the group were studying Agronomy.

**Table 5**
*Paid Non-AgPAQ Volunteer Group Characteristics by Frequency*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>71.4</td>
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<td>42.9</td>
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<tr>
<td>Senior</td>
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<td>57.1</td>
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<tr>
<td>Total</td>
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<tr>
<td><strong>Study Area</strong></td>
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<tr>
<td>Agronomy</td>
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<td>57.1</td>
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<tr>
<td>Agricultural Studies</td>
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<td>23.8</td>
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<tr>
<td>Agricultural Business</td>
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<td>19.0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100.0</td>
</tr>
</tbody>
</table>

College grade point averages (GPAs) were gathered for each of the paid volunteer groups (N = 21) at the beginning of the semester and again at the end of the spring semesters in 2005 and 2006. This group comprised of 7 students who had participated in AgPAQ in previous
years, and fourteen students who came from similar backgrounds but did not participate in the learning community. Figure 5 shows a comparison of GPAs between the paid non-AgPAQ volunteer group participants and the paid AgPAQ volunteer group participants. Two students had GPAs of 0.00 because they were new transfer students. The distribution was skewed with a mean of 2.59 and a standard deviation of 1.24. The beginning GPAs for the AgPAQ participants were distributed with 42.9% of the students having GPAs over 3.71. The distribution was skewed with a mean of 3.41 and a standard deviation of .44 (Figure 5).

Figure 5. *Paid Volunteer Students’ Beginning Grade Point Averages by Group*

Figure 6 shows a summary for the final grade point averages for the paid volunteer groups at the end of the spring semesters in 2005 and 2006. The ending grade point averages for the paid non-AgPAQ participants ranged from a low of 2.10 to a high of 4.00 with 35.5% of the participants having grade point averages between 3.36 and 4.00. The mean was 2.94
and the standard deviation was .62. The ending GPAs for the AgPAQ participants in the paid group ranged from a low of 2.64 to a high of 3.76 with 57.2% of the participants having grade point averages between 3.50 and 3.76. The mean was 3.43 and the standard deviation was .40 (Figure 6).

![Figure 6. Paid Volunteer Students’ Ending Grade Point Averages by Group](image)

**Figure 6.** Paid Volunteer Students’ Ending Grade Point Averages by Group

**Agronomy 356**

Table 6 provides a summary of frequencies for the Agronomy 356 group characteristics.

As noted, the majority of the Agronomy 356 students were male seniors studying Agronomy.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>71.4</td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>28.6</td>
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<tr>
<td>Total</td>
<td>14</td>
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</tbody>
</table>
College grade point averages were gathered from the registrar for each of the Agronomy 356 classes at the beginning of the semester and again at the end of the semester 1996, 1997, and 2003. The grade point average at the beginning of the term ranged from a low of 1.44 to a high of 3.81. Figure 7 shows the distribution for the beginning grade point averages, with 50% of the participants having beginning grade point averages between 2.41 and 3.00. The distribution was skewed, with a mean of 2.69 and a standard deviation of .59 (Figure 7).
Figure 7. Agronomy 356 Students’ Beginning Grade Point Averages

Figure 8 provides a visual of the final grade point averages (GPAs) of the Agronomy 356 classes gathered at the end of each semester in 1996, 1997, and 2003. The GPAs ranged from a low of 1.27 to a high of 3.84. Figure 8 shows there was a fairly normal distribution between the ending grade point averages of the learning community and comparison group participants, 38.9% of the participants had ending grade point averages between 2.41 and 2.80. The distribution was skewed with a mean of 2.76 and standard deviation of .57 (Fig. 8).
Agronomy 356/English 309 Integration

Table 7 provides a summary of frequencies for the Agronomy 356/English 309 group characteristics. As indicated in the table, 91.4% of the students in the Agronomy 356/English 309 integration were male seniors studying Agronomy.

Table 7
Agronomy 356/English 309 Integration Group Characteristics by Frequency

<table>
<thead>
<tr>
<th>Characteristic</th>
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<tr>
<td>Total</td>
<td>35</td>
<td>100.0</td>
</tr>
</tbody>
</table>
College grade point averages were gathered for each of the Agronomy 356/English 306 integration classes at the beginning of the semester and again at the end of the semester in 1999, 2000, and 2002. The grade point average at the beginning of the term ranged from a low of 0.00 (two students had GPAs of 0.00 because they were new transfer students) to a high of 3.83. Figure 9 shows the distribution for the beginning grade point averages, with 20% of the participants having beginning grade point averages between 2.61 and 2.80. The distribution was skewed with a mean of 2.73 and a standard deviation of .72 (Figure 9).
Figure 9. *Agronomy 356/English 309 Students’ Beginning Grade Point Averages*

Figure 10 shows the final grade point averages of the Agronomy 356/English 309 integration gathered at the end of each semester in 1999, 2000, and 2002. The grade point average ranged from a low of 1.94 to a high of 3.82. The distribution was skewed with a mean of 2.83 and a standard deviation of .50 (Figure 10).
Figure 10. *Agronomy 356/English 309 Students’ Ending Grade Point Averages*

Reports from students who participated in the Agronomy 356/English 309 integration in 1999, 2000, and 2002 were also used. In 1999, 9 students working in 3 groups produced 3 reports. In 2000, 10 students working in 3 groups produced 3 reports. In 2002, 16 students working in 5 groups produced 5 reports. The students from these three classes of the Agronomy 356/English 309 integration (35 students), working in 11 groups, produced a total of 11 reports that were also used as comparison data.

**Instruments**

The instruments used in this study included the Problem-Solving Inventory (PSI) (Heppner, 1988) and three rubrics that measured performance on written communication, oral communication, and technical content knowledge.
**Problem-Solving Inventory**

The Problem-Solving Inventory (PSI) (Heppner, 1988) is a 35-item instrument for assessing self-perceived problem-solving skills and measuring perceived problem-solving abilities. The PSI is a self-administered, paper-and-pencil test that the participants completed in approximately 15 minutes. The test is composed of three scales that measure an individual's confidence in problem-solving abilities, tendency to approach or avoid problem situations, and degree of personal control of emotions and behavior. A total score is obtained by summing the scores on the three scales. Each item statement is rated by the student on a Likert-type range from 1 (Strongly Agree) to 6 (Strongly Disagree). Equal numbers of positively and negatively worded items in the inventory prevent response bias. Low scores are associated with a positive self-appraisal of problem-solving skills.

Heppner (1988) reports that the test-retest reliability measures for the three scales and the total PSI score ranged from .83 to .88 across 2 weeks, from .77 to .81 for another sample tested over 3 weeks, and from .44 to .65 for a third sample tested after a 2-year period. Alpha coefficients for the three scales and the total score ranged from .72 to .91 across three independent samples (Heppner). Most data on test-retest reliabilities and other psychometric properties of the instrument were collected from university students.

Heppner discusses how “estimates of concurrent, discriminant, and construct validity” were established (p. 10). For concurrent validity, “the three [PSI] scale scores and the Total PSI score were correlated with students’ ratings of their level of problem-solving skills and their perceived level of satisfaction with their skills” (p. 10). Discriminant validity was established by correlating the PSI with SCAT Series II, SAT Total, Verbal, and Math scores, Missouri College English Test scores, Missouri Mathematics Placement Test scores, and
high school rank (p. 10–11). Construct validity was estimated by comparing the PSI with other instruments such as the Myers-Briggs Type Indicator™, Unusual Uses Activity Scale, Means-Ends Problem-Solving Procedure, and Rotter Internal-External Locus of Control Scale (p. 11).

**Written Communication Assessment Rubric**

The Written Communication Assessment Rubric (Barnett, 2006) (Appendix B) is a modified version of the Written Communication Rubric that was developed by the Educational Leadership & Policy Studies (ELPS) department at Iowa State University. According to Huba and Freed (2000), a rubric is an assessment tool that “explains to students the criteria against which their work will be judged… [and] makes public key criteria that students can use in developing, revising, and judging their work.” However, in this study, the Written Communication Assessment Rubric (Barnett, 2006) was not shared with the students, but instead was used by the trained experts.

Inter and intrarater-reliability for the Written Communication Assessment Rubric was conducted by utilizing a test-retest approach. Nine experts performed an evaluation using the rubric to determine a score on the written communication pieces. After two weeks, the same evaluators conducted another evaluation of the same data using the same rubric. A correlation of the test/retest scores yielded a Pearson test-retest interrater reliability coefficient of .83, indicating strong retest reliability. A correlation of the test/retest scores yielded a Pearson test-retest intrarater reliability coefficient of .28, indicating low retest reliability. The alpha coefficient for internal consistency within the rubric was .92, indicating strong internal consistency as noted by Cronbach (1951). To report internal consistency results, the researcher used first round data because 4 weeks elapsed between the training and
the second round of scoring, and the researcher felt that the first round of rating data may be more reliable.

Five communication experts determined the validity for the Written Communication Assessment Rubric. All were staff or faculty members at Iowa State University at the time of the study. Face and content validity procedures were conducted to determine “the extent to which an instrument measures what it is supposed to measure” (Wiersma, 2000, p. 299). The panel of experts was asked to perform a two-round evaluation of the rubric to verify that the instrument contained the correct criterion to accurately measure elements of written communication. In addition, the experts were asked to determine if the tool would measure what the researchers claimed it would measure. At the conclusion of the 2nd round of the evaluation, it was determined by 80% (4 out of 5) of the experts that the tool was face and content valid.

The rubric includes 5 criteria: content, development, organization, sentence structure (grammar, spelling, and mechanics), and style (voice, tone, and word choice). A four-level, Likert-type range was used for scoring. Each level was given a numeric value for statistical analysis: 3 = exemplary, 2 = proficient, 1 = marginal, and 0 = unacceptable.

**Group Oral Communication Rubric**

The oral communication assessment was completed by a group of five professionals who have experience in oral communication. They used the Group Oral Communication Rubric (Barnett, 2006) (Appendix C), a modified version of the Oral Communication Rubric developed by faculty in the ELPS department at ISU in 2000.

The rubric includes 6 criteria: organization, style (verbal and non-verbal), content (depth and accuracy), oral language conventions (use of language and grammar and word choice),
group interaction (responsiveness to audience and body language), and use of communication aids. A four-level, Likert-type range was used for scoring. Each level was given a numeric value for statistical analysis: 3 = exemplary, 2 = proficient, 1 = marginal, and 0 = unacceptable.

Reliability for the Group Oral Communication Rubric was determined by utilizing a test-retest approach. Fifteen experts performed an evaluation using the rubric to determine a score of the oral communication data. After two weeks, the same evaluators conducted another evaluation of the same data using the same rubric. A correlation of the test/retest scores yielded a Pearson test-retest interrater reliability coefficient of .89, indicating strong retest reliability. A correlation of the test/retest scores yielded a Pearson test-retest intrarater reliability coefficient of .46, indicating weak retest reliability. The alpha coefficient for internal consistency within the rubric was .90, indicating strong internal consistency as noted by Cronbach (1951). To report internal consistency results, the researcher used first round data. This was done due to the fact that 4 weeks lapsed between the training and the second round of scoring, and the researcher felt that the first round of rating data may be more reliable.

Five communication experts determined the validity for the Group Oral Communication Rubric. All were staff or faculty members at Iowa State University at the time of the study. Face and content validity procedures were conducted to determine “the extent to which an instrument measures what it is supposed to measure” (Wiersma, 2000, p. 299). The panel performed a two-round evaluation of the rubric to verify that the instrument contained the correct criterion to accurately measure elements of oral communication. In addition, the experts were asked to determine if the tool would measure what the researchers claimed it
would measure. At the conclusion of the 2nd round of the evaluation, 100% of the experts
determined that the tool was face and content valid.

**Technical Content Assessment Rubric**

The Technical Content Assessment Rubric (Gibson, Polito, Kliebenstein, Roberts, &
Barnett, 2006) (Appendix D) includes thirteen criteria: identification of problem and
formulation of questions, conceptual framework, soil sampling, nutrient recommendations,
drainage, soil conservation, geographic information system and mapping, crop management,
analysis and interpretation of data gathered, farm records, budgets, and economic
management recommendations. These criteria were developed to determine if the: 1) client’s
problems/opportunities were clearly stated; 2) suggested recommendations were supported
by sound agronomy principles, include correct calculations, and were economically feasible
for the client; 3) report was appropriately tailored to the client audience; and 4) report
recommendations took into account environmental impact and social acceptability. A four-
level, Likert-type range was used for scoring. Each level was given a numeric value for
statistical analysis: 3 = exemplary, 2 = proficient, 1 = marginal, and 0 = unacceptable.

Reliability for the Technical Content Assessment Rubric was conducted by utilizing a
test-retest approach. Fifteen experts performed an evaluation using the rubric to determine a
score for the reports of the paid volunteer groups. After two weeks, the same evaluators
conducted another evaluation of the same data using the same rubric. A correlation of the
test/retest scores yielded a Pearson test-retest interrater reliability coefficient of .75,
indicating moderately strong retest reliability. A correlation of the test/retest scores yielded a
Pearson test-retest intrarater reliability coefficient of .78, indicating moderately strong
reliability. The alpha coefficient for internal consistency within the rubric was .88 as noted
by Cronbach (1951). To report internal consistency results, the researcher used first round data. This was done due to the fact that 4 weeks lapsed between the training and the second round of scoring, and the researcher felt that the first round of rating data may be more reliable. Validity for the Technical Content Assessment Rubric was conducted by a panel of five technical content experts in agronomy or economics. Two economic experts were faculty members at Iowa State University, and are teaching in the agricultural economics field. The three other experts were agronomy faculty members at South East Missouri State, Illinois State University, and Iowa State University, and are teaching in the agronomy field.

Face and content validity procedures were conducted to determine “the extent to which an instrument measures what it is supposed to measure” (Wiersma, 2000, p. 299). The panel of experts was asked to perform a two-round evaluation of the rubric to verify that the instrument contained the correct criteria to accurately measure elements of agronomic/economic technical content. In addition, the experts were asked to determine if the tool would measure what the researchers claimed it would measure. At the conclusion of the 2nd round of the evaluation, it was determined by 100% of the experts that the tool was face and content valid.

**Evaluator Training**

A session was designed to train evaluators to score data with, and to help them understand, the corresponding rubric which they would be utilizing. For the evaluators to have a working knowledge of the rubrics, it was required for them to attend the training and participate in a group learning environment.

Training included a facilitator, who was familiar with the training materials, teaching about rubric essentials and the design and organization of a rubric. These parts included
discussing the definition of the term “rubric,” talking about the purpose of a rubric and what the rubric should help an evaluator do. In addition, a discussion about the working parts of a rubric—levels of mastery with scoring scale, dimension groups and quality characteristics—was conducted. Lesson plans and visual aids (Appendix E) were developed to provide the evaluators an outline of pertinent information to be delivered during the training. Once the initial training was complete, the group was asked to split into their corresponding evaluator groups—written communication, oral communication, or technical content—and meet in their designated rooms. Evaluators were then asked to independently read a written report or view an oral presentation, after which the evaluators had 30 minutes to independently score the data with the corresponding rubric.

Once the independent evaluation was complete, participants were called together by the facilitator. A group discussion regarding the results took place and a technique called “consensus decision-making” was implemented. Crow (2002) defines the procedure of consensus decision-making as a process that fully utilizes the resources of a group. It is more difficult and time consuming to reach than a democratic vote or an autocratic decision. Most issues will involve trade-offs and the various decision alternatives will not satisfy everyone. Complete unanimity is not the goal - that is rarely possible. However, it is possible for each individual to have had the opportunity to express their opinion, be listened to, and accept a group decision based on its logic and feasibility considering all relevant factors. This requires the mutual trust and respect of each team member. (n.p.) For the purposes of the training, the system used to implement consensus decision-making meant constructing a matrix on a dry erase board listing each evaluator’s score for each
criteria used on the rubric. If the scores were equal across all evaluators, then the facilitator would move to the next criterion. In the event that the evaluators did not agree on a particular criterion within a dimension group, the facilitator would initiate a discussion from the evaluation panel, exploring all comments and suggestions to help the evaluators review the data consistently once asked to work on their own. Once a consensus was reached regarding that specific criterion, the facilitator would move down the list until all of the data was completely covered by the group.

Upon the conclusion of the consensus discussion, the facilitator handed each evaluator a packet that included their randomly assigned data and enough corresponding rubrics to evaluate all of the data. The evaluation panel was asked to complete the packet in 2 weeks, at which point they would receive another packet to evaluate in another 2 weeks time.

**Testing Conditions**

At the beginning of their first lecture period of each fall semester (2004 & 2005) during the study, students in the AgPAQ integrated course cluster were presented with an overview of the integrated course cluster study. They were then asked to sign a consent form to participate in the study. All students agreed to participate.

The AgEdS 450 students were also given an overview about the study by their course instructor in the fall terms of 2004 and 2005. The students had the option to participate and were asked to sign a consent form if they agreed to participate. In 2004, 20 students agreed to participate, and in 2005, 37 students agreed.

Participants in both groups completed the PSI and the PTPS measurement during class in the first week of the fall term. During the time the tests were being administered, the researcher kept a log of unusual events; no unusual events occurred.
The PSI was a self-administered test given in a group format. The written directions on the instrument were clear, but the print on the instrument was small and may have presented problems for individuals with impaired vision. Copies with larger print were available in case they were needed. The test items cover the front and back of a single 8 ½ x 11 inch page, and respondents circled a number (1-6) next to each statement. Respondents were given 15 minutes to complete the instrument.

The Treatment Group

This section describes AgPAQ, the treatment group, in terms of its learning community model features, the courses that made up the four-course integrated course cluster learning community, and the approaches used by instructors of these courses to form the community, are also discussed.

AgPAQ Learning Community Model Features

The AgPAQ learning community included several features from four of the five main types of learning communities discussed in more detail in Chapter 2. The four types of learning communities that share common features with the AgPAQ learning community are Linked Courses, Integrated Course Clusters, Freshman Interest Groups, and Coordinated Studies. The fifth kind of learning community model, the Federated Learning Community model does not share any common features with the AgPAQ learning community. Table 8 shows the common features of each of the four types of learning communities related to the features of the AgPAQ learning community.
Table 8  
*AgPAQ Characteristics*

<table>
<thead>
<tr>
<th>AgPAQ Characteristics</th>
<th>Types of Learning Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centered on an interdisciplinary project theme</td>
<td>Integrated Course Cluster, Freshman Interest Groups, Coordinated Studies</td>
</tr>
<tr>
<td>Cluster of courses comprised students’ complete course schedule and load</td>
<td>Integrated Course Cluster</td>
</tr>
<tr>
<td>Cohort of students was established</td>
<td>Integrated Course Cluster</td>
</tr>
<tr>
<td>Coordinated syllabi</td>
<td>Linked Course, Integrated Course Cluster</td>
</tr>
<tr>
<td>Extensive planning</td>
<td>Linked Course, Integrated Course Cluster, Coordinated Studies</td>
</tr>
<tr>
<td>Field trips, hands-on activities</td>
<td>Linked Course</td>
</tr>
<tr>
<td>Integrative assignments</td>
<td>Linked Course, Integrated Course Cluster, Coordinated Studies</td>
</tr>
<tr>
<td>Three courses are integrated with a skill building course, in this case, English</td>
<td>Linked Course, Integrated Course Cluster</td>
</tr>
</tbody>
</table>

*AgPAQ Course Description and Information*

In order to participate in the AgPAQ learning community, students must have enrolled in four courses together totaling 14 credits. Students also had the option to take an additional course outside the learning community if they desired (Gibson, 2004). The AgPAQ learning community was offered during the fall semester. In each course, students addressed the problems of an area farmer and learned how to take a multidisciplinary approach to the client's problems. On the AgPAQ website, http://www.agron.iastate.edu/courses/agpaq/Course_Descriptions.htm, Gibson (2004) provided the following descriptions for each of the courses that comprise the learning community:

- **Agronomy 312X - Crop Management Decision Making**

  Development of solutions to crop management problems in consultation with a producer-client. The first nine weeks will focus on identification of client's needs, gathering technical information, and instruction in the use of geographic information
systems as a tool for making crop management decisions. The latter part of the course will be used to develop and present solutions for crop management issues confronting the client. Emphasis will be placed on identifying and solving complex problems that require integration of biological, physical, chemical, and economic components within a crop management system.

- **Agronomy 356 - Soil, Fertilizer, & Water Management**

  *Prereq:* Agronomy 354, Recommended Agronomy 114. Nutrient management principles from determining nutrient needs to supplying nutrients from mineral and organic sources. Soil environment changes between various tillage systems and their impact on crop management decisions are studied. Students evaluate the client's tillage system with respect to soil loss using the universal soil loss equation. Legal and social obligations concerning nutrient management, soil conservation and soil drainage are stressed throughout the course.

- **Economics 330 - Farm Business Management**

  *Prereq:* Economics 101. Business and financial analysis of the farm operation. Production information developed in the other courses in the cluster will be used in the analysis. Students will prepare cost and return budgets for the enterprises produced on the farm. Cash flow will be developed to reflect the operation. Additionally, students will analyze the financial position of the operation and look at alternative business structure arrangements. AGPAQ students must enroll in the course section designated for the AgPAQ learning community.

- **English 311X - Professional Communication in Agriculture**
Prereq: English 105. Written, oral, and visual communication in agriculture, agronomy, and agricultural business. Genres covered will include consulting proposals, fact sheets, business presentations, and analytical reports. Students will be introduced to the rhetorical foundations of professional communication and will design, develop, and deliver a series of communications to an actual client. There will be significant emphasis on collaborative problem-solving and the interaction between science and communication. (n.p.)

AgPAQ Development and Collaboration

The ISU faculty and staff who were involved in the Integrating an Entire Semester to Make Connections for Cross-Disciplinary Collaboration and Communication Challenge Grant were committed to the project in its entirety and met regularly to plan various aspects of the project.

Each faculty member agreed to develop syllabi for the course he taught. However, instead of constructing an “encapsulated” (Harms, 2003) syllabus, each designed his course intentionally to complement the courses prepared by other members of the teaching team. To synchronize the integrated material, the planners decided which professor(s) and/or staff would visit specific classes and labs would go on field trips. In addition, the professors contributed to the lecture grid so everyone on the project would know when particular topics were covered in each of the integrated courses, which meant that everyone knew when classes and labs would meet and when assignments in each course were given and when they were due.

The researcher associated with the project organized some and attended all meetings of the project committee. She took notes about the discussions and recorded group decisions,
which included selecting a local farmer who was willing to participate in the project. A list of farmers was provided by the local county extension offices to the AgPAQ planners. To be considered, farms must have met two criterion: highly erodable lands and a livestock operation. One farmer, whose farm met both criteria, acted as the client for both years of the study.

The students took field trips to the client’s farm and, on one visit, they interviewed the client, his financial planner, and his banker, who all provided financial and crop data. Students acted as agronomy consultants and used information from the client and what they learning in their courses to solve a problem the client had encountered.

Students were separated into three- or four-person consultant groups. The Agronomy 356 and English 311X instructors divided the students using the scores students achieved on a writing exercise, and how they answered questions about their backgrounds and experiences in production agriculture. Groups worked together through the entire semester gathering data from the farmer through various methods including completing interviews, collecting of soil and manure samples, taking residue and lowest loss counts, and reviewing previous farm management reports. After the groups of students gathered their data, each group generated a final recommendation report that had both oral and written components. These reports constituted the data used in this study.

The Comparison Groups

The comparison groups for this study were paid AgPAQ volunteer groups, paid non-AgPAQ volunteer groups, groups formed in an AgEdS 450 class, groups formed in the Agronomy 356 stand-alone course, and groups formed in the Agronomy 356/English 309 integration. This section describes these groups.
AgEdS 450 Farm Management

AgEdS 450, Farm Management and Operation, is the senior-level capstone course for students majoring in agricultural studies, although other ISU agriculture students frequently enroll in the course. The online *Iowa State University Catalog* (2004) describes the course this way:

> **Prereq.** Econ 235, Econ 330, junior classification. Participation in the management and operation of a diversified Iowa farm. The class is responsible for the plans, records, and decisions for buying and selling the farm's livestock, crops, and equipment. Special speakers on current topics. May be taken for credit 3 times at different times of the year by permission of the instructor. Nonmajor graduate credit. (n.p.)

Classroom lectures and discussion emphasize the application of agricultural production skills learned in other courses, risk management and risk management strategies, financial management and cash flow, alternative leasing agreements, and problem-solving in exploring strategic issues related to the farm. Using students in the AgEdS 450 course as a comparison group is appropriate because the course has the same general focus as the AgPAQ integrated course cluster, uses similar teaching strategies, has course outcomes similar to those of AgPAQ, and includes students with backgrounds similar to those of students in AgPAQ. Working in groups is central to the course.

Agronomy 356 Stand-Alone Course

This comparison group consisted of students who were enrolled in the Agronomy 356 class during the years 1996, 1997, and 2003. Working in groups, thirty-six students generated 11 recommendation reports. Using these recommendation reports—that were archived by the course instructor for future use—is appropriate because the course is included within
AgPAQ, the integrated course cluster learning community used in this study. The online *Iowa State University Catalog* (2004) describes Agronomy 356 this way:

*Prereq:* Agronomy 354. Recommended: Agronomy 114. Integration of crop, tillage, drainage, erosion, fertility, and fertilizer information in management decisions. Economic and environmental implications of these decisions on long-term sustainability. Suitability and accuracy of soil evaluation methods. Handling characteristics and soil reactions of organic and mineral fertilizers. An in-depth farm plan will be developed for a client. Nonmajor graduate credit. (n.p.)

**Agronomy 356/English 309 Integration Group**

This comparison group consisted of students who were enrolled in Agronomy 356/English 309 linked courses in 1999, 2000, and 2002. Working in groups, thirty-five students generated 11 recommendation reports. Using these recommendation reports—that were archived by the course instructor for future use—is appropriate because the two classes within this integration are the similar to those within AgPAQ, the integrated course cluster learning community used in this study. The previous section gives the course description for Agronomy 356; the English 309 course was the foundation for English 311X, the English course in the AgPAQ. The online *Iowa State University Catalog* (2004) describes English 309 this way:

*Prereq:* English 105, junior classification. Introduction to the theory and practice of preparing and analyzing reports and proposals intended for businesses, governmental agencies, and private and corporate foundations. Individual assignments and group projects include text documents and oral presentations. (n.p.)

**Paid AgPAQ Volunteer Group**

This comparison group consisted of two groups recruited in the two years of the project. In the spring 2005 and the spring of 2006, AgPAQ instructors asked for prior AgPAQ
students to volunteer to work as a group to solve a professional work-related multidisciplinary problem similar to the problem they had solved in AgPAQ. In both years, instructors invited any students who might be interested in working in groups to solve a professional work-related multidisciplinary problem similar to the problem they had solved in AgPAQ to volunteer. In both years, all of the students who volunteered were used in the comparison group for that year.

In 2005, three past AgPAQ participants volunteered to be the first paid AgPAQ volunteer comparison group. In the spring of 2006, four past AgPAQ participants volunteered to be the second paid AgPAQ volunteer comparison group.

Because only enough students volunteered to make up one group each year, the comparison of the reports generated from these groups was performed to see how well each group demonstrated their achievement of the desired outcomes in communication and multidisciplinary problem solving. These students worked 12 hours per week for 6 weeks and were paid $500 each.

**Paid Non-AgPAQ Volunteer Group**
In the spring term of 2005, a group of 6 agriculture students volunteered to solve a real multidisciplinary problem. This group of students was the first paid non-AgPAQ volunteer comparison group. The second year, spring of 2006, a second paid non-AgPAQ volunteer comparison group had 8 students. They were all randomly assigned to two work groups. A comparison of the reports generated from these groups was performed to see how well each group demonstrated their achievement of the desired outcomes in communication and multidisciplinary problem solving. These students worked 12 hours per week for 6 weeks and were paid $500 each.
A further comparison was made using the reports from both of these paid volunteer groups and the reports from the students who were previously enrolled in the Agronomy 356 stand-alone course and the Agronomy 356/English 309 integration. The students produced recommendation reports that implemented techniques and theories the instructors taught during regular lecture periods. These reports were graded by the instructor. A group of examiners then coded and analyzed the data using the Written Communication Assessment Rubric (Barnett, 2006), a modified version of the Written Communication Rubric developed by faculty in the ELPS department at ISU.

Data Collection

Data collection for this study was approved by the Committee on the Use of Human Subjects in Research at Iowa State University. For both years of the study, before treatments were administered the students signed an informed consent letter asking permission for their participation in this study. The PSI was administered to the AgPAQ integrated course cluster and the AgEdS 450 comparison group participants the first week of the fall term and again during the 14th week of fall term to control nonresponse error rates. Time limits were set for each assessment, and the researcher supervised the tests.

Table 9 shows the number of students within each group, the number of reports generated by each group, and the year in which the reports were generated.
Table 9  
*Reports Collected by Group*

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>Number of Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Written reports generated</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996 Agronomy 356</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>1997 Agronomy 356</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>2003 Agronomy 356</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>1999 356/309 Integration</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>2000 356/309 Integration</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2002 356/309 Integration</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>2004 AgPAQ</td>
<td>19</td>
<td>10&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2004 450 Comparison Group</td>
<td>7</td>
<td>4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 AgPAQ</td>
<td>14</td>
<td>8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 450 Comparison Group</td>
<td>37</td>
<td>14&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 Volunteer Group</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>2005 AgPAQ Volunteer Group</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2006 Volunteer Group</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2006 AgPAQ Volunteer Group</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>63</strong></td>
</tr>
<tr>
<td><strong>Oral presentations generated</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996 Agronomy 356</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>1997 Agronomy 356</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2003 Agronomy 356</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>1999 356/309 Integration</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2000 356/309 Integration</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2002 356/309 Integration</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2004 AgPAQ</td>
<td>19</td>
<td>10&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2004 450 Comparison Group</td>
<td>7</td>
<td>4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 AgPAQ</td>
<td>14</td>
<td>8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 450 Comparison Group</td>
<td>37</td>
<td>14&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 Volunteer Group</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2005 AgPAQ Volunteer Group</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2006 Volunteer Group</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2006 AgPAQ Volunteer Group</td>
<td>-</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes pretest/post test numbers

<sup>b</sup> Oral presentation data not available
**Data Analysis**

Analysis of data was performed using the Statistical Package for the Social Sciences, Version 14. Data was collected, coded, and analyzed by the researchers affiliated with this study. Data analysis included frequencies, means, standard deviations, Pearson correlations, and general linear models—ANOVA and ANCOVA. The alpha level was set *a priori* at .05. This means the researcher was willing to accept a five percent chance of rejecting a null hypothesis that was actually true (Howell, 2002).
Chapter 4
Findings

The purpose of this study was to determine whether students who participated in the AgPAQ integrated course cluster demonstrated enhanced learning in the areas of communication (written and oral) and problem-solving as well as technical content knowledge when compared to students who did not participate in the AgPAQ integrated course cluster. This chapter contains the findings for the study using the following sections: research hypotheses and findings for each hypothesis.

Research Hypotheses

The following research hypotheses derived from these objectives are as follows:

1. Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of oral communication than students who participated in the AgEdS 450 course.

2. Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of written communication than students who participated in the AgEdS 450 course.

3. Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of written communication skills compared to students who participated in the Agronomy 356 stand-alone course, the Agronomy356/English 309 integration, and the non-AgPAQ paid volunteer group.

4. Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of technical content knowledge compared to students who participated
in the Agronomy 356 stand-alone course, the Agronomy356/English 309 integration, and the non-AgPAQ paid volunteer group.

5. Students who participated in the AgPAQ integrated course cluster will attain higher test scores in the area of problem-solving skills compared to students who participated in the AgEdS 450 course.

6. A self-selected paid group of past participants from the AgPAQ integrated course cluster will attain a higher written communication scores and technical content scores when solving a multidisciplinary problem compared to a self-selected paid volunteer group of students who did not participate in the AgPAQ integrated course cluster.

The findings of this study are presented under the following headings: (1) participant characteristics by group and (2) hypotheses results. These headings correspond with the research objectives and hypotheses mentioned herein.

Hypotheses Test Results

Results for Hypothesis 1 [oral communication: AgPAQ, AgEdS 450]

This section will address Hypothesis 1 and the findings pertaining to it. Hypothesis 1 reads: “Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of oral communication skills than will students who participated in the AgEdS 450 course.”

Besides the AgPAQ group, the only other group from which the researchers collected oral communication data was the AgEdS 450 comparison group. The General Linear Model statistical analysis procedure in SPSS was used to test the hypothesis. Pretest and posttest data were collected using the Group Oral Presentation Rubric (Barnett, 2006). Total scores on the rubric could range from 0 to 21. The rubric had 7 separate criteria, and each criterion
could be scored from 0 to 3, with a score of 0 designating “unacceptable” presentation skills and a score of 3 designating “exemplary” presentation skills.

Table 10 shows the mean for the pre/posttest oral communication scores for the AgPAQ learning community and the AgEdS 450 comparison group. In addition, the table gives the standard deviation for each group. The AgPAQ participants scored higher on their pretest oral communication scores when compared to the AgEdS 450 class. It is also important to note that the sample sizes are relatively equal (AgPAQ = 33, AgEdS 450 = 44). The pretest oral communication mean for the smaller group (AgPAQ) is higher than that of the larger group (AgEdS 450). Table 10 also shows that AgPAQ was higher on the posttest results, but was also higher on the pretest.

Table 10
AgPAQ/AgEdS 450 Pretest/posttest Oral Communication Mean Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>14.88</td>
<td>3.28</td>
<td>33</td>
</tr>
<tr>
<td>Posttest</td>
<td>16.24</td>
<td>2.55</td>
<td>33</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>9.59</td>
<td>3.78</td>
<td>44</td>
</tr>
<tr>
<td>Posttest</td>
<td>10.00</td>
<td>2.74</td>
<td>44</td>
</tr>
</tbody>
</table>

To determine if there was a statistically significant difference between the AgPAQ and AgEdS 450 posttest oral communication scores, an analysis of covariance (ANCOVA) model was estimated. This procedure adjusted the posttest oral communication scores for both groups. The students’ pretest oral communication scores were used as a covariate. The ANCOVA procedure revealed that the AgPAQ treatment group and the AgEdS 450 group differed significantly on their adjusted posttest means ($F = 54.75, p < .001$, one-tailed); the null hypothesis is rejected. The data tend to support the alternate hypothesis that the AgPAQ
The group achieved significantly higher adjusted posttest mean scores than the AgEdS 450 group. Table 11 gives the results of this analysis with corresponding confidence intervals.

Table 11
*AgPAQ/AgEdS 450 Adjusted Means for Posttest Oral Communication Skill*

<table>
<thead>
<tr>
<th>Group</th>
<th>Posttest Adj. Mean</th>
<th>SE</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>15.88</td>
<td>.53</td>
<td>14.83</td>
<td>16.93</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td>10.27</td>
<td>.44</td>
<td>9.39</td>
<td>11.16</td>
</tr>
</tbody>
</table>

In summary, the statistical analysis for this hypothesis indicates rejection of the null hypothesis. To illustrate the magnitude of the difference, each adjusted posttest mean score is divided by the highest possible score on the rubric (18 points). Table 12 gives these results.

Table 12
*AgPAQ/AgEdS 450 Oral Communication Skill Percentages*

<table>
<thead>
<tr>
<th>Group</th>
<th>Posttest Adjusted Mean Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>88%</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td>57%</td>
</tr>
</tbody>
</table>

Table 12 shows that the AgPAQ participants achieved posttest oral communication scores that were 31% higher than the scores of the AgEdS 450 students.

**Results for Hypothesis 2 [written communication: AgPAQ, AgEdS 450]**

This section will address Hypothesis 2 and the findings pertaining to it. Hypothesis 2 reads: “Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of written communication skills than students who participated in the AgEdS 450 course.”

The groups from which the researchers collected written communication data for this hypothesis were AgPAQ and the AgEdS 450 comparison group. The General Linear Model
statistical analysis procedure in SPSS was used to test the hypothesis. Pretest and posttest data were collected using the Written Communication Assessment Rubric (Barnett, 2006). Total scores on the rubric could range from 0 to 15. The rubric had 5 separate criteria, and each criterion could be scored from 0 to 3, with a score of 0 designating “unacceptable” writing skills and a score of 3 designating “exemplary” writing skills.

Table 13 shows the mean for the pre/posttest written communication scores for the AgPAQ learning community and the AgEdS 450 comparison groups. In addition, the table gives the standard deviation for each group. It is important to note that the AgPAQ participants scored higher on their pretest written communication scores when compared to the pretest written communication scores of the AgEdS 450 class. It is also important to note that the sample sizes are relatively equal (AgPAQ = 33, AgEdS 450 = 44). The mean for the smaller group (AgPAQ) is higher than that of the larger group (AgEdS 450); yet, the standard deviation for the AgPAQ group is larger than that of the AgEdS 450 group. Table 13 also shows that AgPAQ was higher on the posttest results, but was also higher on the pretest.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>7.82</td>
<td>3.57</td>
<td>33</td>
</tr>
<tr>
<td>Posttest</td>
<td>12.52</td>
<td>1.68</td>
<td>33</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>5.07</td>
<td>3.47</td>
<td>44</td>
</tr>
<tr>
<td>Posttest</td>
<td>6.00</td>
<td>3.49</td>
<td>44</td>
</tr>
</tbody>
</table>

In order to determine if there was a statistically significant difference between the AgPAQ and AgEdS 450 posttest written communication scores, an analysis of covariance (ANCOVA) model was estimated. This procedure adjusted the posttest written
communication scores for both groups by utilizing their pretest written communication scores as the covariate. Table 14 gives the results of this analysis with corresponding confidence intervals. The ANCOVA procedure revealed that the AgPAQ treatment group and the AgEdS 450 group differed significantly on their adjusted posttest means ($F = 93.32$, $p < .001$, one-tailed); the null hypothesis is rejected. The data tend to support the alternate hypothesis that the AgPAQ group achieved significantly higher adjusted posttest mean scores than the AgEdS 450 group.

Table 14
AgPAQ/AgEdS 450 Adjusted Means for Posttest Written Communication Skill

<table>
<thead>
<tr>
<th>Group</th>
<th>Posttest Adj. Mean</th>
<th>SE</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>12.69</td>
<td>.52</td>
<td>11.66</td>
<td>13.72</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td>5.87</td>
<td>.44</td>
<td>4.98</td>
<td>6.75</td>
</tr>
</tbody>
</table>

In summary, the statistical analysis for this hypothesis indicates rejection of the null hypothesis. To illustrate the magnitude of the difference, each adjusted posttest mean score is divided by the highest possible score on the rubric (15 points). Table 15 gives these results.

Table 15
AgPAQ/AgEdS 450 Written Communication Percentages

<table>
<thead>
<tr>
<th>Group</th>
<th>Posttest Adjusted Mean Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>85%</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td>39%</td>
</tr>
</tbody>
</table>

Table 15 reveals that the AgPAQ participants achieved posttest written communication scores that were 46% higher than the AgEdS 450 students.
Results for Hypothesis 3 [written communication: AgPAQ, Agronomy 356, 356/309 integration, and the paid non-AgPAQ group]

This section will address Hypothesis 3 and the findings pertaining to it. Hypothesis 3 reads: “Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of written communication skills compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.”

The groups from which the researchers collected written communication data for this hypothesis were AgPAQ, Agronomy 356, and the Agronomy 356/English 309 integration group, and the paid non-AgPAQ volunteer group. Data were analyzed using the Written Communication Assessment Rubric (Barnett, 2006). Total scores on the rubric could range from 0 to 15. The rubric had 5 separate criteria, and each criterion could be scored from 0 to 3, with a score of 0 designating “unacceptable” writing skills and a score of 3 designating “exemplary” writing skills.

Table 16 shows the mean for the final written communication score for the AgPAQ learning community as well as the final written communication scores for Agronomy 356, the Agronomy 356/English 309 integration group, and the paid non-AgPAQ volunteer group. As indicated in the table, the scores generated by AgPAQ participants were higher than the scores gathered at the end of regular semester work in Agronomy 356 and Agronomy 356/English 309 integration as well as the non-AgPAQ paid volunteer group.
Table 16
Written Communication Mean Scores by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>12.52</td>
<td>1.68</td>
<td>33</td>
</tr>
<tr>
<td>Agronomy 356</td>
<td>7.47</td>
<td>2.77</td>
<td>36</td>
</tr>
<tr>
<td>Agronomy 356/English 309</td>
<td>8.86</td>
<td>3.17</td>
<td>35</td>
</tr>
<tr>
<td>Paid Volunteer Group</td>
<td>8.21</td>
<td>2.52</td>
<td>14</td>
</tr>
</tbody>
</table>

To determine if there was a statistically significant difference between the AgPAQ and AgEdS 450 posttest oral communication scores, an analysis of variance (ANOVA) model was estimated. The ANOVA procedure revealed that there was an effect of what type of group students participated in and their written communication scores ($F = 23.46, p < .001$, one-tailed); the null hypothesis is not rejected. The General Linear Model statistical analysis procedure in SPSS was used to test the hypothesis. Table 17 gives the ANOVA results of this analysis.

Table 17
ANOVA Results on Written Communication Mean Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>483.98</td>
<td>3</td>
<td>161.33</td>
<td>23.46</td>
<td>.00</td>
</tr>
<tr>
<td>Error</td>
<td>783.86</td>
<td>114</td>
<td>6.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11653.00</td>
<td>118</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While Table 17 shows a difference among group means, it does not show which group means differ from one another. The Tukey post hoc test was computed for comparison of differences between the means (by group) for the written communication scores. Table 18 shows that AgPAQ group mean scores for written communication were significantly higher than all of the other groups.
Table 18
*Tukey Post Hoc Results for Written Communication Scores by Group*

<table>
<thead>
<tr>
<th>Type of Group</th>
<th>Type of Group</th>
<th>Mean Diff</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>356 Stand Alone</td>
<td>5.04*</td>
<td>.00</td>
<td>3.40</td>
<td>6.69</td>
</tr>
<tr>
<td></td>
<td>356/309</td>
<td>3.66*</td>
<td>.00</td>
<td>2.00</td>
<td>5.32</td>
</tr>
<tr>
<td></td>
<td>Paid Volunteer</td>
<td>4.30*</td>
<td>.00</td>
<td>2.12</td>
<td>6.48</td>
</tr>
<tr>
<td>356 Stand Alone</td>
<td>356/309</td>
<td>-1.38</td>
<td>.12</td>
<td>-3.01</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>Paid Volunteer</td>
<td>-.74</td>
<td>.81</td>
<td>-2.90</td>
<td>1.41</td>
</tr>
<tr>
<td>356/309 Integration</td>
<td>Paid Volunteer</td>
<td>.64</td>
<td>.87</td>
<td>-1.52</td>
<td>2.80</td>
</tr>
</tbody>
</table>

*The mean difference is significant at the .05 level.*

In summary, the statistical analysis for this hypothesis indicates rejection of the null hypothesis.

**Results for Hypothesis 4 [technical content: AgPAQ, Agronomy 356, 356/309 integration, paid non-AgPAQ]**

This section will address Hypothesis 4 and the findings pertaining to it. Hypothesis 4 reads: “Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of technical content knowledge compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.”

The groups from which the researchers collected written communication data for this hypothesis were AgPAQ, Agronomy 356, the Agronomy 356/English 309 integration group, and the paid non-AgPAQ volunteer group. Data were analyzed using the Technical Content Assessment Rubric (Gibson et al., 2006). Total scores on the rubric could range from 0 to 39. The rubric had 13 separate criteria, and each criterion could be scored from 0 to 3, with a score of 0 designating an “unacceptable” technical content level and a score of 3 designating an “exemplary” technical content level.
Table 19 shows the means for the final technical content knowledge scores for the AgPAQ learning community as well as the final written communication scores for Agronomy 356, the Agronomy 356/English 309 integration group, and the paid non-AgPAQ volunteer group. As indicated in the table, the scores generated by AgPAQ participants were higher than the scores gathered at the end of regular semester work in Agronomy 356 as well as for the Agronomy 356/English 309 integration.

Table 19

Technical Content Mean Scores by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>23.42</td>
<td>7.76</td>
<td>33</td>
</tr>
<tr>
<td>Agronomy 356</td>
<td>17.00</td>
<td>5.04</td>
<td>36</td>
</tr>
<tr>
<td>Agronomy 356/English 309</td>
<td>21.86</td>
<td>4.81</td>
<td>35</td>
</tr>
<tr>
<td>Paid Non-AgPAQ Volunteer Group</td>
<td>13.43</td>
<td>6.81</td>
<td>14</td>
</tr>
</tbody>
</table>

The General Linear Model statistical analysis procedure in SPSS was used to test the hypothesis. Table 20 gives the ANOVA results of this analysis. The ANOVA procedure revealed that there was an effect of what type of group students participated in and their technical content knowledge scores ($F = 12.94, p < .001$, one-tailed); the null hypothesis is not rejected.

Table 20

ANOVA Results on Technical Content Mean Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1432.12</td>
<td>3</td>
<td>477.37</td>
<td>12.94</td>
<td>.00</td>
</tr>
<tr>
<td>Error</td>
<td>4205.78</td>
<td>114</td>
<td>36.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>51962.00</td>
<td>118</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While Table 20 shows that there is a difference among group means, it does not show which group means differ from one another. The Tukey post hoc test was computed for comparison of mean differences between groups for the technical content knowledge mean
scores. Table 21 shows that AgPAQ group mean scores for technical content knowledge were significantly higher when compared with mean scores of the 356 Stand Alone and Paid Volunteer groups; AgPAQ group mean scores for technical content knowledge were not significant when compared to the 356/309 integration group.

Table 21
*Tukey Post Hoc Results Technical Content Scores by Group*

<table>
<thead>
<tr>
<th>Type of Group</th>
<th>Type of Group</th>
<th>Mean Diff</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>356 Stand Alone</td>
<td>6.42*</td>
<td>.00</td>
<td>2.61</td>
<td>10.24</td>
</tr>
<tr>
<td></td>
<td>356/309</td>
<td>1.57</td>
<td>.71</td>
<td>-2.28</td>
<td>5.41</td>
</tr>
<tr>
<td></td>
<td>Paid Volunteer</td>
<td>10.00*</td>
<td>.00</td>
<td>4.94</td>
<td>15.05</td>
</tr>
<tr>
<td>356 Stand Alone</td>
<td>356/309</td>
<td>-4.86*</td>
<td>.01</td>
<td>-8.62</td>
<td>-1.10</td>
</tr>
<tr>
<td></td>
<td>Paid Volunteer</td>
<td>3.57</td>
<td>.25</td>
<td>-1.42</td>
<td>8.56</td>
</tr>
<tr>
<td>356/309 Integration</td>
<td>Paid Volunteer</td>
<td>8.43*</td>
<td>.00</td>
<td>3.42</td>
<td>13.44</td>
</tr>
</tbody>
</table>

*The mean difference is significant at the .05 level.

In summary, the statistical analysis for this hypothesis indicates that there was a statistically significant difference between the technical content knowledge scores for the AgPAQ learning community and the Agronomy 356, and the paid non-AgPAQ volunteer group. The analysis also shows there was not a statistically significant difference between the technical content knowledge scores for the AgPAQ learning community and the 356/309 integration group. Therefore, the statistical analysis for this hypothesis indicates partial rejection of the null hypothesis.

**Results for Hypothesis 5 [problem-solving: AgPAQ, AgEdS 450]**

This section will address Hypothesis 5. Hypothesis 5 reads: “Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of problem-solving skills compared to students who participated in the AgEdS 450 course.”
The groups from which the researchers collected problem-solving data for this hypothesis were AgPAQ and AgEdS 450. Pretest and posttest data were collected using the Problem Solving Inventory (Heppner, 1988) which assesses self-perceived problem-solving skills and measures perceived problem-solving abilities. The General Linear Model statistical analysis procedure in SPSS was used to test the hypothesis.

Table 22 shows the mean for the pre/posttest problem-solving scores for the AgPAQ learning community and for the AgEdS 450 comparison group. In addition, the table gives the standard deviation for each group characteristic. The problem-solving pretest and posttest score means for AgPAQ were lower than that of AgEdS 450. AgPAQ had lower problem-solving scores.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest Mean</th>
<th>Standard Deviation</th>
<th>N</th>
<th>Posttest Mean</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>57.12</td>
<td>15.43</td>
<td>33</td>
<td>53.88</td>
<td>15.44</td>
<td>32</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td>57.15</td>
<td>17.02</td>
<td>55</td>
<td>58.38</td>
<td>21.07</td>
<td>55</td>
</tr>
</tbody>
</table>

In order to determine if there was a statistically significant difference between the AgPAQ and AgEdS 450 posttest problem-solving mean scores, a one-way analysis of covariance (ANCOVA) model was estimated. This procedure adjusted the posttest problem-solving scores for both groups. The students’ pretest problem-solving scores were used as a covariate. The ANCOVA procedure revealed that the AgPAQ treatment group and the AgEdS 450 group did not differ significantly ($F = 1.56$, $p > .05$, one-tailed); the null hypothesis is not rejected. Thus, the data tend to not support the alternate hypothesis that the AgPAQ group achieved significantly higher adjusted posttest mean scores than the AgEdS
450 group. Table 23 gives the results of this analysis with corresponding confidence intervals.

Table 23

<table>
<thead>
<tr>
<th>Group</th>
<th>Posttest Adj. Mean</th>
<th>SE</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgPAQ</td>
<td>54.01</td>
<td>2.73</td>
<td>48.57</td>
<td>59.44</td>
</tr>
<tr>
<td>AgEdS 450</td>
<td>58.30</td>
<td>2.08</td>
<td>54.16</td>
<td>62.45</td>
</tr>
</tbody>
</table>

In summary, the statistical analysis for this hypothesis indicates failure to reject the null hypothesis.

Results for Hypothesis 6 [written communication, technical content: paid AgPAQ, paid non-AgPAQ]

This section will address Hypothesis 6. Hypothesis 6 reads: “A self-selected paid group of past participants from the AgPAQ integrated course cluster will attain higher written communication scores and technical content knowledge scores when solving a multidisciplinary problem compared to a self-selected paid volunteer group of students who did not participate in the AgPAQ integrated course cluster.”

In the spring of 2005 and again in the spring of 2006, two groups of students volunteered to solve a multidisciplinary problem—one group of students who had previously participated in AgPAQ and another group who had not. In 2005, 3 students who had participated in the AgPAQ learning community in 2004 volunteered to be one subgroup, and in 2006, 4 students who had participated in AgPAQ in 2005 volunteered to be the second subgroup. Each year, each group developed one recommendation report. The report was scored by the evaluators and all of the members within each group received the same score.
The second volunteer group, made up of students who had not participated in AgPAQ, consisted of 8 students (2 groups) in 2005 and 6 students (2 groups) in 2006. Each of these groups developed a recommendation report that was scored by evaluators; all of the members within each group received the same score. The scores generated from the reports were used to compare the paid AgPAQ volunteer group and the paid non-AgPAQ volunteer group each year.

The General Linear Model statistical analysis procedure in SPSS was used to test the hypothesis. Test data was collected using the Written Communication Assessment Rubric (Barnett, 2006) and the Technical Content Assessment Rubric (Gibson et al., 2006). Total scores on the Written Communication Assessment Rubric could range from 0 to 15. The Written Communication Assessment Rubric had 5 separate criteria, and each criterion could be scored from 0 to 3, with a score of 0 designating “unacceptable” writing skills and a score of 3 designating “exemplary” writing skills. The Technical Content Assessment Rubric could range from 0 to 39, and had 13 separate criteria. Each criterion could be scored from 0 to 3, with a score 0 designating “unacceptable” technical content level and a score of 3 designating “exemplary” technical content level.

Table 24 shows the mean scores for written communication and technical content knowledge for the AgPAQ paid volunteer group and the paid non-AgPAQ volunteer group. In addition, the table gives the standard deviation and standard error for both groups. Table 24 shows that the AgPAQ paid volunteer participants scored higher on their written communication and technical content knowledge scores when compared to the group scores of the paid non-AgPAQ volunteer participants.
Table 24
Paid Volunteer Written Communication and Technical Content Mean Scores by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AgPAQ – Paid Volunteer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written Communication Score</td>
<td>15.00</td>
<td>.00</td>
<td>.00</td>
<td>7</td>
</tr>
<tr>
<td>Technical Content Score</td>
<td>21.86</td>
<td>4.81</td>
<td>1.82</td>
<td>7</td>
</tr>
<tr>
<td><strong>Non-AgPAQ – Paid Volunteer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written Communication Score</td>
<td>8.21</td>
<td>2.52</td>
<td>.67</td>
<td>14</td>
</tr>
<tr>
<td>Technical Content Score</td>
<td>13.43</td>
<td>6.81</td>
<td>1.82</td>
<td>14</td>
</tr>
</tbody>
</table>

Table 25 shows \( t \)-test results of the paid AgPAQ volunteer group mean scores and the paid non-AgPAQ volunteer group mean scores in written communication and technical content knowledge. Table 25 shows that there was a significant difference between both the group written communication score and the technical content knowledge mean scores.

Table 25
Paid Volunteer Written Communication and Technical Content \( t \)-test Results

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Variances</th>
<th>df</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Communication Score</td>
<td>Equal</td>
<td>19.00</td>
<td>.00</td>
<td>4.77</td>
<td>8.80</td>
</tr>
<tr>
<td></td>
<td>Unequal</td>
<td>13.00</td>
<td>.00</td>
<td>5.33</td>
<td>8.24</td>
</tr>
<tr>
<td>Technical Content Score</td>
<td>Equal</td>
<td>19.00</td>
<td>.01</td>
<td>2.37</td>
<td>14.48</td>
</tr>
<tr>
<td></td>
<td>Unequal</td>
<td>16.44</td>
<td>.01</td>
<td>2.99</td>
<td>13.87</td>
</tr>
</tbody>
</table>

In summary, the statistical analysis for this hypothesis indicates rejection of the null hypothesis.
Chapter 5
Summary, Discussion, Conclusions, and Recommendations

The main intention of this study was to determine whether students who participated in an agriculturally centered learning community—where four courses were integrated—would demonstrate enhanced learning as measured by higher scores in the areas of oral communication, written communication, technical content knowledge, and problem-solving when compared to students who did not participate in an integrated course cluster. While there is a body of research into learning communities in general, very little research has been conducted on the integrated course structure. For example, few studies have examined the finer details and outcomes related to higher order thinking or solving complex problems, and then making decisions as a result of these processes (Kaltsounis, 1990). This is particularly true within the agricultural education discipline. Moreover, there is virtually no literature regarding the impact a learning community—such as the one described in this study—has on a student’s communication and problem-solving development.

In addition to filling in this gap in extant literature, this study examined the assertions of scholars, including Kellogg (1999), who argue that “students who are involved in learning communities show an increased level in academic achievement, retention, motivation, intellectual development, learning, and involvement within the community” (p. 4).

While previous chapters have described this study and its methods, populations, tools, and findings, this chapter summarizes and discusses the findings and suggests conclusions and recommendations for further research.
Study Summary

In 2003, a Higher Education Challenge Grant was approved by the USDA to study the impact of a learning community in the College of Agriculture at Iowa State University. This study sought to determine whether or not participation in the learning community had a positive impact on oral communication, written communication, technical content knowledge, and problem-solving skills. Using this USDA Higher Education Challenge Grant as an investigative platform, this study was conducted to explore six hypotheses to assess the impact that participation in a learning community (AgPAQ) would have, as compared with results from groups of students who did not participate in the learning community. Two AgPAQ learning communities were implemented in the Department of Agronomy, one in the fall of 2004 and another in the fall of 2005.

AgPAQ students and AgEdS 450 students—one of the comparison groups—were the only groups that completed pretest and posttest measures specifically designed to quantify oral communication and attributes of problem-solving. AgPAQ, AgEdS 450 and three additional comparison groups—Agronomy 356 students, the Agronomy 356/English 309 integration group, the paid AgPAQ volunteer group, and the paid non-AgPAQ volunteer group—generated written communication and technical content knowledge data.

Written and oral communication data produced by the study participants was assessed using rubrics that were developed or modified specifically to measure oral communication, written communication, and technical content knowledge. Reliability tests and validity procedures were conducted on all of the rubrics, and high coefficients were determined for internal consistency and inter-rater reliability. Intrarater reliability on all rubrics was very poor.
This project was approved by the Iowa State University Institutional Review Board (IRB) in 2003 and received continuing approval through 2006 (Appendix A). Because the project involved examining data generated by students who participated in the learning community and comparison groups, informed consent procedures were followed. Measurements and procedures were also reviewed and approved by the IRB.

Discussion

The main objective of this study was to determine whether students who participated in the AgPAQ integrated course cluster demonstrated enhanced learning in the areas of oral communication, written communication, technical content knowledge, and problem-solving, when compared to groups of students who did not participate in AgPAQ. The combined results from testing the hypotheses show positive trends regarding the influence participation in this learning community had on students’ written and oral communication skills and technical content knowledge. At the same time, measures of students’ problem-solving attributes did not show the same kind of positive trend. Similarly, in one comparison, the AgPAQ group mean scores for technical content knowledge were not significant when compared to the 356/309 integration group.

In terms of positive trends, this study’s findings are consistent with the expected outcomes predicted by Dewey’s progressive education philosophy. Dewey (1938) explained that acquiring knowledge does not come from the reception of information; instead, understanding develops when the student has developed a mentorship with an educator and, through mutual discovery, the student attains knowledge. The treatment group experience—the AgPAQ learning community—included pieces from the progressive education philosophy such as experiential learning, social interactions, and integrated courses. One
result of this learning environment was that AgPAQ students showed improved written communication skills, oral communication skills, and technical content knowledge when compared to most of the other groups in the study.

Like Dewey’s predictions, Cove and Love (1996) suggest that social dynamics—the interactions among students and between students and faculty that result from participating in learning communities—enhance student learning. Pretest and posttest oral communication, written communication, and technical content knowledge data gathered as a part of this study tend to support Cove and Love’s claim. For example, in this study, the AgPAQ participants attained higher scores on written communication and oral communication measures than the comparison groups.

This study revealed that the AgPAQ learning community did provide an environment that afforded AgPAQ participants the opportunity to attain higher scores on measures of oral communication, written communication, and technical content knowledge. These results are consistent with Kellogg’s (1999) and other scholars’ (Brewer, 1999; Cove & Love, 1996; Smith et al., 2004; White, 2002) assertions that learning community participants are more successful in achieving higher academic scores. In fact, one comparison group, the Agronomy 356/English 309 integration group, achieved higher technical content knowledge scores than all of the other comparison groups and were, in fact, statistically significant compared to AgPAQ technical content knowledge scores. This finding can be explained because the Agronomy 356/English 309 integration group was, in fact, a two-course linked learning community, whereas the other comparison groups were stand-alone courses. The learning community students benefited in several ways, including having feedback on their work from more than one professor, with one professor teaching oral and written
communication within the context of the agronomy course content. These students were not only taught how to write, they were taught how to write to learn technical content.

On the other hand, with regard to problem-solving, this study is inconclusive. AgPAQ scores on the three Problem Solving Inventory (PSI) scales—confidence in problem-solving abilities, tendency to approach or avoid problem situations, and degree of personal control of emotions and behavior—did not differ significantly from the PSI scores of the comparison groups. Perhaps one reason for the similar problem-solving scores is that problem-solving strategies were indirectly incorporated into the syllabi and were only addressed in the Technical Content Assessment Rubric. From the way AgPAQ was structured, it may have been assumed that students would draw from all four courses and would thereby acquire enhanced problem-solving skills.

In this study, individuals rated oral communication, written communication, and technical content knowledge data, but according to Stemler (2004) the “task of judging behavior invites some degree of subjectivity in that the rating given will depend upon the judge’s interpretation of the construct” (n.p.). The intrarater reliability coefficients were low for all rubrics, which may be attributed to the fact that, during the time between their training session and rating the second set of data, individual raters may have forgotten what had been discussed during the training. This may have increased what Stemler called their “degree of subjectivity.” The degree of subjectivity was related to the intrarater reliability. Having evaluators work in teams might improve intrarater reliability by fostering accountability and allowing individuals to recall the training and the constructs of the rubrics and contribute to a more accurate group memory.
Another issue that perhaps influenced the study had to do with differences in the numbers of individuals in the various groups. While this disparity was the result of course enrollment, the AgPAQ population actually declined for the second year of the study. This decline may have resulted from not having fostered interest and enthusiasm regarding the potential benefits to students of participating in AgPAQ. For example, AgPAQ focused on practical skills graduates would need as they moved into the workplace, but it is difficult to convey not only the importance of these skills, but also difficult for students to genuinely understand what professionals in agriculture, such as agronomists, seed scientists, and agricultural economists, do on a day-to-day basis. One possible way to remedy this situation would be to develop a seminar designed to recruit students for integrated course clusters like AgPAQ. A seminar like this could directly establish the relationships between AgPAQ activities and the skills students will need as they pursue careers as professionals in agriculture. This, as Gabelnick et al. (2003) suggest, promotes congruency of the learning community material.

Conclusions

This section will provide conclusions for each hypothesis.

Hypothesis 1 [oral communication: AgPAQ, AgEdS 450]

Hypothesis one reads “Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of oral communication skills than will students who participated in the AgEdS 450 course.” The following conclusion can be made using the findings for this hypothesis as described in Chapter 4.

1. Students who participated in the AgPAQ learning community achieved higher scores in the area of oral communication skills than students who participated in the AgEdS 450 course.
Hypothesis 2 [written communication: AgPAQ, AgEdS 450]

Hypothesis two reads “Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of written communication skills than students who participated in the AgEdS 450 course.” The following conclusion can be made using the findings for this hypothesis as described in Chapter 4.

1. Students who participated in the AgPAQ learning community achieved higher scores in the area of written communication skills than students who participated in the AgEdS 450 course.

Hypothesis 3 [written communication: AgPAQ, Agronomy 356]

Hypothesis three reads “Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of written communication skills compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.” The following conclusion can be made using the findings for this hypothesis as described in Chapter 4.

1. Students who participated in the AgPAQ learning community achieved higher scores in the area of written communication skills than students who participated in the 356/309 integration group, the Agronomy 356 stand-alone group, and the paid non-AgPAQ volunteer group.

Hypothesis 4 [technical content: AgPAQ, Agronomy 356, 356/309 integration, paid non-AgPAQ]

Hypothesis four reads “Students who participated in the AgPAQ integrated course cluster will attain higher scores in the area of technical content knowledge compared to students who participated in the Agronomy 356 stand-alone course, the 356/309 integration, and the non-AgPAQ paid volunteer group.” The following conclusions can be made using the findings for this hypothesis as described in Chapter 4.
1. Students who participated in the AgPAQ learning community achieved higher scores in the area of technical content knowledge than students who participated in the Agronomy 356 group, and the paid non-AgPAQ volunteer group.

2. While the students who participated in the AgPAQ learning community achieved higher scores in the area of technical content knowledge than students who participated in the 356/309 integration group, the difference was not statistically significant.

**Hypothesis 5 [problem-solving: AgPAQ, AgEdS 450]**

Hypothesis five reads “Students who participated in the AgPAQ integrated course cluster will attain higher scores on a measure of problem-solving skills compared to students who participated in the AgEdS 450 course.” The following conclusions can be made using the findings for this hypothesis as described in Chapter 4.

1. Students who participated in the AgPAQ learning community did not achieve higher scores on the three Problem Solving Inventory (PSI) scales—confidence in problem-solving abilities, tendency to approach or avoid problem situations, and degree of personal control of emotions and behavior—than students who participated in the AgEdS 450 course.

**Hypothesis 6 [written communication, technical content: paid AgPAQ, paid non-AgPAQ]**

Hypothesis six reads “A self-selected paid group of past participants from the AgPAQ integrated course cluster will attain higher written communication scores and technical content knowledge scores when solving a multidisciplinary problem compared to a self-selected paid volunteer group of students who did not participate in the AgPAQ
integrated course cluster.” The following conclusions can be made using the findings for this hypothesis as described in Chapter 4.

1. Previous AgPAQ participation had a positive effect on the achievement of higher written communication scores when compared to the scores of students who had no previous AgPAQ experience.

2. Previous AgPAQ participation had a positive effect on the achievement of higher technical content scores when compared to the scores of the paid non-AgPAQ volunteer group of students.

**Overall Conclusions**

In general, participation in the AgPAQ learning community had a positive impact on oral communication skills, written communication skills, and technical content knowledge, which tends to support the effectiveness of the integrated course cluster, and, in turn, supports the principles that were central to the original USDA grant.

On the other hand, AgPAQ students did not attain statistically significant increases in problem-solving scores, which may be the result of using a tool that did not specifically measure problem-solving skills acquisition. The Problem-Solving Inventory used in this study measures an individual's confidence in problem-solving abilities, tendency to approach or avoid problem situations, and degree of personal control of emotions and behavior.

**Recommendations**

Recommendations based on the results of this study fall into three main areas: *practice* (having to do with the place of learning communities within higher education), *procedures* (having to do with how to replicate this study), and *implications for future research*. 
Suggestions for Learning Community Practice

Because this study was located at a particular university, Iowa State University, these suggestions for learning community practice are, for the most part, specific to that university. The suggestions are based on the results of this study, notably the positive trends in AgPAQ student achievement. On a most basic level, this study seems to show that integrated course clusters foster enhanced learning in specific areas, and therefore ought to be continued. In light of the results of this study, educators should

1. continue to incorporate oral and written communication as components of agriculture-based integrated course clusters;
2. make problem solving a more prominent, explicit feature of the curriculum;
3. continue to coordinate the individual course syllabi so every course component compliments the content in integrated course clusters; and
4. implement a seminar that introduces, directly establishes, and explores the relationships between AgPAQ activities and the skills students will need as they pursue careers as professionals in agriculture.

Suggestions for Replicating the Study

While the complexity of this study—the number of hypotheses, the four different comparison groups, and the number of variables considered—allowed for interesting and useful investigation, researchers who want to extend this line of study might benefit from our experiences. Specifically, we suggest that researchers

1. use a group rating system as opposed to the individual rating system to evaluate the data, which might improve intrarater reliability. Because the “task of judging behavior invites some degree of subjectivity in that the rating given will depend upon the judge’s interpretation of the construct” (Stemler, 2004, n.p.), it may be
beneficial to incorporate a group rating system where raters work in teams rating random samples of the data; and

2. use a tool to evaluate problem solving skills that does not rely on participant self-reports.

**Implications for Further Research**

As with all studies, this one was bounded in scope and focus. Therefore, while the study yielded specific results, the researcher recognized areas where additional research might further contribute to the knowledge of the discipline. In general, we see value in designing learning communities as research sites in order to extend the growing body of research about learning communities designed specifically for upper-division students in agriculture.

More specifically, the implications for research presented here fall into three main categories.

1. Researchers might focus more narrowly by investigating various pieces of this study. For example,
   - faculty might assign class research projects that would center on investigating the impact of intentionally including problem-solving course material in linked courses; or
   - researchers might, instead of replicating the entire study (e.g., comparing a four-course integrated course cluster learning community with the kinds of comparison groups used in this study), compare a two-course learning community with a four-course integrated course cluster like AgPAQ.

2. Researchers might conduct parallel studies that are similar in scope and focus to this study. For example, researchers could
• incorporate qualitative methods to supplement the quantitative results and possibly address issues of satisfaction among students and faculty, group dynamics, and problem-solving skills; or
• incorporate an observation aspect to triangulate student reports of levels of participation, leadership, and conduct in problem-solving situations; or
• situate a learning community in a different major area of study in agriculture, such as agribusiness, animal science, natural resource ecology and management, or food science and human nutrition.

3. Researchers could expand on this study. For example, researchers could
• study an integrated course cluster like AgPAQ that includes a seminar, which is a feature of the federated learning community, a learning community characteristic not represented in AgPAQ.
Appendix A
ISU Human Subjects Documents
DATE: February 8, 2002

TO: Tom Polito

FROM: Janell Meldrem, IRB Administrator

RE: “Integrating an Entire Semester to Make Connections for Cross-Disciplinary Collaboration and Community” IRB ID 02-297

TYPE OF APPLICATION: ☐ New Project  ☐ Continuing Review  ☐ Modification

The project, “Integrating an Entire Semester to Make Connections for Cross-Disciplinary Collaboration and Community” has been approved for one year from its IRB approval date February 8, 2002. Once the instruments have been completed, submit them for review and approval by the IRB (Institutional Review Board). University policy and Federal regulations (45 CFR 46) require that all research involving human subjects be reviewed by the Institutional Review Board (IRB) on a continuing basis at intervals appropriate to the degree of risk, but at least once per year.

Any modification of this research project must be submitted to the IRB for prior review and approval. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires).

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

The PI must retain the signed consent documents for at least three years past completion of the research activity. If the principal investigator terminates association with the University before that time, the signed informed consent documents should go to the DEO to be maintained.

You are expected to make sure that additional key personnel who are involved in human subjects research complete training prior to their interactions with human subjects. Web based training is available from our web site.

Upon completion of data collection, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project. If data collection will continue beyond the approval date, you will receive a letter notifying you a month in advance that the expiration date is approaching. At that time, you will need to fill out a Continuing Review/and or Modification Form.

Both of these forms are on the Human Subjects Research Office web site at: http://grants-svr.admin.iastate.edu/VPR/humanSubjects.html.
TO: Thomas Polito

FROM: Janelle Meldrem, IRB Administrator

PROJECT TITLE: Integrating an Entire Semester to Make Connections for Cross-Disciplinary Collaboration and Communication

RE: IRB ID No.: 02-297

APPROVAL DATE: February 8, 2003

REVIEW DATE: January 14, 2003

LENGTH OF APPROVAL: 1 year

CONTINUING REVIEW DATE: February 7, 2004

TYPE OF APPLICATION: ☑ New Project ☑ Continuing Review

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached “masters” for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

If this study is sponsored by an external funding source, the original Assurance Certification/Identification form has been forwarded to the Office of Sponsored Programs Administration.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected to comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.
DATE: December 19, 2003

TO: Thomas Polito

C: Human Subjects Research Office

RE: Integrating an entire semester to make connections for cross-disciplinary collaboration and communication
IRB ID #: 02-297
Expires: February 7, 2004

University policy and Federal regulations (45 CFR 46) require that all research involving human subjects be reviewed by the Institutional Review Board (IRB) on a continuing basis at intervals appropriate to the degree of risk, but at least once per year. Our records indicate that this project is due for continuing review.

If the IRB does not receive, review, and approve this project by the expiration date indicated above, IRB approval has lapsed and, in accordance with Federal regulations, all research activity, including enrollment of subjects, must cease pending the receipt, review, and approval of a Continuing Review/Modification Form. If a Continuing Review form is not submitted by the expiration date, this study will be administratively closed. The forms have changed; please go to the website for the new form. http://grantssvr.admin.iastate.edu/vpr/humansubjects.html

Please do one of the following at this time:

1) If this project is ongoing, please complete the Continuing Review/and or Modification form and send it to the Human Subjects Research Office before the expiration date listed above. If data analysis is still in progress or has not occurred, the project needs to remain open and continuing review must be requested.

OR

2) If this project has already been completed or if it will not continue beyond the above expiration date, please complete a Project Closure Form and send it to the Human Subjects Research Office.

Forms are available at http://grantssvr.admin.iastate.edu/VPR/humansubjects.html. Hard copies are available from 2810 Beardshear Hall, 294-4566 or austigr@iastate.edu.

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Human Subjects Research Office
2810 Beardshear Hall
515/294-4566
FAX: 515/294-7288
http://grantssvr.admin.iastate.edu/vpr/humansubjects.html
TO: Tom Polito

FROM: Human Subjects Research Office

PROJECT TITLE: "Integrating an entire semester to make connections for cross disciplinary collaborations and communication"

RE: IRB ID No.: 02-297

APPROVAL DATE: January 30, 2004 REVIEW DATE: January 30, 2004

LENGTH OF APPROVAL: 1 Year CONTINUING REVIEW DATE: February 7, 2005

TYPE OF APPLICATION: □ New Project □ Continuing Review

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached "masters" for subjects to sign upon agreeing to participate. The original, signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

If this study is sponsored by an external funding source, the original Assurance Certification/Identification form has been forwarded to the Office of Sponsored Programs Administration.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

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Approval letter
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You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected to comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.

C: Agronomy
TO: Thomas Polito

FROM: Ginny Austin, IRB Administrator

PROJECT TITLE (s): “Integrating an entire semester to make connections for cross-disciplinary collaboration and communication”

RE: IRB ID No.: 02-297

TYPE OF APPLICATION: Modification  APPROVAL DATE: August 17, 2004

REVIEW DATE: August 17, 2004  CONTINUING REVIEW DATE: September 7, 2005

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached “masters” for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

If this study is sponsored by an external funding source, the original Assurance Certification/Identification form has been forwarded to the Office of Sponsored Programs Administration.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI’s responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.

C: Agronomy
   Ag Ed
TO: Thomas Polito

FROM: Ginny Austin Eason, IRB Administrator

PROJECT TITLE: “Integrating an Entire Semester to Make Connections for Cross-Disciplinary Collaboration and Communication”

RE: IRB ID No.: 02-297

APPROVAL DATE: January 10, 2005 REVIEW DATE: January 10, 2005

LENGTH OF APPROVAL: 1 Year CONTINUING REVIEW DATE: February 7, 2006

TYPE OF APPLICATION: □ New Project □ Continuing Review

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only are attached. Please make copies from the attached “masters” for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

When re-contacting the students that did not provide consent you will need to be exceptionally sensitive to the study subject’s wishes, and the informed Consent procedure should be discontinued immediately if the subject indicates he or she is not interested in participating. When the Informed Consent Document is presented to the subjects, the investigators are to make clear the subject’s consent to use the taped oral presentations is completely voluntary. Please note if the subject(s) do not give consent the tapes cannot be used.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI’s responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including
additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected to comply with the University’s Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.

C: Agronomy/Ag Eds
   Cynthia Barnett
TO: Thomas Polito

FROM: Ginny Austin Eason, IRB Administrator

PROJECT TITLE: “Integrating an entire semester to make connections for cross-disciplinary collaboration and communication”

RE: IRB ID No.: 02-297

TYPE OF APPLICATION: Modification               APPROVAL DATE: February 14, 2005


Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached "masters" for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

If this study is sponsored by an external funding source, the original Assurance Certification/Identification form has been forwarded to the Office of Sponsored Programs Administration.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
Approval letter
Page 2
Polito

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.

C: Agronomy/AgEd
DATE: April 12, 2006

TO: Dr. Thomas Polito

FROM: Institutional Review Board, Office of Research Assurances

RE: IRB ID: 02-297

Approval Date of Modification: April 11, 2006
Date for Continuing Review: February 7, 2007

The Chair of the Institutional Review Board Chair has reviewed and approved the modification of your protocol entitled: “Integrating an Entire Semester to Make Connections for Cross-disciplinary Collaboration and Communication.”

As a reminder, your study has been approved for a period of one year from February 8, 2006 to February 7, 2006. The continuing review date for this study is no later than February 7, 2006. In the future, please be sure to leave a one-inch margin on all study documents so that the IRB approval stamp may be placed on the document.

Any further changes in the protocol or consent form may not be implemented without prior IRB review and approval, using the “Continuing Review and/or Modification” form. Research investigators are expected to comply with the principles of the Belmont Report, and state and federal regulations regarding the involvement of humans in research. These documents are located on the Office of Research Assurances website or available by calling (515) 294-4566, www.compliance.iastate.edu.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Upon completion of the project, a Project Closure Form should be submitted to the Human Subjects Research Office to officially close the project.
TO: Thomas Polito

FROM: Human Subject Research Compliance Office

PROJECT TITLE: Integrating an entire semester to make connections for cross-disciplinary collaboration and communication

RE: IRB ID No. 02-297

TYPE OF APPLICATION: Modification

APPROVAL DATE: April 26, 2005

REVIEW DATE: April 26, 2005

CONTINUING REVIEW DATE: February 7, 2006

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached "masters" for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

If this study is sponsored by an external funding source, the original Assurance Certification/Identification form has been forwarded to the Office of Sponsored Programs Administration.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
Approval letter
Page 2
Polito

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected comply with the University’s Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.

C: Agronomy
Ag Ed & Studies
January 20, 2006

Thomas Polito, Ph.D.
23 Curtiss Hall

Dear Professor Polito,

Approval date for Continuing Review: January 20, 2006  Date for Continuing Review: February 7, 2007

The Institutional Review Board Chair of Iowa State University reviewed and approved the protocol entitled: Integrating an Entire Semester to make Connections for Cross-Disciplinary Collaboration and Communication on January 20, 2006 the protocol ID Number is: 02-297. Please refer to this number in all correspondence regarding the protocol.

X  The continuing review of your study has been approved for a period of one year from January 20, 2006 to February 7, 2007. The continuation review for this study is no later than February 7, 2007. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

The recruitment of subjects is not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached "masters" for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol.

Research investigators are expected to comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These
Continuing Review Letter
Page 2

documents are on the Office of Research Assurances' website www.compliance.iastate.edu, available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Office of Research Assurances to officially close the project.

Sincerely,

Dianne Anderson
IRB Co-Chair

C: Agronomy/Ag Ed Studies
February 7, 2006

Thomas Polito, Ph.D.
Agronomy/Ag Ed Studies
223A Curtiss Hall

Dear Professor Polito,

Approval date for Modification: February 7, 2006 Date for Continuing Review: February 7, 2007

The Institutional Review Board Co-Chair of Iowa State University must reviewed and approved the protocol entitled: "Integrating an Entire Semester to Make Connections for Cross-Disciplinary Collaboration and Communication", on February 7, 2006 the protocol ID Number is: 02-297. Please refer to this number in all correspondence regarding the protocol.

X The modification of your study has been approved and the continuation review for this study is no later than February 7, 2007. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

The recruitment of subjects is not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached "masters" for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subjects.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol.
Modification Letter
Page 2

Research investigators are expected to comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Office of Research Assurances' website www.compliance.iastate.edu or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Office of Research Assurances to officially close the project.

Sincerely,

Dianne Anderson
IRB Co-Chair

C: Agronomy/Ag Ed Studies
Informed Consent Document

AgPAQ Group
August 22, 2005

Title of Study: Integrating an entire semester to make connections for cross-disciplinary collaboration and communication

Investigators:
Dr. Tom Polito, PhD
Dr. Dave Roberts, PhD
Dr. Lance Gibson, PhD
Dr. Jim Kliebenstein, PhD
Dr. Greg Miller, PhD
Cynthia Barnett, MS

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to discover whether simultaneously enrolling students in integrated crops, soils, business, and communications courses during the same semester will contribute to greater student learning and skill development than taking the courses individually. You are being invited to participate in this study because you are a student in these courses.

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, your participation will begin August 22, 2005 and end December 16, 2005. During the study expect the following study procedures to be followed:

1. Complete a survey about your perceptions regarding your capabilities of working in a team. You may skip any question that you do not wish to answer or that makes you feel uncomfortable. This will take approximately 20 minutes and will be given once in August and again in December.
2. Complete a survey about your perceptions regarding your capabilities of problem solving. You may skip any question that you do not wish to answer or that makes you feel uncomfortable. This will take approximately 20 minutes and will be given once in August and again in December.
3. Complete a survey regarding your team working skills. You may skip any question that you do not wish to answer or that makes you feel uncomfortable. This will take approximately 20 minutes and will be given once in August and again in December.
4. Give an oral presentation of the prospective client report that will be taped by the graduate research assistant. This will last approximately 12-15 minutes and will be done in September, 2005. Once evaluation of the presentation is complete, taped recordings will be destroyed.
5. Give an oral presentation of the Business Presentation: Farm Plan Report that will be taped by the graduate research assistant. This will last approximately 12-15 minutes.
and will be done in December, 2005. Once evaluation of the presentation is complete, taped recordings will be destroyed.

6. Copies of the prospective client report will be collected for evaluation of written communication skills. The prospective client report will be collected in September.

7. Copies of the final recommendation report will be collected for an evaluation of written communication skills to be compared to students who participated in Agronomy 356 and the Agronomy 356/English 309 integration in previous years. The final recommendation report will be collected in December.

8. Provide anonymous feedback three times during the fall semester at week 5, week 10, and week 15 regarding experiences in the learning community.

9. Your GPA, student identification number, class rank, major, and gender before participation in the corresponding course will be collected.

**RISKS**

There are no known risks to you while participating in this study.

**BENEFITS**

If you decide to participate in this study there will be no direct benefit to you. It is hoped that the information gained in this study will benefit society by providing valuable information regarding integrated course development.

**COSTS AND COMPENSATION**

You will not have any costs from participating in this. You will not be compensated for participating in this study.

**PARTICIPANT RIGHTS**

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. Nonparticipation will not affect your course evaluations.

**CONFIDENTIALITY**

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: you will not be identified by name in any written or oral presentations. You will be
assigned a letter and this will be used on evaluation forms instead of your name. Only the researchers mentioned herein will know your name; however, personal identifiers will only be known by the graduate research assistant. Records will be kept confidential and stored in a filing cabinet under lock and key as well as password protected computer files. If the results are published, your identity will remain confidential.

**QUESTIONS OR PROBLEMS**

You are encouraged to ask questions at any time during this study. For further information about the study contact Dr. Tom Polito at (515) 294-2766. If you have any questions about the rights of research subjects or research-related injury, please contact the Human Subjects Research Office, 1138 Pearson Hall, (515) 294-4566; austingr@iastate.edu or the Research Compliance Officer, Office of Research Compliance, 1138 Pearson Hall, (515) 294-3115; dament@iastate.edu

***************************************************************************

**SUBJECT SIGNATURE**

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. I understand that my confidentiality will be preserved, and that I may withdraw from participation at any time. You will receive a copy of the signed and dated written informed consent prior to your participation in the study.

Subject’s Name (printed)  

(Subject’s Signature)  (Date)

**INVESTIGATOR STATEMENT**

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

(Signature of Person Obtaining Informed Consent)  (Date)
Title of Study: Integrating an entire semester to make connections for cross-disciplinary collaboration and communication

Investigators:
Dr. Tom Polito, PhD  Dr. Jim Kliebenstein, PhD
Dr. Dave Roberts, PhD  Dr. Greg Miller, PhD
Dr. Lance Gibson, PhD  Cynthia Barnett, MS

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to discover whether simultaneously enrolling students in integrated crops, soils, business, and communications courses during the same semester will contribute to greater student learning and skill development than taking the courses individually. You are being invited to participate in this study because you are a student in these courses.

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, your participation will begin August 22, 2005 and end December 16, 2005. During the study expect the following study procedures to be followed:

1. Complete a survey about your perceptions regarding your capabilities of working in a team. You may skip any question that you do not wish to answer or that makes you feel uncomfortable. This will take approximately 20 minutes and will be given once in August and again in December.
2. Complete a survey about your perceptions regarding your capabilities of problem solving. You may skip any question that you do not wish to answer or that makes you feel uncomfortable. This will take approximately 20 minutes and will be given once in August and again in December.
3. Give oral presentations that will be taped by the graduate research assistant. This will last approximately 15-20 minutes per group and will be taped once on September 20th, 2005, and again on November 15th, 2005. Once evaluation of the presentations is complete, taped recordings will be destroyed.
4. Copies of the State-of-the-Farm report will be collected for evaluation of written communication skills. The State-of-the-Farm report will be collected in September.
5. Copies of the Strategic Issues report will be collected for an evaluation of written communication skills to be compared to students who participated in the AgPAQ
integrated course cluster. The final recommendation report will be collected in December.

6. Provide anonymous feedback three times during the fall semester at week 5, week 10, and week 15 regarding experiences in the AgEdS 450 class.

7. Your student identification number, GPA, class rank, major, and gender before participation in the corresponding course will be collected.

**RISKS**

There are no known risks to you while participating in this study.

**BENEFITS**

If you decide to participate in this study there will be no direct benefit to you. It is hoped that the information gained in this study will benefit society by providing valuable information regarding integrated course development.

**COSTS AND COMPENSATION**

You will not have any costs from participating in this. You will not be compensated for participating in this study.

**PARTICIPANT RIGHTS**

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. Nonparticipation will not affect your course evaluations.

**CONFIDENTIALITY**

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: you will not be identified by name in any written or oral presentations. You will be assigned a letter and this will be used on evaluation forms instead of your name. Only the researchers mentioned herein will know your name; however, personal identifiers will only be known by the graduate research assistant. Records will be kept confidential and stored in
a filing cabinet under lock and key as well as password protected computer files. If the results are published, your identity will remain confidential.

**QUESTIONS OR PROBLEMS**

You are encouraged to ask questions at any time during this study. For further information about the study contact Dr. Tom Polito at (515) 294-2766. If you have any questions about the rights of research subjects or research-related injury, please contact the Human Subjects Research Office, 1138 Pearson Hall, (515) 294-4566; austingr@iastate.edu or the Research Compliance Officer, Office of Research Compliance, 1138 Pearson Hall, (515) 294-3115; dament@iastate.edu

***************************************************************************

**SUBJECT SIGNATURE**

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. I understand that my confidentiality will be preserved, and that I may withdraw from participation at any time. You will receive a copy of the signed and dated written informed consent prior to your participation in the study.

Subject’s Name (printed) ____________________________________________

(Subject’s Signature) ______________________________________________ (Date)

**INVESTIGATOR STATEMENT**

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

(Signature of Person Obtaining Informed Consent) (Date)
Appendix C

Written Communication Assessment Rubric
## Written Communication Assessment Rubric (4-06)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Levels of Achievement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td>Exemplary = 3</td>
<td>Proficient = 2</td>
</tr>
<tr>
<td>The writer's purpose clearly stated. Even, balanced information clearly and effectively supports a main idea and displays a thoughtful, in-depth analysis of a sufficiently limited topic. The author displays profound insights.</td>
<td>The writing has a clear purpose and seldom digresses. Information provides firm support for main idea and displays evidence of a basic analysis of a sufficiently limited topic. Author displays sufficient insights.</td>
<td>The purpose is not always clearly stated. Information supports main idea at times. Main topic is carelessly identified and addressed. Analysis is basic or general. The author displays some insights.</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td>References to support claims are generally present. Author clearly utilizes sources of ideas to develop detail while supporting main ideas.</td>
<td>Although occasional utilization of references is performed, the author over relies on unsubstantiated statements. Sources of ideas aren’t fully developed. Detail supporting main ideas is vague and nondescript.</td>
</tr>
<tr>
<td>Thorough and appropriate references are given to support claims and attribution is clear and fairly represented. By utilizing the sources appropriately, the author provides reader with a comprehensive understanding of the topic.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>The ideas are arranged logically to support the thesis. They flow smoothly from one to another and are clearly linked to each other. Arguments are substantive.</td>
<td>The ideas are arranged logically. Frequently, ideas fail to make sense together. Author gives some forecasts and topic sentences. The reader must try to figure out what writer intends. Arguments are vague and unsubstantiated.</td>
</tr>
<tr>
<td>The ideas are arranged logically to support the thesis. They are usually clearly linked to each other. Author gives adequate forecasts and topic sentences. But reader has a small problem following the line of reasoning. Arguments are somewhat unsupported and shaky.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categories</td>
<td>Levels of Achievement</td>
<td>Score</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| **Sentence structure, Grammar, Spelling, Mechanics (i.e., Punctuation, Italics, Capitalization, etc.)** | **Exemplary = 3**  
Sentences are well phrased and varied in length and structure. They consistently flow smoothly from one to another and are coherent. The writing is free or almost free of errors. |       |
|                                                | **Proficient = 2**  
Sentences are well phrased and demonstrate some variety in structure and length. The coherency and flow from sentence to sentence is generally smooth. There are some violations in the writing, but they don’t obscure the meaning or represent a major distraction. |       |
|                                                | **Marginal = 1**  
Some sentences are awkwardly constructed, and they represent an occasional distraction for the reader. The writing has numerous errors, and the reader is distracted by them. |       |
|                                                | **Unacceptable = 0**  
Errors in sentence structure are frequent enough to represent a major distraction to the reader. Errors are so numerous that they obscure the meaning of the passage. The reader is confused and stops reading. |       |
| **Style: Voice, Tone, and word choice**         | The writing is compelling. It engages the reader and sustains interest throughout. The tone is consistently professional and appropriate for the audience, the purpose, and the type of written material (e.g., letter, memo, proposal, report, application, research summary, and scholarly communication). Word choice is consistently precise, appropriate, and effective. |       |
|                                                | The writing is generally engaging, but occasionally dull. The communication is generally focused and interesting. The tone is generally professional. In general, it is appropriate for the audience and purpose. Word choice is generally appropriate. The writer goes beyond the generic word to find one more precise and effective. |       |
|                                                | The writing is dull and perfunctory. Though the paper may have some interesting parts, readers find it difficult to maintain interest. The tone is not consistently professional or appropriate for the audience and purpose. Word choice is merely adequate, and the range of words is limited. Some words are used imprecisely or inappropriately. |       |
|                                                | The writing has little personality. The audience quickly loses interest and stops reading. The tone is not professional. It is inappropriate for the audience and purpose. Many words are used imprecisely or inappropriately, confusing the reader. The writer may also use clichés and colloquial language. |       |

TOTAL SCORE
Appendix D
Group Oral Communication Rubric
# Group Oral Presentation Rubric (4-06)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Exemplary = 3</th>
<th>Proficient = 2</th>
<th>Marginal = 1</th>
<th>Unacceptable = 0</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organization</strong></td>
<td>Presentation is clear, logical and sequential with a well constructed introduction, body, and conclusion. Listener can follow line of reasoning because presenter makes clear transitions between main points.</td>
<td>Presentation is generally clear and sequential. It contains a workman-like introduction, body, and conclusion. Listener may be confused due to unclear transitions between key points.</td>
<td>Listener must follow presentation with effort. Presentation is not clear due to weak or missing components (conclusions, introduction, etc.). Transitions are limited and connections unclear. Presentation is poorly planned.</td>
<td>Logic of structure is not clear or sequential. All or most of the essential structural elements are missing, and major ideas are not clear. Listeners are confused. There are no transitions, and presentation seems unplanned.</td>
<td></td>
</tr>
<tr>
<td><strong>Style – Verbal Delivery</strong></td>
<td>Presentation is a planned conversation, paced for audience understanding. Voice is clear and articulated, and adds meaning to the presentation. Delivery is fluid and given with appropriate vocal varieties (not spoken in a monotone). Vocalized pauses such as “you know” and “um” are avoided.</td>
<td>Pacing is sometimes too fast or too slow. Vocalized pauses such as “you know” and “um” may be used occasionally. Vocal delivery generally works well. Presenter may struggle occasionally with articulation and/or volume. Voice is clear overall though may add little to the presentation.</td>
<td>Presentation is consistently either too fast or too slow. Presenter’s voice may be shaky or words are not clearly articulated. S/he can be heard only if listener is very attentive. Vocalized pauses such as “you know” and “um” are evident. Speaker lapses into a monotone several times.</td>
<td>Presenter talks too fast and cannot be heard. Information is read to audience. Presentation is not planned. Word enunciation is lacking. Vocalized pauses such as “uh”, “you know”, and “um” are widely used. Presenter speaks in a complete monotone.</td>
<td></td>
</tr>
<tr>
<td><strong>Style – Non-verbal Delivery</strong></td>
<td>Personal appearance is appropriate and professional for the occasion and the audience. Body language, such as posture, gestures, and stance reflects ease and confidence when interacting with audience. Speaker shows respect for client, team members, and material. Presenter maintains eye contact with the audience and is comfortable in front of the group.</td>
<td>Personal appearance is mostly professional and suitable for the audience and occasion. Body language (i.e. posture, stance) reflects comfort when interacting with audience, but may occasionally show a little disrespect or disconnect from team members, client, and material. Presenter lacks eye contact with audience due to reliance on notes. May face away or have a fixed gaze.</td>
<td>Personal appearance is somewhat unprofessional/inappropriate for the occasion and audience. Body language (i.e. stance, posture, gestures) reflects some anxiety or discomfort when speaking to or interacting with audience. Disrespect for or disconnect from client, team members, and material may be evident. Eye contact is minimal. Speaker avoids contact as if speaker avoids audience more than half the time.</td>
<td>Personal appearance is entirely unprofessional and inappropriate for the occasion and audience. Body language (i.e. stance, posture, gestures) reveals a reluctance to interact with audience. Presenter is obviously anxious. Disrespect or disconnect for client, team members, and material is evident during the presentation. Sustained eye contact is absent as speaker avoids audience more than half the time.</td>
<td></td>
</tr>
<tr>
<td><strong>Content: Depth and Accuracy</strong></td>
<td>Speaker provides an accurate and complete explanation of key concepts, citing literature. Information (names, facts, etc.) included in the presentation is consistently accurate. Presenter chooses good strategies to make information clear and provides the listener insights by taking them to a higher level of understanding.</td>
<td>Speaker gives some helpful explanations regarding the information (names, facts, etc.) and concepts included in the presentation, but some of the pertinent information is unclear or missing. Some citations are made. Strategies used to make information clear are somewhat inconsistent. Listeners gain insights, but are puzzled by one major or a few minor points.</td>
<td>Content is inaccurate or incomplete. Little attempt is made to tie concept to practice. Several errors in accuracy distract a knowledgeable listener. The listener must determine what parts of the information (names, facts, etc.) presented are useful and reliable. Citations are rarely made. Listeners get little insight from the presentation.</td>
<td>No reference is made to literature. Explanation of key concepts is not made, and information (names, facts, etc.) included is sufficiently inaccurate so that the listener cannot depend on the presentation as a source of accurate information. Listeners may have been misled and get no new insights regarding the information delivered.</td>
<td></td>
</tr>
</tbody>
</table>
## Group Oral Presentation Rubric (4-06)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Levels of Achievement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exemplary = 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Proficient = 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marginal = 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unacceptable = 0</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Score</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Oral Language Conventions
- Vocabulary level of presentation is appropriate for the audience. Presenter speaks in first person. Sentences are complete and grammatically correct. Slang/jargon and acronyms are avoided. The sentences flow together easily. Appropriate words are used to make ideas clear and concise for the listeners. Word choice is free from stereotypes and draws listeners in to the presentation.
- Vocabulary level and tense of presentation is generally appropriate. Most of the time sentences are grammatically correct and complete and flow together easily. Slang/jargon and acronyms may be used, but with a few exceptions, words are used to make ideas clear and concise while typically drawing in listeners. It is free from stereotypes with one or two minor exceptions.
- Aspects of presentation are too elementary or too sophisticated for audience. Some grammatical errors and use of slang/jargon are evident. Some sentences are incomplete, halting, and word choice is somewhat limited or inappropriate. Word choice may include some distracting bias. Listeners may be offended and put off.
- Listeners are so distracted by the presenter's obvious difficulty with appropriate vocabulary and grammar that they cannot focus on the ideas presented. Acronyms and slang/jargon are used frequently. Sentences are incomplete. Word choice may frequently reflect stereotypical opinions. Some, if not all, listeners will be offended or lose interest in the information presented.

### Group Interaction*
- It is apparent that the group was prepared and well-practiced. All members had a balanced amount of speaking time, and each member's response built upon the information delivered by the previous speaker in the group. Transitions between each speaker were smooth and connected ideas with previous information.
- Group appears to have practiced in preparation for the presentation. For the most part, all members had an equal amount of speaking time. The order of speakers generally compliments the information, but there are occasional overlaps or gaps in the material presented. Transitions between speakers in the group may be somewhat stiff.
- Presentation is not clearly coordinated. Delivery of the information is not balanced among the group. Lack of coordination among speakers leads to distortion of material for listeners (and/or group members). Transitions between speakers are weak.
- One speaker dominated the presentation and the other speakers did not have equal time to present information. There was limited coordination between speakers and transitions were either nonexistent or extremely confusing. It is extremely obvious that the group did not practice together in preparation for the presentation.

### Use of Communication Aids*(e.g., Transparencies, Slides, Posters, Handouts, Computer-Generated Materials)
- Communication aids enhance the quality of the presentation and are of professional quality. Font on visuals is large enough to be seen by all. Information is appropriate and is organized to maximize audience understanding. Electronic presentation features are minimized so that main points in text and tables stand out.
- Communication aids contribute to the quality of the presentation. They are adequately prepared. Font size is suitable for reading. Appropriate information is included. Some visual material is not ideally organized or presenters may have chosen not to use a visual aid where having one would increase clarity of tables or text.
- Communication aids are poorly prepared or used inappropriately and distract the listener. Font may be too small or too decorative to be easily seen. Too much information may be included or withheld. Unimportant material is highlighted. Text and tables may be difficult to understand, and listeners may be confused.
- No communication aids are used, or they are so poorly prepared that they detract from the presentation. Font is unreadable and it is difficult for audience to make sense of tables or text. Electronic presentation features are grossly misused and distract audience from the content.

---

Adapted from Oral Communication Rubric, Department of Educational Leadership and Policy Studies, Iowa State University. Copyright © 1995-2003. [http://www.educ.iastate.edu/elps/elpsrubrics.htm](http://www.educ.iastate.edu/elps/elpsrubrics.htm)

*Sources used for this section include:
Appendix E
Technical Content Assessment Rubric
## Technical Content Assessment Rubric (4-06)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Levels of Achievement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of Main Problem &amp; Formulation of Questions</td>
<td>Clearly and concisely identifies and articulates problems and opportunities to be solved and applies knowledge gained throughout the course.</td>
<td>Exemplary = 3</td>
</tr>
<tr>
<td></td>
<td>May have some difficulty formulating problem solving questions to move toward better understanding of the problem.</td>
<td>Proficient = 2</td>
</tr>
<tr>
<td></td>
<td>Uses very little agronomic/economic knowledge in the problem solving process. Does not justify or use sufficient external resources to adequately address the situation.</td>
<td>Marginal = 1</td>
</tr>
<tr>
<td></td>
<td>No questions pertaining to the client’s needs are identified. There is no main problem mentioned or addressed in the report on the whole. Exhibits little or no problem-solving skills.</td>
<td>Unacceptable = 0</td>
</tr>
<tr>
<td>Conceptual Framework</td>
<td>Creates and applies an in-depth framework (e.g., a flow diagram, other visual, written description, or mathematical statements) throughout the process. Uses framework to aid in problem-solving.</td>
<td>Exemplary = 3</td>
</tr>
<tr>
<td></td>
<td>Creates a clear description framework (e.g., a flow diagram, other visual, written description, or mathematical statements) to help formulate a model of the problem. May not be consistently used in an effective manner.</td>
<td>Proficient = 2</td>
</tr>
<tr>
<td></td>
<td>Creates vague/ambiguous frameworks that do not move the problem-solving process along.</td>
<td>Marginal = 1</td>
</tr>
<tr>
<td></td>
<td>Does not show an effective framework and fails to look at the solution relative to the original question.</td>
<td>Unacceptable = 0</td>
</tr>
<tr>
<td>Soil Sampling</td>
<td>For at least one field, reports the results of soil samples taken using two different sampling strategies. Explains the difference between those two strategies and selects one to use as a basis for making nutrient recommendations. Appropriately justifies the strategy used and recommends an appropriate plan for the next soil sampling cycle.</td>
<td>Exemplary = 3</td>
</tr>
<tr>
<td></td>
<td>For at least one field, reports the results of soil samples taken using two different sampling strategies. Lacks or provides little justification in explaining the difference between those two strategies and select one to use as a basis for making recommendations.</td>
<td>Proficient = 2</td>
</tr>
<tr>
<td></td>
<td>Uses one of two sampling strategies as a basis for making nutrient recommendations but doesn’t explain the difference between the strategies.</td>
<td>Marginal = 1</td>
</tr>
<tr>
<td></td>
<td>Makes no reference to the soil samples taken on the client’s property. Mentions nothing in regards to the importance of taking soil samples.</td>
<td>Unacceptable = 0</td>
</tr>
</tbody>
</table>
### Technical Content Assessment Rubric (4-06)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Levels of Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exemplary = 3</td>
</tr>
<tr>
<td><strong>Nutrient Recommendations</strong></td>
<td>Includes a summary table with soil test results and nutrient recommended application rates. Explains results and the ramifications of those results to the crops planned over the next three years. Evaluates testing results and determines if appropriate testing methods were used or suggests alternatives.</td>
</tr>
<tr>
<td></td>
<td><strong>Drainage</strong></td>
</tr>
<tr>
<td></td>
<td>Identifies hydric soils in the field correctly. Explains accurately the legal and management ramifications of hydric soils. Makes appropriate drainage and management recommendations considering any hydric soils that may be present.</td>
</tr>
<tr>
<td></td>
<td><strong>Soil Conservation</strong></td>
</tr>
<tr>
<td></td>
<td>Identifies potential HEL soils in fields and calculates whether or not particular fields are HEL. Accurately explains the legal and management ramifications of the HEL soils and fields accurately. Determines if management changes are needed and gives appropriate recommendations to stay in conservation compliance. Helps the client to manage those changes if appropriate.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Levels of Achievement</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Exemplary = 3</td>
</tr>
<tr>
<td><strong>Geographic Information System (GIS) and Mapping</strong></td>
<td>The report contains maps that spatially represent important soil and/or field characteristics. The report text contains detailed descriptions and discussions of the maps to improve the clients understanding of field variability and its management implications.</td>
</tr>
<tr>
<td><strong>Crop Management</strong></td>
<td>Justification for the recommendations contains sufficient crop management detail to improve the client’s understanding of the problems and their solution.</td>
</tr>
<tr>
<td><strong>Analysis and interpretation of data gathered</strong></td>
<td>Relates solution to theory &amp; research. Able to describe conclusions in a clear &amp; concise manner using experimental results &amp; those cited in the literature. Contrasts results with those expected from hypotheses. Accounts for any unexplained results.</td>
</tr>
<tr>
<td><strong>Farm Records</strong></td>
<td>Farm record (enterprise and whole farm) results are utilized to assist in developing trends and identifying strengths and weaknesses of the business. Record information is directly utilized in budget development and evaluation of future directions of the business operation. Solvency, profitability, and liquidity considerations are incorporated into the analysis and decision making process.</td>
</tr>
</tbody>
</table>
## Technical Content Assessment Rubric (4-06)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Levels of Achievement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Budgets</strong></td>
<td>Budgets (enterprise, partial, cash flow, and whole farm) are completely developed and expanded to include future analysis of enterprises not produced in the case farm production process. Cash flows are developed and machinery management and land purchase issues are addressed. Budget information utilized is justified regarding decision analyses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Budgets (enterprise, partial, cash flow, and whole farm) which are developed and utilized in the decision analysis only include enterprises produced, machinery resources and/or land currently farmed on the case farm. Provides little or no justification for decisions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prepares budgets but not clear how they are used in decision analysis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No budget information utilized in decision analyses.</td>
<td></td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td>Provides &amp; utilizes information on resources needed &amp; available. This includes an inventory of land, labor, capital, and management needed and available. This would include family resources and all other available resources.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provides information on resources needed and available. However, does not utilize resource information in decision recommendations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provides information on some resources available.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Does not include information pertaining to resources needed or available.</td>
<td></td>
</tr>
<tr>
<td><strong>Economic Management Recommendations</strong></td>
<td>Farm record results and budget information is utilized in developing marginal analysis for management decisions regarding the case farm. This would involve economic concepts such as marginality (marginal costs, marginal revenue, etc.). These concepts are used in the justification of decision recommendations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>An economic concept (i.e., marginality) is utilized in the decision analysis. However, little or no justification is provided pertaining to decision analyses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic concepts such as marginality are discussed but not clear on how they are used in the decision analyses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic concepts such as marginality (marginal costs, marginal revenue, etc.) are not utilized in the decision analyses.</td>
<td></td>
</tr>
</tbody>
</table>

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Appendix F
Evaluator Training Lesson Plans and Visual Aids
Evaluator Training

April 18, 2006
224 Curtiss
5-8pm

Agenda

1. Welcome and Introductions 15 minutes
   2. Assessment Procedures & Objectives 15 minutes
      a. Rubric essentials (Handouts 1 & 2)

DINNER BREAK

3. Divide into groups
   a. Oral Group – Cyndi Barnett, facilitator
      - Room 224
   b. Written Group – Dr. Lance Gibson, facilitator
      - Room 229

4. Rubrics & Training Pieces 15 minutes
   - Handouts 5 & 6 (rubrics)
   - Written Report
   - Oral presentation

5. Evaluation session – work independently 30 minutes
   Written group – distribute practice report & score using rubric
   Oral group – watch video & score using rubric

6. Group Discussion of Results 30 minutes

7. Questions 15 minutes

8. Conclusion – Handout data packets (marked with Evaluator name) 10 minutes
   Review Assessment Procedures
      - Oral (Handout #3) - Cyndi
      - Written (Handout #4) – Dr. Gibson

9. Thank you!
Evaluator Training

**Purpose:** The purpose of this training is to make clear to the evaluators the procedures to follow in assessing the written and oral data.

**Objectives:**
1. The evaluators will acquire the knowledge needed to accurately assess the data gathered from the study,
2. The evaluators will be able to utilize the correct rubric for each type of data (oral & written),
3. Evaluators will be able to identify essential aspects of written documents,
4. Evaluators will be able to identify essential aspects of oral presentation delivery,
5. The evaluators will be able to rate data appropriately, and
6. The evaluators will be trained the appropriate assessment procedures and protocol.

**Rubrics**

Introduce and explain the theory for using rubrics for accurate assessment (Huba & Freed, 2000). Hand out rubric example. Review each level of achievement for corresponding criteria.

**Focus:** Give written communication evaluators a written report.

Ask the evaluators to rate the example using the criteria of the Written Communication Assessment Rubric (Barnett, 2006) individually.
1. Ask each evaluator how they rated the example. Note each score on the board.
2. Ask each evaluator to share why they rated the example the way they did.
3. Discuss results, and answer questions &/or concerns.
4. Reach a consensus on an adequate score based on previous discussion.

**Focus:** Present an oral presentation to the evaluators.

After viewing, ask the evaluators to rate the example using the criteria of the Group Oral Presentation Rubric (Barnett, 2006) individually. This group will need to be in a separate room to watch a CD.
1. Ask each evaluator how they rated the example. Note each score on the board.
2. Ask each evaluator to share why they rated the example the way they did.
3. Discuss results, and answer questions &/or concerns.
4. Reach a consensus on an adequate score based on previous discussion.
Rubric Essentials

Handout #1

First…

What is a rubric? It is an instrument that “explains . . . the criteria against which . . . work will be judged” (Huba & Freed, 2000, p. 155). The Chicago Board of Education’s website (2000) states that a rubric is “a good set of scoring guidelines that provides a way to make judgments fair and sound. It does so by setting forth a uniform set of precisely defined criteria or guidelines that will be used to judge student work” (¶ 1).

Second…

What does a good rubric do? “It helps … define excellence and helps raters be accurate, unbiased and consistent in scoring” (Chicago Board of Education website, 2000, inset).

Third…

The instrument’s design and organization

1. **Levels of Mastery with Scoring Scale** – This rubric has four (4) columns. Each column has a label indicating the level of mastery with its corresponding score. For these rubrics, the levels include exemplary (score = 3), proficient (score = 2), marginal (score = 1), and unacceptable (score = 0).

2. **Dimension Groups** – Each row of the rubric designates a specific element that we, as researchers, believe is important in determining the quality of the data you are being asked to evaluate. There are a total of seven groups in the Group Oral Communication Rubric and five groups in the Written Assessment Rubric.

3. **Quality Characteristics** – Each group within the rubric contains a detailed explanation that describes the quality relevant to the level of mastery. In other words, for each level of mastery, a “description defining features of work” (Huba & Freed, 2000, p. 167) is provided. These descriptions supply the standard for you, as an evaluator, to determine the quality of the data being assessed.

Fourth…

“The rubric should organize and clarify the scoring criteria well enough so that two [raters] who apply the rubric to a student's work will generally arrive at the same score. The degree of agreement between the scores assigned by two independent scorers is a measure of the reliability of an assessment” (Chicago Board of Education website, 2000, ¶ 2).

Sources:


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## Rubric Components

<table>
<thead>
<tr>
<th>Levels of Mastery with Scoring Scale</th>
<th>Criteria</th>
<th>Exemplary = 3</th>
<th>Proficient = 2</th>
<th>Marginal = 1</th>
<th>Unacceptable = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organization</strong></td>
<td></td>
<td>Presentation is clear, logical and sequential with a well-constructed introduction, body, and conclusion. Listener can follow line of reasoning because presenter makes clear transitions between main points.</td>
<td>Presentation is generally clear and sequential. It contains a workman-like introduction, body, and conclusion. Listener may be confused due to unclear transitions between key points.</td>
<td>Listener must follow presentation with effort. Presentation is not clear due to weak or missing components (conclusions, introduction, etc.). Transitions are limited and connections unclear. Presentation is poorly planned.</td>
<td>Logic of structure is not clear or sequential. All or most of the essential structural elements are missing, and major ideas are not clear. Listeners are confused. There are no transitions, and presentation seems unplanned.</td>
</tr>
<tr>
<td><strong>Style – Verbal Delivery</strong></td>
<td></td>
<td>Presentation is a planned conversation, paced for audience understanding. Voice is clear and articulated, and adds meaning to the presentation. Delivery is fluid and given with appropriate vocal varieties (not spoken in a monotone). Vocalized pauses such as “you know” and “um” are avoided.</td>
<td>Pacing is sometimes too fast or too slow. Vocalized pauses such as “you know” and “um” may be used occasionally. Vocal delivery generally flows well. Presenter may struggle occasionally with articulation and/or volume. Voice is clear overall though may add little to the presentation.</td>
<td>Presentation is consistently either too fast or too slow. Presenter’s voice may be shaky or words are not clearly articulated. She can be heard only if listener is very attentive. Vocalized pauses such as “you know” and “um” are evident. Speaker lapses into a monotone several times.</td>
<td>Presenter talks too fast and cannot be heard. Information is read to audience. Presentation is not planned. Word enunciation is lacking. Vocalized pauses such as “uh”, “you know”, and “um” are widely used. Presenter speaks in a complete monotone.</td>
</tr>
<tr>
<td><strong>Style – Non-verbal Delivery</strong></td>
<td></td>
<td>Personal appearance is appropriate and professional for the occasion and the audience. Body language (i.e. posture, stance) reflects ease and confidence when interacting with audience. Speaker shows respect for client, team members, and material. Presenter maintains eye contact with the audience and is comfortable in front of the group.</td>
<td>Personal appearance is mostly professional and suitable for the audience and occasion. Body language (i.e. posture, stance) reflects comfort when interacting with audience, but may occasionally show a little disrespect or disconnect from team members, client, and material. Presenter lacks eye contact with audience due to reliance on notes. May face away or have a fixed gaze.</td>
<td>Personal appearance is somewhat unprofessional/inappropriate for the occasion and audience. Body language (i.e. stance, posture, gestures) reflects some anxiety or discomfort when speaking to or interacting with audience. Disrespect or disconnect from client, team members, and material may be evident. Eye contact is minimal as speaker avoids turns from audience nearly half the time.</td>
<td>Personal appearance is entirely unprofessional and inappropriate for the occasion and audience. Body language (i.e. stance, posture, gestures) reveals a reluctance to interact with audience. Presenter is obviously anxious. Disrespect or disconnect for client, team members, and material is evident during the presentation. Sustained eye contact is absent as speaker avoids audience more than half the time.</td>
</tr>
</tbody>
</table>

**Scoring Area** **TOTAL SCORE**

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*Sources used for this section include*


Training tool developed by Cyrill Barnett Copyright © 2006
Oral Presentation Assessment Procedures

Handout #3

Attached to this training document are enough rubrics to be used for each assessment. The CD contains video of the oral presentations and is accessible using RealPlayer® on your computer. We have provided sheets of paper for you to make any necessary comments for your convenience. Please keep all data in a safe and confidential place.

Directions to access files are as follows:

Slip the CD into your CD drive. A dialog box will come up on your screen. It will be labeled “EvalTrnApr06.__ (the number of the CD). Choose “open folder to view files using Windows Explorer” and click the “OK” button. Another box with six files will come up. Each file is accessible only through RealPlayer®. If you do not have this program on your computer, you may go to www.real.com and follow the directions for their free download. You will notice that each file has an alpha/numeric name. This is the file’s special identification number. Please note this identification number in the space provided in the upper right corner of the rubric. Double click on a file. RealPlayer® will open automatically starting the first oral presentation. You may hear audio before you see the visual; however, the picture will come up in about 5 – 10 seconds. When you are finished, simply hit the “X” in the upper right corner and select another file from your explorer window.

Please do not confer with the other members of the assessment team. Please return the packets and all materials by April 28, 2006. Return them to Cyndi Barnett, 223A Curtiss Hall in the envelopes provided. You will then receive a second set of data that is due May 10, 2006.

The researchers appreciate your willingness to volunteer.
Written Report Assessment Procedures

Handout #4

Attached to this training document are enough rubrics to be used for each assessment. Please notate the data identification number in the space provided in the upper right corner of the rubric. This number is on the cover sheet of each report. **PLEASE DO NOT WRITE ON THE REPORTS!** We have provided sheets of paper for you to make any necessary comments for your convenience. Please keep all data in a safe and confidential place.

Please *do not* confer with the other members of the assessment team. Please return the packets and all materials by April 28, 2006. Return them to Cyndi Barnett, 223A Curtiss Hall in the envelopes provided. You will then receive a second set of data that is due May 10, 2006.

The researchers appreciate your willingness to volunteer.

Produced by Cyndi Barnett
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References


