ABSTRACT

THE EFFECTIVENESS OF WEB-BASED INSTRUCTION IN SUPPORTING TEACHERS IN IMPLEMENTING INQUIRY-BASED INSTRUCTION

By Amanda Jane Harris Byers

The purpose of this paper was to investigate the effectiveness of a web-based learning environment in supporting the participants in implementing a new instructional technique. This paper also investigated the expectations of those participants enrolled in the web-based learning environment. The data in this study was obtained during a previous study of a graduate-level on-line course. Pre and post-surveys were given to the participants of the course and a group of teachers who had participated in a previous, more traditional course. The data was analyzed through MANCOVA and ANCOVA. Open-ended questions were summarized to obtain more information about the expectations of the course. The results showed that those who participated in the web-based course felt more supported in implementing the instructional technique in their classrooms than those who had not participated. Qualitative analysis resulted in a variety of course expectations listed by those enrolled in the web-based learning environment.
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TEACHERS IN IMPLEMENTING INQUIRY-BASED INSTRUCTION

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CHAPTER I

Introduction

As technology becomes more integrated into the everyday lives of individuals, it has also become a low-cost training tool. An increased number of professionals have turned to the Internet as a convenient way to train those in their field in new techniques and changes. Educators are among this group of professionals (Salmon, 2000). About one-half of all college level courses offered in the United States integrate the Internet into the coursework (Merisotis, 2002). The Internet can be used to support classroom instruction as an outside resource for students (Merisotis, 2002) or a place for out-of-class discussions (Driver, 2002). Entire courses can also be given over the Internet, sometimes referred to as web-based instruction or web-based learning environments (Thurmond, Wambach, Connors, & Frey, 2002). This study examines the effectiveness of such a course.

Many advantages and disadvantages of web-based learning environments have been cited in research. Often web-based learning environments attract students with flexible schedules (O’Donoghue, Singh, & Dorward, 2001), lower costs (O’Donoghue et al., 2001; Salmon, 2000), and an increased ease of communication (Berge & Collins, 1995; Perez-Prado & Thirunarayanan, 2002; Seng & Mohamad, 2002). However, students are often discouraged from enrolling in or completing web-based learning environments due to a lack of structure (Essex, 2002; Hill, Raven, & Han, 2002), an increased amount of time spent on coursework (Thurmond et al., 2002), and the technology available to the student (Essex, 2002; Merisotis, 2002). Research has also found that web-based learning environments have a significantly higher drop-out rate than traditional courses. A number of reasons such as feelings of isolation, lack of motivation, and frustrations with technology have been given as explanations (Hill et al., 2002; King, 2002).

Studies have examined many factors that are believed to affect the quality of the education received through these courses. These factors include interaction among students, student satisfaction, course completion, and student characteristics (Angeli, Valanides, and Bonk, 2003; Driver, 2002; Hill et al., 2002; King, 2002). It is believed that social factors play the largest role in determining the effectiveness of an on-line course (King, 2002). However, the depth of this interaction has been called into question.
Researchers believe that the level of communication that occurs in some web-based courses does not sufficiently demonstrate critical thinking skills (Angeli et al., 2003). Therefore, it is still undecided amongst researchers which characteristics significantly affect the effectiveness of web-based learning environments.

A limited amount of research has been completed evaluating the effectiveness of these web-based learning environments (Perez-Prado & Thirunarayanan, 2002). While many articles and books have been written about distance learning and web-based learning environments, much of the work are opinion pieces, how-to articles and second hand reports; most lacking actual research or empirical data (Merisotis, 2002). Due to the limited amount of empirical research available on this topic and the conflicting findings of some reports, the effectiveness of web-based learning environments in supporting individuals in their professional practice is still a topic of much debate (Perez-Prado & Thirunarayanan, 2002). This study sought to provide more insights into how effective web-based instruction can be in supporting individuals in implementing new ideas and technologies into their work. It was expected that the teachers who completed the on-line course in this study felt more supported in their efforts to implement inquiry-based instruction in their classrooms than those who did not complete the course. The participants’ responses to open-ended questions were summarized and compared to the literature in order to obtain more qualitative information about the effectiveness of the web-based learning environment.
Chapter II
Review of Literature

Over the past decade, technology and the Internet has changed education in various ways. Colleges and universities are integrating technology into instruction and increasing the number of web-based learning environments at rapid rates. A variety of professions have also turned to the Internet to train those in their field through computer-based instruction. These web-based learning environments are often used to teach new methods and give professionals support in implementing these methods. Professionals in the field of education are no exception (Salmon, 2000).

Background

The World Wide Web has spread rapidly through higher education and is being used in a variety of ways for instructional purposes (Merisotis, 2002; Perez-Prado & Thirunarayanan, 2002). Examples of these changes include the increased number of resources available for teachers on the Internet, the increased number of college courses and degrees available on-line, the increased number of computers readily available to educators and students, and the growing associations between technology, network providers, publishers, and educational institutions (Perez-Prado & Thirunarayanan, 2002; Salmon, 2000). As of 2002, one half of all college courses offered in the United States integrated the Internet into the coursework in some way (Merisotis, 2002). It was also estimated that one out of ten American college students would take at least one distance education course (Merisotis, 2002). As of 2002, it was estimated that 25,730 courses were offered through distance education and 700 degrees could be earned by taking purely distance education courses (King, 2002). Universities and colleges are also increasing the use of technology in graduate level courses (O’Donoghue et al., 2001). With the demand for distance learning on the rise, some colleges are moving funds away from campus reconstruction projects and towards expanding distance learning programs (Merisotis, 2002). Businesses and industries are also beginning to offer professional development courses through distance education (King, 2002).

There are many different types of distance education formats and each type integrates technology in various ways. There are also varying degrees to which the Internet can be integrated into the course work of a class. A professor may use the Internet as a tool to refer students for resources (Salmon, 2000). A class might be web-
enhanced. This type of course still meets in a traditional classroom (Driver, 2002). However, a great deal of discussion is done outside of class through Internet chats and discussion boards. Some classes are based almost completely on the Internet (Thurmond et al., 2002). This study examines such a course, which may be referred to as web-based instruction.

**Advantages and Disadvantages of Distance Learning and Web-based Instruction**

Universities are beginning to realize the numerous advantages of distance learning which might make it a more appealing option for students rather than the traditional classroom courses (O’Donoghue et al., 2001). One advantage to distance learning is the expense. Often, distance learning courses are less expensive than classes held in a traditional classroom. The Internet is being viewed as a low cost tool for distributing information and resources to students (O’Donoghue et al., 2001; Salmon, 2000).

Another benefit of web-based instruction is flexibility. Students are not constrained to a place or, often, a time to meet. Students who would not have enrolled in a course due to other commitments often enroll in on-line courses and cite flexibility as a reason. Many on-line courses allow students to complete assignments at their convenience. Students may enroll in a variety of curriculums and participate at any time and in a variety of locations. Students enrolled in web-based learning environments often have the flexibility to learn and participate at their own pace (Chuang & Tsai, 2005). As the lifestyles of a many people become busier, it is believed that more people view web-based learning environments as a more practical option (O’Donoghue et al., 2001). Web-based learning environments also allow students to interact more often than the times the class meets during the week. The number of times students can interact is virtually unlimited (Perez-Prado & Thirunarayanan, 2002; Seng & Mohamad, 2002).

A large emphasis has been placed on discussion in web-based learning environments. Some researchers believe that students in web-based learning environments are more open to discussion (Lapadat, 2003). Often, those groups such as women, racial minorities, and age group minorities, whom research has shown to be typically quieter during classroom discussion, become more expressive in web-based discussions. The ease of communication among people is listed as one of the main strengths of web-based instruction (Berge & Collins, 1995). On-line communication allows groups of people with similar interests and ideas to connect (Salmon, 2000). In
web-based learning environments, the interaction between the students can be just as important as the interaction between the teacher and the students (Driver, 2002). In one study, Driver (2002) found that students enrolled in an on-line graduate course perceived that class interaction and student satisfaction was positively affected by small group interaction. Another study by Perez-Prado & Thirunarayanan (2002) had similar results. Students in this study reported a strong connection between interaction with peers and the learning process. They believed that learning was more interesting when the class interacted more.

While many benefits exist, there are also some disadvantages to distance education. One disadvantage is the lack of structure. Students often need to be self-motivated in order to complete assignments as they may receive little structure from instructors. Due to the lack of face-to-face interaction, students are often forced to hold themselves accountable for keeping up with the coursework (Essex, 2002; Hill et al., 2002). Often they must guide themselves through the materials offered in their coursework, with little assistance from an instructor. Motivation can be a major factor in determining instructional effectiveness in a web-based learning environment (Thompson & Lynch, 2003). A major complaint of students cited in research is the amount of time students and professors spend on the coursework. Many feel that they spent significantly more time on the coursework for their web-based learning environments than for their traditional classroom courses (Thurmond et al., 2002).

Another disadvantage that has been cited in literature is the technology available to each individual student (Essex, 2002). Students in web-based learning environments can be limited by the type of technology available to them and by their knowledge of this technology (Hill et al., 2002). Another disadvantage to web-based instruction is the number of students to which this opportunity is available. At the present, web-based instruction is not considered an equal educational opportunity. Many parts of the United States, Africa, and Europe do not have the technology as readily available to certain populations. These populations include ethnic minorities, individuals with low socioeconomic status, and residents of non-urban areas (Merisotis, 2002).

Another problem with web-based instruction is the number of students who complete the course. Studies have found that web-based learning environments often have more students drop out than traditional classroom courses. Several reasons have
been given to explain this phenomenon. These reasons include lack of motivation on the part of the students, a feeling of isolation by the students, lack of prior experience with distance learning, external demands, frustrations with technology, or not feeling supported in their work (Hill et al., 2002; King, 2002).

Measuring the Effectiveness of Web-Based Learning Environments

After reviewing the literature, it becomes evident that there is no consensus on the best way to measure the effectiveness of a web-based learning environment. Many different characteristics of web-based instruction have been studied as to how that characteristic relates to the effectiveness of the course. One element is the learning process. Some researchers believe that web-based instruction is more effective because students become more invested in the learning process and instructors can more easily examine this process and provide the appropriate scaffolding for the students (Seng & Mohamad, 2002; Thurmond et al., 2002). One study by Perez-Prado & Thirunarayanan (2002) examined the differences in the perceptions of students taking a college course. One group was taking the course through an on-line classroom and one group was taking the course in a traditional classroom. Perez-Prado & Thirunarayanan found that the interaction among the students in the on-line classroom fortified the learning process as well as made it more enjoyable. Students in the on-line classroom also felt that the web-based instruction placed more responsibility for learning on the learner. Often web-based learning environments are controlled more by the student than by the teacher, turning the classroom into a “learning community” (Berge & Collins, 1995).

Another characteristic is communication. Web-based instruction often allows for a combination of various forms of communication to occur at the same time. Elements of writing combine with thinking and publishing to form something that resembles verbal communication (Salmon, 2000). This is often referred to as computer mediated communication. There are various ways in which students in web-based learning environments can communicate. These include e-mail, chat rooms, and discussion boards (Berge & Collins, 1995). Some of these forms, such as discussion boards, offer asynchronous communication, meaning students post messages at their convenience and are not involved in a rapid response conversation with one another (Salmon, 2000).

Researchers believe that this communication, or social interaction, is a strong determinant in the effectiveness of a web-based learning environment (Angeli et al.,
It is believed that in order for a web-based learning environment to be successful, it must allow members to feel as though they are part of a collaborative community of learners (King, 2002). Researchers also suggest that web-based learning environments allow for increased social interaction, which allows students to develop critical thinking skills (Angeli et al., 2003). Learner satisfaction can often be linked to the amount of interaction perceived by the students (Perez-Prado & Thirunarayanan, 2002). Some researchers conclude that the discussion boards used by many web-based learning environments allow students to be more reflective in their responses and discussions as they have more time than when responding in a classroom discussion (Driver, 2002; Salmon, 2000). In her study, Driver (2002) examined the interactions that occurred in a web-based learning environment and the students’ perceptions of these interactions. The findings led her to suggest that high levels of group interaction guided by on-line discussions positively affected the perceptions of group interaction and class satisfaction. This means that student satisfaction is related to perceived levels of group interaction. The researcher went on to suggest that interaction between learners in small group settings can substitute for the interaction that occurs between the instructor and the learners in the whole class environment.

While the above research suggests that students can interact as well over the Internet as they can face-to-face, some research suggests that face-to-face interaction among people is preferred (O’Donoghue et al., 2001). Researchers have found that online interaction is not always as meaningful as the interaction that occurs in a traditional classroom. In their study examining the quality of interactions in a web-based learning environment, Angeli et al. (2003) found that most of the interactions in the on-line discussions were personal experiences rather than well supported reasoning. Therefore, limited critical thinking skills were used in the discussions. The researchers also found that students were answering questions and creating dialogue, not due to pure interest in the topic but, because it was a requirement of the class. Often students would ask only low level questions. The researchers were unsure of how effective this level of communication was in supporting the students in the class and the development of critical thinking skills.

Another communication problem in web-based learning environments is the speed of the discussion. Often, members will not receive feedback in an efficient
manner. This can be problematic for students during times of high emotional stress (e.g., questions about assignments, technical difficulties). Instant feedback is often a rare event. E-mail can often be easy for students and teachers to ignore (Clift, Mullen, Levin, & Larson, 2001). Another problem is that the interaction in web-based learning environments can often be misleading. Students may be prone to developing false identities in web-based learning environments (Clift et al., 2001). It can also be easy to misinterpret the remarks made by others in the classroom without the visual aid of body language (Thurmond et al., 2002).

As previously mentioned, one major concern with web-based instruction that has become evident over the years is the number of students who complete the course. Studies have found that web-based learning environments often have more students drop out than traditional classroom courses. Several reasons have been given to explain this phenomenon. Many of these reasons can be related to student characteristics (e.g., lack of motivation, a feeling of isolation by the students, lack of prior experience with distance learning, external demands, frustrations with technology, or not feeling supported in their work) (Hill et al., 2002; King, 2002). Therefore some researchers believe that student characteristics play a large role in determining the effectiveness of web-based learning environments. These may include lack of prior experience with distance learning, conflicts with motivational demands, and experience with course content (Hill et al., 2002, Thurmond et al., 2002). However, King (2002) suggests that social factors play a larger role than technical factors in determining the success or failure of a web-based learning environment. Thurmond et al. (2002) examined the impact of student characteristics on the effectiveness of a web-based learning environment. They found that 47.5% of the students enrolled were satisfied with their experiences in the on-line classroom and 31.6% were not. They also found that student characteristics did not influence the web-based learning environment or student satisfaction. Therefore, student characteristics may not play a large role in the effectiveness of a web-based learning environment.

Suggestions for the Future

Based on the above research in web-based instruction, researchers have made many suggestions in improving web-based learning environments. One of these suggestions is to offer “electronic office hours”. These office hours would be a set time
in which students knew an instructor could be reached. This could enable students to feel more supported in their coursework. Another tool suggested by a researcher is the use of a virtual student to model how students should approach the course. This student can be used to open up communication in discussion groups or to ask questions about certain projects or assignments (King, 2002). Community-building activities are also recommended to keep students from feeling isolated. This could be accomplished by helping students feel that they belong through the classroom discussions. Overall, the teachers need to be very active and strive to create a supporting environment for their students (Hill et al., 2002).

**Previous Research**

The increased emphasis on distance learning in higher education and professional development might lead some to believe that no significant difference exists between the outcomes of a traditional classroom and the outcomes of distance learning (Merisotis, 2002). However, this is a topic that is yet to be settled through empirical data. Due to the rapid changes occurring in the field of technology, little empirical research has been conducted on the effectiveness of web-based instruction, on-line courses, or distance learning (Perez-Prado & Thirunarayanan, 2002). The empirical studies that have been published offer conflicting findings (Perez-Prado & Thirunarayanan, 2002). These studies also use instruments with questionable reliability and validity (Merisotis, 2002). Therefore, the debate over the effectiveness of web-based instruction in higher education is still being argued.

A limited amount of quantitative research has been completed on the effectiveness of web-based learning environments. With the demand for distance learning growing at a rapid rate, this research is imperative to aid in determining course structures and expectations (King, 2002; Merisotis, 2002). This study attempted to provide more insights into how effective web-based instruction can be in training professionals, particularly those in the education field. While this study examined teachers in a graduate level course, it was believed that the findings could be generalized to other professional training courses, including those in school psychology. With the rapidly growing number of courses offered on-line, many professionals may choose to take a professional development course over the Internet. This study sought to examine how effective these courses might be in training such professionals.
This study used data collected during an evaluation of the iDiscovery program at Miami University in Ohio. The iDiscovery program was designed as a follow up course for the OSI-Discovery Workshops. The original, more traditional workshops focused on the background of inquiry-based lessons and curricula, how to design, implement, and support inquiry-based lessons and curricula, and modify or revise inquiry lessons to meet student, teacher, and curriculum needs. The iDiscovery workshops were designed to provide students with long-term support in implementing the skills they had just acquired in the classroom. The iDiscovery courses were held on-line with one face-to-face meeting. The objectives of this course were as follows:

Upon completion of the course, the participants will be able to:

- Feel more invested and supported in Discovery activities
- Communicate with other teachers about their teaching practices
- Feel more comfortable and competent learning with technology
- Implement core Discovery best-practice goals

The iDiscovery course consisted of approximately twelve individual lessons. Students were asked to develop and post lesson plans which implemented inquiry-based instruction. The students were then required to comment on the lesson plans posted by their peers. Some lessons also encouraged students to review resources available for them on the Internet (e.g., the Ohio Resource Center web-site) and discuss these resources with their peers. Communication in the class was accomplished primarily through discussion boards and secondarily through e-mail. Both of these are forms of asynchronous communication, meaning the students posted messages at their leisure and instant communication did not occur.

The data collection for the evaluation of the effectiveness of the iDiscovery workshops was completed in fall of 2003. The course was evaluated through the use of on-line and hard copy pre and post-surveys. Course participants were given a pre-survey at the beginning of the course and a post-survey at the end of the course. Hard-copy surveys were sent to a group of teachers who had participated in the original Discovery course. The surveys were tested in a pilot study during the fall of 2002.
Purpose

The purpose of this study was to examine the effectiveness of the iDiscovery course in supporting students in implementing inquiry-based instruction in their classrooms. In order to explore this, the participants’ responses to the close-ended questions dealing specifically with perceived support levels on the surveys were analyzed. The participants’ responses to the open-ended questions on the surveys were then summarized. It was believed that their responses to the open-ended questions provided insights into why they did or did not feel supported in the iDiscovery course.

Hypotheses

It was hypothesized that the participants who took part in the iDiscovery course would feel more supported in implementing inquiry-based instruction in their classroom than those teachers who did not participate in the web-based learning environment. In order to obtain more information about why the participants did or did not feel supported and about their expectations for the web-based learning environment, open-ended questions were summarized and compared to the literature previously reviewed.
CHAPTER III
Methodology

Participants

Experimental Group. The experimental group was composed of 159 teachers and administrators who completed the iDiscovery workshop in the spring of 2003. A majority of the participants were teachers; two people identified themselves as administrators. Of these participants, 140 provided demographic information, 165 completed a pre-survey, 135 completed a post-survey, and 90 completed both the pre and post-surveys. Please refer Table1 for more demographic information concerning the experimental and control groups.

Control Group. The control group included mainly teachers who had taken earlier training in inquiry-based instruction but who were not in the present workshop group. Pre-surveys were sent to seventy-five teachers who were randomly selected from a list of teachers who had previously received instruction in inquiry through the Discovery course offered at Miami University, Ohio. Thirty-four people returned a pre-survey, which included questions concerning demographic information; five people responded that they were not able to complete the survey. Thirty-five people returned a post-survey.
Table 1: Demographical comparisons between experimental and control groups

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23 (16.4%)</td>
<td>3 (8.8%)</td>
</tr>
<tr>
<td>Female</td>
<td>117 (83.6%)</td>
<td>31 (91.2%)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>16 (11.4%)</td>
<td>2 (5.9%)</td>
</tr>
<tr>
<td>Appalachian</td>
<td>15 (10.7%)</td>
<td>1 (2.9%)</td>
</tr>
<tr>
<td>White</td>
<td>107 (76.4%)</td>
<td>31 (91.2%)</td>
</tr>
<tr>
<td>Average number of years taught</td>
<td>12.6</td>
<td>16.1</td>
</tr>
<tr>
<td>Average amount of time spent on teaching math or science daily</td>
<td>148.3</td>
<td>155.1</td>
</tr>
<tr>
<td>Average number of on-line course previously taken</td>
<td>.4</td>
<td>.5</td>
</tr>
</tbody>
</table>

**Procedures**

Materials. The instruments were pre and post Likert surveys that measured the objectives of the project. The instructor pre-survey consisted of forty-six questions. The instructor's post-survey was made up of seventy-one questions. The experimental pre-survey consisted of fifty questions. The experimental post-survey was made up of fifty-three questions. The control pre-survey consisted of seventy-two questions. The post-survey for the control group contained sixty-nine questions. For the purposes of this study, only those questions dealing directly with perceived levels of support were analyzed. The instruments were piloted with participants of the fall 2002 iDiscovery workshops. The instruments were developed based on the iDiscovery course objectives and from two lists from the National Research Council entitled Changing Emphases (throughout the System) and Changing Emphases to Promote Inquiry. After the surveys had been piloted, analyses were run to determine which questions produced varying responses. Any questions that did not produce an array of responses were dropped from the survey. Comments from the course developers and participants as well as length of the surveys were also taken into consideration when editing the surveys.

The surveys used in the original study were believed by the authors to be valid. Content validity was controlled for in a variety of ways. The instruments were developed according to the objectives of the course. They were consistent with inquiry-based
instruction guidelines as stated by the Ohio Department of Education. In addition, the individuals who designed the iDiscovery training program examined the surveys. These individuals considered the instruments consistent with the training objectives. The reliability of the instruments was measured in the current study by comparing the responses of the control group on the pre-survey to the responses on the post-survey. Results of this analysis can be found in Table 2. Since this group received no treatment, the repeated data collection can be considered a measurement of test-retest reliability. Based on this analysis, the test-retest reliability varied based on the section of the survey. A three month period passed between completions of the two surveys for the control group. These associations should have been higher if the test-retest reliability were measured in a typically shorter interval of two to three weeks. Internal reliability was assessed through completion of a Cronbach’s Alpha analysis. Results of this analysis can be found in Table 3. Results of this analysis suggest that the control surveys had relatively strong internal reliability.
Table 2: Test-Retest Reliability

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Pearson Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-survey Part A/Post-survey Part A</td>
<td>.034</td>
<td>.89</td>
</tr>
<tr>
<td>Pre-survey Part B/Post-survey Part B</td>
<td>-.358</td>
<td>.159</td>
</tr>
<tr>
<td>Pre-survey Part C/Post-survey Part C</td>
<td>.261</td>
<td>.295</td>
</tr>
<tr>
<td>Pre-survey Part D/Post-survey Part D</td>
<td>.549</td>
<td>.022</td>
</tr>
<tr>
<td>Pre-survey Part E/Post-survey Part E</td>
<td>-.298</td>
<td>.202</td>
</tr>
<tr>
<td>Pre-survey/Post-survey</td>
<td>-.229</td>
<td>.332</td>
</tr>
<tr>
<td>Pre-survey “Being supported in Discovery/Dragonfly activities”/ Post-survey “Being supported in Discovery/Dragonfly activities”</td>
<td>-.195</td>
<td>.409</td>
</tr>
<tr>
<td>Pre-survey “Being supported in incorporating technology into teaching math/science”/ Post-survey “Being supported in incorporating technology into teaching math/science”</td>
<td>-.125</td>
<td>.600</td>
</tr>
<tr>
<td>Pre-survey “Being supported in implementing inquiry-based instruction”/ Post-survey “Being supported in implementing inquiry-based instruction”</td>
<td>.066</td>
<td>.784</td>
</tr>
</tbody>
</table>

Table 3: Internal Reliability

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Pre-survey</td>
<td>.732</td>
</tr>
<tr>
<td>Control Post-survey</td>
<td>.828</td>
</tr>
</tbody>
</table>

Data Collection. This study used data collected in a previous study. The data was collected in the following manner. The iDiscovery instructors asked their students to complete an on-line pre-survey at the beginning of the course and an on-line post-survey at the completion of the course. In order to maintain anonymity, members of the experimental group were asked to identify themselves through an identification number (the last five digits in their social security number). Hard copies of the surveys were mailed to the control group. They also had the option of taking the survey on-line. The control group was given an identification number to use in order to hide their identity.
Data Analysis. Multiple analysis of variance (MANOVA) and analysis of covariance (ANCOVA) were used to examine the impact of the training on the experimental group using the pre-survey as the covariant. This analysis compared the differences on the post-survey between the experimental and control groups to examine the effect of the treatment on the experimental group. The first hypothesis, which stated that those enrolled in the web-based learning environment would feel more supported in implementing inquiry-based instruction in their classroom than those not enrolled in the web-based learning environment, was evaluated through analysis of three questions from the pre and post surveys for both groups. One question from the pre and post-surveys directly measured the level of support the participants in the experimental and control groups felt that they had in implementing the inquiry-based instruction technique in their classrooms. This question asked the respondents to rate on a scale of one to ten the amount of support they felt in implementing the inquiry-based instruction in their classrooms. One indicated the lowest level of support and ten indicated the highest level of support. Two additional questions were also analyzed to obtain more information about support levels in reference to other areas. The first question asked the participants to rate on a scale of one to ten how supported they felt in Discovery and Dragonfly activities with one indicating the lowest level of support and ten indicating the highest level of support. The second question asked participants to rate on a scale of one to ten the level of support they felt in incorporating technology into teaching math and science. Again, one indicated the lowest level of support and ten indicated the highest level of support.

The open-ended questions were then analyzed in order to gain more information as to the participants’ reasoning for their responses to the close-ended questions and to examine course expectations. Their responses to the open-ended questions were reviewed and categories were constructed based on common themes in the responses. The number of times each theme was mentioned in the responses was tallied and percentages were calculated.
CHAPTER IV
Results

Quantitative Analysis

The first hypothesis stated that those enrolled in the web-based learning environment would feel more supported in implementing the inquiry-based instruction in their classrooms than those who did not enroll in the follow-up course. This hypothesis was supported in a number of ways. According to the data collected, there was a significant difference between the amount of support the iDiscovery participants reported feeling in implementing the inquiry-based instruction and the level of support the control group felt they had in implementing the techniques. A MANCOVA of the data was conducted using the post-survey responses concerning the level of support the participants felt as the dependent variable and the corresponding pre-survey responses as the covariates to compare the experimental group with the control group. A significant difference was found between the groups, $F(2, 87) = 16.405, p < .001$. This suggests that the experimental group reported a greater change in levels of support than the control group when responding to all three questions.

Follow-up ANCOVAs revealed a significant relationship between the covariates and dependent variables in the participants’ responses to the support they had for incorporating technology into teaching math and science, $F(1,89) = 6.2, p = .014$, and the support they had for implementing inquiry-based instruction in the classroom, $F(1, 89) = 8.83, p = .004$. This suggests that there was a significant difference between the pre-survey and the post-survey for the two groups combined in these two areas.

An ANCOVA revealed a significant difference between the support the groups had in implementing inquiry-based instruction, $F(1, 89) = 13.47, p < .001$. The level of support the experimental group reported on the pre-survey ($M = 8.0, SD = 2.63$) increased significantly more on the post-survey ($M = 8.8, SD = 2.09$) than the increase between the control group’s responses on the pre-survey ($M = 6.7, SD = 2.26$) and post-survey ($M = 6.0, SD = 3.21$), which actually decreased between the two surveys. This demonstrates the first hypothesis appears to be supported as the experimental group reported feeling more supported in implementing the inquiry-based instruction in the classroom than the control group (see Table 4 and Chart 3).
Another area of significance was the difference between the groups in the change between the participants’ responses on the pre-survey and the post-survey in how supported they felt in incorporating technology into teaching math and science, $F(1, 89) = 6.36, p = .013$. This reveals that the level of support the experimental group reported on the pre-survey ($M = 6.1, SD = 2.74$) increased significantly more on the post-survey ($M = 7.7, SD = 2.02$) than the increase between the control’s responses on the pre-survey ($M = 6.6, SD = 2.63$) and post-survey ($M = 6.3, SD = 2.59$), which actually decreased between the two surveys (see Table 4 and Chart 2). Also significant was the change between the participants’ responses on the pre-survey and the post-survey in how supported they felt in the Discovery/Dragonfly activities, $F(1, 89) = 46.16, p < .001$. This reveals that the level of support the experimental group reported on the pre-survey ($M = 5.6, SD = 2.99$) increased significantly more on the post-survey ($M = 8.0, SD = 1.92$) than the increase between the control’s responses on the pre-survey ($M = 5.3, SD = 3.19$) and post-survey ($M = 4.0, SD = 3.00$), which, again, decreased (see Table 4 and Chart 1).

Table 4: Descriptive Statistics

<table>
<thead>
<tr>
<th>Survey Questions</th>
<th>Group</th>
<th>Pre-Survey</th>
<th>Post-Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate your level at this point on being supported in Discovery/Dragonfly activities.</em></td>
<td>Experimental</td>
<td>5.6</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>5.3</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.99</td>
<td>1.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.19</td>
<td>3.00</td>
</tr>
<tr>
<td><em>On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate your level at this point on the support you have for incorporating technology into teaching math/science.</em></td>
<td>Experimental</td>
<td>6.1</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>6.6</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.74</td>
<td>2.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.63</td>
<td>2.59</td>
</tr>
<tr>
<td><em>On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate your level at this point on the support you have for implementing inquiry-based instruction.</em></td>
<td>Experimental</td>
<td>8.0</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>6.7</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.63</td>
<td>2.09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.26</td>
<td>3.21</td>
</tr>
</tbody>
</table>
Chart 1: Support in Discovery/Dragonfly Activities

Chart 2: Support in Incorporating Technology into Teaching Math/Science
Several open-ended questions were summarized in both the experimental and control surveys to examine why the participants did or did not feel supported and any expectations they might have had about the web-based learning environments.

**Reasons for Participation.** One hundred fifty-four participants in the experimental group listed a variety of reasons for deciding to participate in the web-based learning environment on the pre-survey. These reasons included having a positive previous experience with the Discovery program (11.0%), an interest in inquiry-based instruction (31.8%), an interest in on-line courses (5.2%), an interest in learning a new teaching method or increasing their knowledge in general (39.0%), an interest in gaining resources to use in their instruction (14.9%), and the convenience of participating in a web-based learning environment rather than a traditional classroom environment (27.3%). The expected conveniences listed by the participants included working on their own, the nontaxing environment, receiving graduate credit for free, not losing time to driving to class, and being able to communicate with peers from a widespread region.
Meeting Expectations. Upon completion of the coursework, the experimental group was asked how the iDiscovery course met their expectations. Of the 136 participants that responded, 33.8% of the responses indicated that the course had helped them increase their knowledge about inquiry-based instruction, 44.9% of the responses mentioned the resources the participant had gained through completing the coursework, 31.0% of the respondents stated that they had enjoyed the collaboration that had occurred in the web-based learning environment, 16.2% of the respondents mentioned their increased comfort level and knowledge of the internet and technology, and 8.1% of the respondents eluded to the convenience of the web-based learning environment.

Important Gains. The participants in the experimental group were also asked to provide the most important gains they had received through completing the coursework in the web-based learning environment. Of the 139 who responded, 12.2% of them stated that they felt more comfortable using technology, 26.6% of the respondents mentioned their increased knowledge of inquiry-based instruction and how it can be used across subject areas, 42.4% of the responses mentioned the resources that the participants had gained through the course of the class, and 43.2% of the respondents mentioned the collaboration and reflection that was possible through the web-based discussions.

Additional training experiences. When the control group was asked in the pre-survey what additional trainings they would like to have after completing the initial Discovery course, 52.4% of the respondents mentioned a specific instructional program in which they would like to be trained (e.g., additional Discovery courses, Saxton Company, Connected Math), 28.6% of the responses mentioned interest in training in additional, general instructional practices, 19.0% of the respondents mentioned they would like to receive training in using technology, and 4.8% of the responses stated an interest in collaborating more with other professionals in the education field. A total of twenty-one students responded to this question.
CHAPTER V
Discussion

Levels of Support

The first hypothesis stated that those participants enrolled in the web-based learning environment would feel more supported in implementing inquiry-based instruction in their classroom than those not enrolled in the web-based learning environment. It was evaluated through analysis of one question from the pre and post surveys for both groups. While the current literature involving web-based learning environments seems to be inconclusive in regards to how supported participants feel, the participants in this study who were enrolled in the web-based learning environment reported feeling more supported in their coursework than those who were not involved in the web-based learning environment. Participants who enrolled in the iDiscovery web-based learning environment reported a significantly larger increase in their level of support in implementing inquiry-based instruction in the classroom at the end of the course than those who did not enroll. They also reported a significantly larger increase in their level of support in Discovery activities and in incorporating technology into teaching math/science. Therefore, the first objective of the course is believed to be consistent with this benefit of the web-based learning environment.

This significantly increased level of support might have occurred for various reasons. It could be that the communication and collaboration that took place within the web-based learning environment provided for a more supportive environment in which the participants could discuss their attempts at inquiry-based instruction. Another reason that the participants might have felt more supported could be that the follow-up on-line course provided an environment in which they could apply what they had learned in a previous course, giving them more confidence in implementing the instruction.

Course Expectations

In order to gain more information about the web-based learning environment and the attitudes of those who did and did not enroll in the class, open-ended responses were summarized. A review of the literature suggested that many participants in a web-based learning environment decided to participate due to the conveniences offered by the course such as low cost, working at own pace, little travel, etc (Chuang & Tsai, 2005; O’Donoghue et al., 2001; Salmon, 2000). Previous research also suggests that
communication can be an advantage of participating in a web-based learning environment (Berge & Collins, 1995; Lapadat, 2003; Perez-Prado & Thirunarayanan, 2002; Seng & Mohamad, 2002). Based on the responses to the open-ended questions, convenience (e.g., cost, flexibility) did play a significant role in the decision to participate in the class for about 27.3% of the respondents. However, by the end of the course, only 8.1% of the respondents stated that the course had met their expectations due to the convenience it provided. As discussed previously, the flexibility offered by web-based learning environments can also be problematic as, often, student must be more responsible and motivated to complete the course requirements (Essex, 2002; Hill et al., 2002; Thompson & Lynch, 2003). Therefore, while a percentage of the students did report that convenience played a role in their decision to enroll in the web-based learning environment, their later responses show that other factors may have played a larger role in supporting them in implementing the inquiry-based instruction.

The type of communication that took place in the web-based learning environment may also have affected the flexibility of the classroom. This course implemented asynchronous communication, meaning that students could respond to others in the classroom at their leisure. The opposite form of communication is synchronous. This means that students have required times in which they must interact with others in the classroom through real-time on-line discussions (Salmon, 2000). As time restraints were limited in this classroom, participation may have been more free and thoughtful, or it may have been less consistent and immediate.

Similar to the results found by Perez-Prado & Thirunarayanan (2002), students participating in the web-based learning environment most often stated that collaboration and communication among participants was the most important gain and this appears to be linked to the increased level of support reported by these same students. While this communication seems to be valued by those who participated in the web-based learning environment, the depth of this conversation is unknown. As discussed previously, studies have shown that the discussions that take place in web-based learning environments is typically lower level sharing instead of higher levels such as application (Angeli et al., 2003; O'Donoghue et al., 2001). However, upon examination of the comments of several students, it appears that they may have found the communication to be authentic. One participant commented that she or he had experienced “good discourse with
teachers…support and advice for implementing inquiry based lessons”. Another participant discussed how the discussion in the web-based learning environment helped to facilitate face-to-face interaction with other participants in her or his building. This is another benefit consistent with one of the course objectives.

Limitations

Based on the data reviewed in this study, there does appear to be a significant difference between participation in the web-based learning environment and perceived levels of support in implementing the inquiry-based instructional technique. However, several limitations to this study should be considered when interpreting the results. One limitation was the number of participants within the control group. There were significantly more participants in the experimental group, which may have made it more difficult to see a significant change in comparison to the smaller control group. Another limitation to consider is the characteristics of the participants who enrolled in the web-based learning environment. The web-based learning environment was a follow-up course to a traditional introductory course in inquiry-based instruction. Therefore, the participants who enrolled in the follow-up course might have differed from those who did not (control) in their interest level in the subject area, their willingness to follow through in implementing the instructional technique, and their willingness to seek out supportive environments to do so. The participants were also receiving free graduate credit through participation in the course. Therefore, they may have been biased in their reports. Another limitation is that this study used self-report data and that only a small section of the surveys were analyzed, which limits the reliability and validity of the survey. An additional limitation might be the lack of information obtained concerning the long-term affects of the iDiscovery program. Due to restrictions put in place by the program, evaluators were not able to collect follow-up data concerning the long-term affects. Therefore, while the participants in the experimental group appear to feel more supported in using the teaching technique upon completing the course, the support they felt in implementing the techniques months after completing the course is not known.

Implications

As more and more universities and post-secondary educational institutions turn to web-based learning environments, research in this area will become increasingly important when deciding what elements should be included and how the courses should
be structured. More professionals are turning to web-based learning environments to continue their education and keep up with changes in their fields. One example of this is the Global School Psychology Network, a web-based network which provides peer support and professional development services to school psychologists and graduate students. It has been in existence for approximately 7 years. This web-based learning environment provides a place for school psychologists to share information and collaborate on cases and important school psychology issues. This web-based community makes it possible for school psychologists from around the world to communicate and collaborate. The research contained within this study would be beneficial to designers of such web-based learning environments to learn more about fostering a supportive environment in which professionals and students can learn.

Future Research

As web-based instruction is a relatively new area in education, the implications for future research are numerous. More empirical research should be conducted to further examine the effectiveness of web-based instruction and trends in success. Examining common characteristics of those who are successful in web-based instruction might help to predict if one is a good candidate to participate in such an environment. Qualitative research in communication in web-based learning environments might be beneficial in examining how to facilitate authentic communication and collaboration in web-based instruction. As more and more universities and professional fields begin to turn to web-based instruction to train and continue to educate students and professionals, more research is needed to guide designers, trainers, and participants in making educated decisions concerning their programs.
References


*Internet and Higher Education, 5*, 109-118.


**Demographic Information Form**

**Project ID _______** (Please find this number at the top of you letter; this will allow the project evaluator to follow your reactions while keeping answers anonymous. Please proceed on to answer the rest of the questions if the ID is entered for you.)

**Please answer the following questions to the best of your knowledge:**

1. You are a ______ Female _____ Male Today’s date is _____________________

2. Your background:
   ______ African American ______ Hispanic ______ Asian or Pacific Islander
   ______ Appalachian ______ White ______ American Indian/Alaskan Native

3. Grade(s) you currently teach ____________ Other assignment _____________

4. Percentage of students in your school (if not know, write your school name ________________):
   African American _____ % Hispanic _____ % Asian or Pacific Islander _____ %
   Appalachian _____ % White _____ % American Indian/Alaskan Native _____ %
   Student with Reduced Lunch _____ % Students with Free Lunch _____ %

5. Your teaching experience ________________ Years and ____________ Months

6. Subjects you currently teach:
   Science ________ Math ________ Language Arts ________
   Social Science ________ All Subjects ________ Other (Specify) ________________

7. On average, amount of time each day you devote to science or math teaching: ____________ Minutes

8. **Number** of courses you took in college in following areas (Not including Discovery Institute):
   physical science ____ biological science ____ methods of teaching science ____
   earth science ____ math ____ methods of teaching math ____

9. How many Discovery/Dragonfly courses/workshops have you participated in before: _____ Courses

10. How many on-line or web-based courses have you taken: _____ Courses

11. Please base your answers to the following questions on your experience teaching either mathematics or science. You will base your answers on your experience teaching:
    ______ math ______ science
Control Pre-Survey

Your Current Situation:

Rate the following statements from 1-5: 1=never; 2=a few times a year; 3=a few times a month; 4=a few times a week, 5 = a few times a day

A. How often do you engage in the following activities:

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>a few times a year</th>
<th>a few times a month</th>
<th>a few times a week</th>
<th>a few times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
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<td>3</td>
<td>4</td>
<td>5</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. Use the Internet to locate resources for your teaching
2. Participate in on-line chats with other teachers about a teaching issue or idea
3. Implement ideas gained through interaction with an OSI-Discovery/Dragonfly program
4. Implement lesson plans gained through interaction with an OSI-Discovery/Dragonfly program
5. Communicate with teachers from your previous OSI-Discovery/Dragonfly Institute
6. Communicate with instructors/faculty from your previous OSI-Discovery/Dragonfly Institute
7. Access materials from Ohio Resource Center

B. In your classes, how often do students:

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>a few times a year</th>
<th>a few times a month</th>
<th>a few times a week</th>
<th>a few times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
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<td>2</td>
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<td>4</td>
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<td>3</td>
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<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. Work on science or math projects that take a week or more
2. Take short answer tests (multiple choice, fill in the blank, etc)
3. Devise their own methods for investigating a science or mathematics problem
4. Take tests requiring open-ended responses (description, justification, etc)
5. Discuss connections between science or math and other subjects
6. Use the Internet to find information
Rate the following from 1 to 4: 1 = Not at all, 2 = slight involvement; 3 = moderate involvement; 4 = great involvement.

C. How involved are you in the following activities:
1. Designing or conducting your own research on a scientific or mathematics question or problem
2. Interacting professionally with a practicing scientist or mathematician from a university or industry
3. Working with a practicing scientist or mathematician to conduct research
4. Leading professional development activities for other teachers
5. Serving on a local committee to revise the science or math curriculum

D. Rate the following statements from 1-5: 1 = Strongly Disagree, 5 = Strongly Agree
1. I am comfortable with inquiry based instruction
2. My awareness of useful resources for teaching math/science is low
3. I strictly follow my lesson plan when I teach
4. I feel comfortable sharing my inquiry based instructional plans with my colleagues
5. My colleagues share their teaching plans with me
6. I have sufficient access to the resources I need for teaching math/science
7. I have enough knowledge to feel comfortable talking with my colleagues on inquiry based instructional plans
8. I have mastered the inquiry based instruction
E. On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate you level at this point on:

1. The level of investment in Discovery/Dragonfly activities
2. Being supported in Discovery/Dragonfly activities
3. Communication with other teachers about their teaching practices.
4. The comfortableness of learning with technology
5. The competence in learning with technology
6. The awareness of useful resources for inquiry-based teachers
7. The computer technology available to you for use
8. Your level of competence in using the web
9. Awareness of Ohio Resource Center
10. The support I have for incorporating technology into teaching math/science
11. The support I have for implementing inquiry-based instruction

F. Please roughly estimate the AVERAGE # of time, and the average # of hours and minutes you spent on the following activities EACH WEEK for the PAST TWO WEEKS.

<table>
<thead>
<tr>
<th>Activity</th>
<th># of Times</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Using the Web to teach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Communicating with other teachers about their teaching practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Communicating with instructor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Communicating with Discovery Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Communicating with Dragonfly Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Using Ohio Resource Center web site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Using Discovery web site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Using Dragonfly web site</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Please briefly answer the following questions:

1. What additional trainings would you like to have to further improve your teaching in math or science?

2. What are some resources you would like to have to better facilitate your teaching in math or science?

3. What are the major gains you have had in teaching math or science since your last Discovery or Dragonfly project?

Thank you for completing this survey.
Control Post-Survey

Project ID _______ (Please find this number at the top of your letter; this will allow the project evaluator to follow your reactions while keeping answers anonymous. Please proceed on to answer the rest of the questions if the ID is entered for you.)

Please answer the following questions to the best of your knowledge:

1. Today’s date is ____________________

2. Please base your answers to the following questions on your experience teaching either mathematics or science. You will base your answers on your experience teaching: _______ math _______ science

Your Current Situation:

Rate the following statements from 1-5: 1=never; 2=a few times a year; 3=a few times a month; 4=a few times a week, 5 = a few times a day

A. How often do you engage in the following activities:

1. Use the Internet to locate resources for your teaching
2. Participate in on-line chats with other teachers about a teaching issue or idea
3. Implement ideas gained through interaction with an OSI-Discovery/Dragonfly program
4. Implement lesson plans gained through interaction with an OSI-Discovery/Dragonfly program
5. Communicate with teachers from your previous OSI-Discovery/Dragonfly Institute
6. Communicate with instructors/faculty from your previous OSI-Discovery/Dragonfly Institute
7. Access materials from Ohio Resource Center

B. In your classes, how often do students:

1. Work on science or math projects that take a week or more
2. Take short answer tests (multiple choice, fill in the blank, etc)
3. Devise their own methods for investigating a science or mathematics problem
4. Take tests requiring open-ended responses (description, justification, etc)
5. Discuss connections between science or math and other subjects
6. Use the Internet to find information
Rate the following from 1 to 4: 1=Not at all, 2=slight involvement; 3=moderate involvement; 4=great involvement.

C. How involved are you in the following activities:
1. Designing or conducting your own research on a scientific or mathematics question or problem
2. Interacting professionally with a practicing scientist or mathematician from a university or industry
3. Working with a practicing scientist or mathematician to conduct research
4. Leading professional development activities for other teachers
5. Serving on a local committee to revise the science or math curriculum

D. Rate the following statements from 1-5: 1=Strongly Disagree, 5 = Strongly Agree
1. I am comfortable with inquiry based instruction
2. My awareness of useful resources for teaching math/science is low
3. I strictly follow my lesson plan when I teach
4. I feel comfortable sharing my inquiry based instructional plans with my colleagues
5. My colleagues share their teaching plans with me
6. I have sufficient access to the resources I need for teaching math/science
7. I have enough knowledge to feel comfortable talking with my colleagues on inquiry based instructional plans
8. I have mastered the inquiry based instruction
E. To what extent did the following occur since you completed a similar survey that we sent to you a few months ago:

(1-4 rating: 1=not at all; 2=slight extent; 3=moderate extent; 4=great extent)

1. Increase your background knowledge in science or mathematics content
2. Increase your knowledge of effective teaching strategies
3. Increase your familiarity with instructional materials
4. Provide ongoing assistance and support as you tried to implement what you learned to the classroom
5. Provided relevant teaching ideas directly tied to what you teach

G. On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate you level at this point on:

1. The level of investment in Discovery/Dragonfly activities
2. Being supported in Discovery/Dragonfly activities
3. Communication with other teachers about their teaching practices.
4. The comfortableness of learning with technology
5. The competence in learning with technology
6. The awareness of useful resources for inquiry-based teachers
7. The computer technology available to you for use
8. Your level of competence in using the web
9. Awareness of Ohio Resource Center
10. The support I have for incorporating technology into teaching math/science
11. The support I have for implementing inquiry-based instruction
H. On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate you level of efficiency at this point on the following items. If your level of efficiency was 5 at the time you completed your first survey, how do you rate yourself now?

1. Using the Internet to locate resources ______
2. Teaching with technology ______
3. Using the Ohio Resource Center web site ______
4. Using Discovery/Dragonfly web site ______
5. Using the Web to support teachers ______
6. Supporting teachers on their inquiry-based teaching ______
7. Using the Web to follow up with teachers ______
8. Following up with teachers on their inquiry-based teaching ______
9. Communicating with other trainers ______
10. Communicating with Discovery/Dragonfly Staff ______

I. On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate you level of articulation at this point on the following items. If your level of articulation was 5 at the time you completed your first survey, how do you rate yourself now?

1. Using the web technology ______
2. Using the technology for inquiry based learning ______
3. Inquiry-based learning approaches ______

J. Please roughly estimate the AVERAGE # of time, and the average # of hours and minutes you spent on the following activities EACH WEEK for the PAST TWO WEEKS.

<table>
<thead>
<tr>
<th># of Times</th>
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</thead>
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<tr>
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<td>3. Communicating with instructor</td>
<td>______ hours ____Minutes</td>
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<td>4. Communicating with Discovery/Dragonfly Staff</td>
<td>______ hours ____Minutes</td>
</tr>
<tr>
<td>5. Using Ohio Resource Center web site</td>
<td>______ hours ____Minutes</td>
</tr>
<tr>
<td>6. Using Discovery/Dragonfly web site</td>
<td>______ hours ____Minutes</td>
</tr>
</tbody>
</table>
Please briefly answer the following questions:

1. What training have you gotten in order to improve your teaching in math or science since you completed the survey we sent you a few months ago?

2. What additional trainings would you like to have to further improve your teaching in math or science?

3. What resources have you discovered since you completed the survey we sent you a few months ago that have better facilitated your teaching in math or science?

4. What are some other resources you would like to have to better facilitate your teaching in math or science?

5. What are the major gains you have had in teaching math or science since you completed the survey we sent you a few months ago?

Thank you for completing this survey.
Experimental Group Pre-Survey

Project ID _ - _ _ _ _ (Please enter last 5 digits of your Social Security number; this will allow the project evaluator to follow your reactions to the course while keeping answers anonymous.)

1. Your workshop number is ___________ 2. Today’s date is ___________

3. The date you first logged-on to the iDiscovery Workshop _____________________

4. Please base your answers to the following questions on your experience teaching either mathematics or science. You will base your answers on your experience teaching: ______ math ______ science

Your Current Situation:

Rate the following statements from 1-5: 1=never; 2=a few times a year; 3=a few times a month; 4=a few times a week, 5 = a few times a day

A. How often do you engage in the following activities:

1. Use the Internet to locate resources for your teaching
2. Participate in on-line chats with other teachers about a teaching issue or idea
3. Implement ideas gained through interaction with an OSI-Discovery program
4. Implement lesson plans gained through interaction with an OSI-Discovery program
5. Communicate with teachers from your previous OSI-Discovery Institute
6. Communicate with instructors/faculty from your previous OSI-Discovery Institute
7. Access materials from Ohio Resource Center

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
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<tr>
<td>Never</td>
<td>1</td>
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B. In your classes, how often do students:

1. Work on science or math projects that take a week or more
2. Take short answer tests (multiple choice, fill in the blank, etc)
3. Devise their own methods for investigating a science or mathematics problem
4. Take tests requiring open-ended responses (description, justification, etc)
5. Discuss connections between science or math and other subjects
6. Use the Internet to find information

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38
Rate the followings from 1 to 4: 1=Not at all, 2=slight involvement; 3=moderate involvement; 4=great involvement.

C. How involved are you in the following activities:

1. Designing or conducting your own research on a scientific or mathematics question or problem
2. Interacting professionally with a practicing scientist or mathematician from a university or industry
3. Working with a practicing scientist or mathematician to conduct research
4. Leading professional development activities for other teachers
5. Serving on a local committee to revise the science or math curriculum

D. Rate the following statements from 1-5: 1=Strongly Disagree, 5 = Strongly Agree

1. I am comfortable with inquiry based instruction
2. My awareness of useful resources for teaching math/science is low
3. I strictly follow my lesson plan when I teach
4. I feel comfortable sharing my inquiry based instructional plans with my colleagues
5. My colleagues share their teaching plans with me
6. I have sufficient access to the resources I need for teaching math/science
7. I have enough knowledge to feel comfortable talking with my colleagues on inquiry based instructional plans
8. I have mastered the inquiry based instruction
E. On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate you level at this point on:

1. The level of investment in Discovery activities ______
2. Being supported in Discovery activities ______
3. Communication with other teachers about their teaching practices. ______
4. The comfortableness of learning with technology ______
5. The competence in learning with technology ______
6. The awareness of useful resources for inquiry-based teachers ______
7. The computer technology available to you for use ______
8. Your level of competence in using the web ______
9. Awareness of Ohio Resource Center ______
10. I have support for incorporating technology into teaching math/science ______
11. I do NOT have support for implementing inquiry-based instruction ______

F. Please roughly estimate the AVERAGE # of time, and the average # of hours and minutes you spent on the following activities EACH WEEK for the PAST TWO WEEKS.

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Please briefly answer the following questions:

1. What are the main reasons you decided to participate in this iDiscovery course?

2. What and how do you expect this iDiscovery course contribute to your teaching / your work?
Experimental Group Post-Survey

Project ID   _ - _ _ _ _ (Your Social Security number)  Today’s date is __________

Your Current Situation:

Rate the following statements from 1-5: 1=never; 2=a few times a year; 3=a few times a month; 4=a few times a week, 5 = a few times a day

A. How often do you engage in the following activities:

1. Use the Internet to locate resources for your teaching
   1 2 3 4 5

2. Participate in on-line chats with other teachers about a teaching issue or idea
   1 2 3 4 5

3. Implement ideas gained through interaction with an OSI-Discovery program
   1 2 3 4 5

4. Implement lesson plans gained through interaction with an OSI-Discovery program
   1 2 3 4 5

5. Communicate with teachers from your previous OSI-Discovery Institute
   1 2 3 4 5

6. Communicate with instructors/faculty from your previous OSI-Discovery Institute
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7. Access materials from Ohio Resource Center
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B. In your classes, how often do students:

1. Work on science or math projects that take a week or more
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6. Use the Internet to find information
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Rate the followings from 1 to 4: 1=Not at all, 2=slight involvement; 3=moderate involvement; 4=great involvement.

C. How involved are you in the following activities:
1. Designing or conducting your own research on a scientific or mathematics question or problem
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3. Working with a practicing scientist or mathematician to conduct research
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8. I have mastered the inquiry based instruction
E. To what extent did the iDiscovery Workshop:

(1-4 rating: 1=not at all; 2=slight extent; 3=moderate extent; 4=great extent)

1. Increase your background knowledge in science or mathematics content
2. Increase your knowledge of effective teaching strategies
3. Increase your familiarity with instructional materials
4. Provide ongoing assistance and support as you tried to implement what you learned to the classroom
5. Provided relevant teaching ideas directly tied to what you teach

F. On a 1-10 point scale with 1 at lowest end and 10 at highest end, rate you level at this point on:

1. The level of investment in Discovery activities
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Please briefly answer the following questions:

1. In what way did this iDiscovery course meet your expectations?

2. What are the most important gains that you got from participating in this iDiscovery course?

3. If you can make up to three changes to this workshop, what are the changes you want to make? How? (Please be as specific as possible)

Thank you for completing this survey.