AC 2008-2925: DISTANCE LEARNING DELIVERY OF A WEB-BASED DEGREE IN ELECTRICAL/ELECTRONICS ENGINEERING TECHNOLOGY, WHICH INCORPORATES HANDS-ON LABORATORY EXPERIMENTS AND REAL TIME VIDEO

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DISTANCE-LEARNING DELIVERY OF A WEB-BASED DEGREE IN ELECTRICAL/ELECTRONICS ENGINEERING TECHNOLOGY, WHICH INCORPORATES HANDS-ON LABORATORY EXPERIMENTS AND REAL-TIME VIDEO INTERACTION WITH LEARNERS
Abstract

This study reports on the problems encountered in the development and deployment of an asynchronous web-based associate degree in electrical/electronics engineering technology (EET), and the effective solutions of these problems. The implementation of hands-on laboratory experiments and effective training material will be discussed. The instructional techniques and tools used to develop animated graphics and to incorporate them in the courseware will be described. The use of videoconferencing as a tool to bridge the distance between the students and the instructor in chat sessions has been successfully incorporated in the courses offered in this degree. Illustration of live videoconferencing in chat sessions will be presented. A comparative analysis of student learning outcomes and student satisfaction in the web based sections and in the in-person instruction will be discussed.

Introduction

The use of the World Wide Web for educational applications has increased tremendously in recent years. With the Internet becoming user friendly and learners being savvy in its usage, exchanging information has become easy by interfacing with communication tools such as audio, video, rich text, animations, and chat. By integrating the Internet with other tools and using the benefits of networks, a transformation in education occurs, resulting in an online educational process that can provide quality education at any time and without being place bound.

Online learning moves knowledge from the classroom to knowledge everywhere. According to a report by the Sloan Consortium, an organization for colleges’ online programs, in 2004 there were 2.3 million people registered for one or more online courses. In 2005, enrollment jumped to 3.2 million—a 40% increase. Similarly, a report by Eduventures, a consulting firm focused on education, notes that about 50% of the people who want to enroll in post-secondary education prefer online programs that take learners beyond the limitations of institutions, reducing geographical boundaries and prescribed class time. Industry forecasts predict 100% annual growth.

As noted by authors in, studies have shown that student participation and motivation is different for an online course. There are a number of attributes that online courses address, including the following:

- Some students are independent learners and may be more productive online.
- Some students (such as those with a fear of speaking in front of peers) are apt to participate more in class discussions if done online.
- Motivated by a busy schedule, students are able to complete coursework on their own time.

Online courses are suitable for self-motivated students who like to learn at their own pace as observed by our student survey results and as observed in. Online learning is especially the answer to non-traditional learners with full-time jobs, business travelers, and those with family responsibilities. The Sloan Consortium reports the following:
Survey results, classified by type of institution, show that the associate degree granting institutions have the largest number of students taking at least one online course, representing about half of all the students studying online. “Distance learning is by no means a new issue. In the mid 1850s, shorthand, speed typing, and foreign languages were taught by correspondence courses. In the last century, radio, TV, video, and satellite have enriched the repertoire of distance learning means. Now the Internet connectivity, the new generations of software, and hardware facilities have demonstrated the usefulness of the Web as an educational system of tools.”

Distance learning has the advantage of flexibility in time and space, which helps present ease of education for learners. With the services available anywhere that there is a computer and Internet connection, there is no need for the physical presence of the instructor or students at the educational institute. Online education is arguably the fastest and most useful method of education. The leaders of various industries appreciate this and have adopted the slogan, “We should take education to the people and avoid taking people to education.” This gives people the flexibility to work and earn while they learn. Many companies encourage their employees to pursue higher education and become better trained.

However, not all online courses are of equal quality. According to the website qualitymatters.org, factors affecting the quality of online teaching include the following:

- course delivery
- course content
- course management
- instructional infrastructure
- student engagement and readiness

Each one of these factors is a challenge in its own right. This paper discusses how each challenge can be met. The problems encountered in the development and deployment of an asynchronous Web-based associate degree in Electrical/Electronics Engineering technology, and the effective solutions for these problems, will be covered. Since 1996, educators at the University of Missouri-Columbia (MU) have integrated video materials, lab kits, field trips, local resources, and World Wide Web into asynchronous learning network (ALN) graduate level courses. At California State University, Fresno, Bachelor’s degree program in Industrial Technology is offered, where students have to travel to the home campus to do laboratory work in two and a half weekends. Just as a person cannot learn to swim without getting wet, an EET student cannot learn good engineering skills without hands-on experience. This paper discusses the delivery of such experience to associate degree students at their own place. Finally, a comparative analysis of student-learning outcomes and student satisfaction with Web-based instruction versus in-person instruction will be discussed.

**Challenges faced in implementation and deployment**
In the academic years 1999 and 2000, we completed at our institution the development of an entirely Web-based master’s degree in technology (MT) program. After completing the development of the MT program, we wanted to see if the Web mode would be suitable for undergraduate instruction. We first tried our Electric Circuits I (EERT 12000) course. We were skeptical that it could meet its educational objectives, so we decided to use every possible tool to make the Web course as close as possible to the classroom course. We spent a large amount of time developing training material for the website on both the lecture and lab components, and we set a goal that all of the labs must be carried out by the students using real components.

We taught the online and in-person courses simultaneously from 2001 through 2004. During this period, we compiled data to compare the students’ performance (as measured by the course GPA), satisfaction, and evaluations. The conclusion of the study was that there was no statistical difference between the two modes. In addition, students who took the online course continued to take other EET online courses, asking for them specifically during advising.

In summary, the course has been successfully delivered as an online course since 2001, and after reviewing the positive results, we launched an entire associate’s degree program in EET with online delivery.

**Course delivery: student engagement and readiness**

Before enrollment, students are made aware of the minimum hardware and software requirements for viewing the course content and the minimum technical skills required. Then, a week before the semester begins, we have an in-person orientation for the students, wherein a demonstration of login procedures, course information, a tour of the labs, an introduction of the instructors, and a tour of the institution is given.

Because most of the students are non-traditional and thus have widely varied schedules, it is very difficult to coordinate an orientation time that will accommodate everyone. However, the students who are unable to attend can get the same information from the material we provide on an orientation website, which includes audio/visual training modules on login procedures, how to navigate WebCT, a “to-do” list, and links to download essential software. We initially mailed the students this information on a CD, weeks in advance, to give the students ample time to review the material, download the required software, and purchase books, lab kits, and accessories before the course began. Eventually we evolved to providing the orientation website (shown in Figure 1) instead, making the orientation material more accessible, eliminating mail delivery issues, and reducing costs. The instructors also send welcome e-mails to establish communication with the students.

**Minimum technology requirements**

Students are expected to have access to the following:

- a Pentium-class, IBM-compatible computer with a minimum of 5 megabytes of free hard-disk space and a 16-bit sound card
- a VGA or better color monitor with a minimum display resolution of 640 x 480
- an Internet connection with a minimum speed of 56.2 KBS
- Web camera
- Audio devices, such as speakers, head phones, and microphones

Course deployment

One of the challenges in planning effective distance education is selecting proper software programs to house and deliver course material effectively. One such program is WebCT (now owned and operated by blackboard.com), which serves as both a vehicle to take the classroom to the living room and a tool to connect the instructor with the students and the students with each other. A calendar function enables students to view their class schedules and deadlines. The website is password protected, and access is provided only to enrolled students.

WebCT Vista is a course management system that allows instructors to create and manage Web-based learning materials and activities, as shown in Figure 2. Using this system, instructors can put together course materials online, giving students easy access to materials such as the syllabus, handouts, and reviews. It is possible to create learning modules to deliver the course contents via PowerPoint, video, and audio presentations.
For communication, WebCT supports online threaded discussions, real-time chats, announcements, and e-mail. For assessing progress, instructors can present timed quizzes, self-tests, and surveys through the website with security settings. Quizzes can be given as multiple choice, matching, true-or-false, or short-answer formats that are automatically graded. WebCT also enables students to submit individual and group assignments and share work with peers online. A course statistics report available to instructors in WebCT shows that students use these resources frequently.

Typically, software programs such as WebCT have options for setting and releasing the course content, thus giving the instructor control as to what material the students can view—and when. This allows the instructor to administer timed exams online.

Despite the many features of WebCT, housing the entire course on the website has its own problems. When the site is not available due to maintenance or some other technical difficulties, students are inconvenienced and lose class time. To counter this in our program, the basic course materials, consisting of course information, weekly lecture and lab notes, and training modules, are all housed on the campus server, as shown in Figure 3. A link to this material is provided on the homepage of the course in WebCT, and students are provided the link to this backup system before beginning the class. This ensures that students have access to the course material at all times, even when WebCT is down.

Figure 2 – The homepage of a course in WebCT vist
Course design

Once the method of dissemination of the course material is selected, the course materials are developed to accomplish the learning objectives. There are often special considerations, such as the lecture material, assessments, and lab components when developing materials for online delivery. So we decided to use every possible tool to make the online courses as close as possible to the classroom courses. As author Karen Hughes Miller stresses, “Academic accrediting organizations such as the Southern Association of Colleges and School (SACS) make it clear that course offerings online must be as similar to face-to-face courses as possible. This is also a good pedagogy”\(^8\).

Developing an online course is a challenge. Attention must be paid to the quality of instruction so that it is not compromised. Course materials are the same as those used for the in-person course. The hands-on lecture and laboratory components have to be developed such that all of the labs can be carried out by the students using real components. The course has to be designed so that it is easily understandable; areas that need more-complex explanations have to be dealt with carefully by giving additional information via training modules.

In the training modules, we use new sound, graphics, and animation techniques to make the material both enjoyable and easy to understand. Producing these modules is the most creative endeavor in the design process. The instructor also must be careful to make sure the relevant material is covered. Streaming video should not be too lengthy and must be of good quality. This is a very time-consuming process. Therefore, it should be stressed that designing course material must be thought out and started well in advance to ensure the course is ready to be delivered when the semester begins.
Another important aspect of designing course material is to keep it as generic as possible, leaving room for updating the course in the future. This way the entire course need not be redone. Some of the basic concepts, especially in technology courses, remain the same, requiring only a few changes in the course material.

A significant challenge in designing an online program is the incorporation of hands-on lab work. Laboratory experiments have always served as the tool for relating the theoretical world to the real one. An EET student cannot learn good engineering skills without hands-on experience. To ensure the successful inclusion of laboratory components in the online program, one approach is to get the students acquainted with the instruments they will be using via training modules and have them simulate the labs using special simulation software such as Circuit Maker or Multisim. The downside of this approach is the cost involved and the bandwidth limitation. Also, these virtual labs do not give the students the real experience of conducting a lab, connecting the circuits with real instruments, and taking real measurements.

Another approach, as mentioned in the Society of Women Engineers Magazine\(^1\), is for students to learn about the lab instruments online and then go to the real lab for only a short time. However, this approach will pose problems in coordinating the lab workstations with the students’ schedules, which are driven by their work schedules. For the laboratory experiments representing the important components of the course work, the approach taken in the design of online program is different from that of in-person courses in that the experiments are conducted by students asynchronously. The distance to the lab must also be considered. It is stated that students would rather buy the equipment than travel over 30 miles\(^1\).

To give students real lab experience in the online mode of teaching, we have incorporated the use of real lab kits and lab components so that the students can conduct the labs on their own, at home, on a weekly basis. When the course was offered online for the first time, the students were allowed to borrow lab equipment and components, but this proved to be an impractical solution, as it was difficult to keep track of the equipment. Enhancement to lab kit was made when course was offered in Fall of 2006. Particular thanks to Professor Robert W. Hendricks, Virginia Tech, for his kind assistance and ideas.

Course content

The course materials contain a syllabus with instructor information, the grading policy, weekly lecture notes, PowerPoint presentations for each chapter, audio/visual training modules, weekly assignments, weekly quizzes, weekly lab assignments, links to other resources, and training modules. These modules are designed to help the students clearly understand the theory behind chapter topics and also include training modules for some laboratory topics needing additional clarification.

Figure 4 shows the lab kit that is currently used. This lab trainer kit consists of a breadboard with fixed and variable power supply; sine, square, and triangular function generator; toggle switches; and buffered LED indicators. The kit has components for laboratory experiments for different courses, so it can be successfully used for several EET courses. Also, it is worth mentioning here that the feedback from student surveys done at the end of each semester indicates that this
solution is acceptable to students. Students will need the following components along with the lab-kit shown in Figure 4 to conduct laboratory experiments during the course work.

- Digital Multimeter, sound card, oscilloscope probes
- Tool kit consisting of –
  - wire stripper/cutter, nose pliers, spools of colored wire, clips and clamps

lab component part – kit, specifically required for each course.

The following is a complete listing of the lab component parts needed for Electric Circuits I (EERT12000) featured above.

**EERT 12000 - Electric Circuits 1 Parts List**

<table>
<thead>
<tr>
<th>Resistors (1/2W) Qty</th>
<th>Value</th>
<th>Resistors (1/2W) Con't Qty</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
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<td>3.3</td>
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<td>47</td>
<td>1</td>
<td>4.7</td>
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<tr>
<td>1</td>
<td>68</td>
<td>2</td>
<td>5.1</td>
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<tr>
<td>1</td>
<td>100</td>
<td>1</td>
<td>5.6</td>
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<td>1</td>
<td>120</td>
<td>1</td>
<td>6.8</td>
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<td>1</td>
<td>150</td>
<td>4</td>
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<tr>
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<td>5</td>
<td>10</td>
</tr>
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<td>15</td>
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<td>370</td>
<td>1</td>
<td>31</td>
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<td>1</td>
<td>830</td>
<td>1</td>
<td>68</td>
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<tr>
<td>3</td>
<td>1 K</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>1.5 K</td>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td>1</td>
<td>1.6 K</td>
<td>1</td>
<td>470</td>
</tr>
<tr>
<td>1</td>
<td>1.8 K</td>
<td>1</td>
<td>1 M</td>
</tr>
<tr>
<td>1</td>
<td>2 K</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>
During this course the students conduct the following experiments listed as shown in the table. The following are the listing of experiments

**LAB OUTLINE**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Exp. #</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric Prefixes, Scientific Notation, and Graphing</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Laboratory Meters and Power Supply</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Measurement of Resistance</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Voltage Measurement and Circuit Ground</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ohm’s Law</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Power in DC Circuits</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Series Circuits</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>The Voltage Divider</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Parallel Circuits</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Series-Parallel Combination Circuits</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>The Superposition Theorem</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Thevenin’s Theorem</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>The Wheatstone Bridge</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Soldering</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Project Design and Construction</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Lab safety procedure is very strongly emphasized during the entire course and students are cautioned to exercise safety in handling lab experiments. A detailed lab procedure posted on the web site is shown below. Typically, students conduct one lab experiment a week, just like the traditional in-person students do, and e-mail or faxed reports to the instructor. From what we have experienced, the on-line students traditionally are serious about their lab work. The comparative study shows that their performance in lab is comparable to their counter parts in in-person class.
Laboratory Safety procedures

A. Proper observance of normal safe laboratory practices will help prevent any serious accident occurrence. Remember, more people are killed in the United States by 120 volts than by all other voltages combined.

B. Although the voltages developed in the trainer kit are low, it is possible to damage the kit if certain errors are made.

C. Following are some general safety precautions that should be observed at all times:

1. Treat every electrical circuit as potentially dangerous. Poor habits acquired on very low voltage or "dead" circuit can be carried to higher voltage circuits.

2. When connecting a circuit, always complete all of the connections and check the circuit before connecting it to the energy source.

3. Always disconnect your circuit from the energy source before beginning to "tear down" the circuit. Remember, a switch may be faulty.

4. When changing a component in the circuit, check to be certain the circuit is de-energized.

5. Many components, such as integrated circuits (ICs) and LEDs are extremely sensitive to voltage spikes and can easily burn out when inserted into the circuit while power is ON.

6. At times it will be necessary to measure voltages at points on an energized circuit. Always use an insulated test probe.

7. In the event of electrical shock or burn take appropriate contact health care provider immediately. Electrical burns are frequently much more severe than they appear.

It is suggested that these safety suggestions be placed nearby and referred to periodically.

Course management

A well-designed course will not only present the appropriate course contents but also allow the students to navigate through the material, enabling them to focus on the material for that week. The technology used should meet the student expectations and technical skills. Weekly modules comprised of lecture notes, training modules, and assignments for that week should all be laid out clearly. Assignments can be scheduled for a fixed duration with deadline dates. Periodic quizzes for quick review are given, typically at the rate of one per week, starting the second week. Communication tools, such as the calendar, announcements, and a discussion forum can be effectively used to communicate to the students about the specifics of assignments, such as deadlines, method of submissions, etc.
Implementation of video conferencing

Scheduled live video chat sessions are an effective tool. Our instructors use Adobe Connect not only to communicate with students in live video conference sessions, but also to deliver recorded lectures. The conference sessions can be recorded and posted for later viewing. This way, those students who could not participate in the live session can still benefit. Video conferencing is particularly useful for review sessions before tests and exams. This is supported by the students’ answers to the survey question, “Course provides some visual, textual, and/or auditory activities to enhance student learning”: 57.1% of students strongly agreed, and 42.9% agreed. The fact that no one disagreed confirms that video conferencing was successfully implemented.

In one particular course, lectures from the entire course were rendered using video conferencing in addition to live video sessions. The students did not need cameras or microphones because they typed their questions, and the instructor could immediately address them through high-quality video by either talking or showing examples on the screen. This was done by setting aside separate office hours for online students. But video conferencing can be further enhanced if the students also have Web cameras on their end, allowing them to have a face-to-face interaction with the instructor. The success of video conferencing can be measured by tracking information provided by WebCT. The number of students participating in the Adobe Connect live video conferencing suggests that the students use this resource successfully.

The discussion forum is also very effective, as it doesn't restrict students to a single time slot. The threaded discussion format makes it very practical, as the students and the instructor can post comments to any discussion item. Furthermore, the discussion forum keeps all messages for the duration of the semester. This provides for a quick reference to topics of interest that were covered during the semester. (For using the forum, it is imperative to give clear instructions to students regarding acceptable language and respect for one another, how to upload assignments, and the turnaround time for feedback from the instructor.) The assignment tool has the option for the instructor to grade and give feedback on the students’ postings, and the grade automatically gets transferred to the grade book.

The calendar is a very useful tool. Each student has access to a course calendar that contains information about assignment deadlines, quiz and test dates, and other important dates related to the course. In addition, students may add their own private entries to the calendar. This information will be unique for each student and will not be viewable by other students. This feature provides a helpful tool for students to set their own goals and deadlines for the course.

Instructional infrastructure

The institute has to invest in the software program for the course deployment, and it is important to offer training sessions to the instructors on course development and application of the audio/visual software. It is helpful if the school’s multimedia services coordinate with the instructors in developing good-quality course content. Student support services, such as advising, help-desk services, and a bookstore, are very useful to the students.
To ensure the integrity of student assessments, the final exam is proctored and is designed to test both the student’s laboratory skills and theoretical knowledge. The challenge lies in scheduling proctored exams. Students who live close to the university can take them on campus with the help of student services. But for students living far from the university, arrangements have to be made with a local library or other such location with authorized personnel to administer the exam.

Analysis

A survey was used to gather the students’ feedback. The survey consisted of six questions pertaining to the course management, with two open-ended questions: “What aspect of the course did you like the most?” and “What could be done to improve this course?” Gathering this feedback allowed the instructors to effectively modify course content. The feedback was very positive, with most students being satisfied with the course content, course management, and overall online course experience. Some of the students’ feedback reflected their appreciation for the flexibility of the course, specifically that they were able to review the material several times and learn on their own time, at their own pace, and at a place convenient for them. Students also appreciated that they could do the real lab experiments instead of virtual labs, and many students said they liked the video demonstrations. On the negative side, some students complained about the training modules freezing at times and suggested that it would be better to have these modules in the form of CD or DVD. Some students also suggested that the course content could be better organized.

Survey questions and responses from the students

Each question had four possible responses: strongly agree, agree, disagree, and strongly disagree.

The following are the questions and the student responses for each question.

1. Course is organized and navigable. Students can understand the key components and structure of the course.
   - strongly agree 48.6%
   - agree 45.7%
   - disagree 5.7%

2. Course syllabus identifies and delineates the role the online environment will play in the course.
   - strongly agree 62.9%
   - agree 25.7%
   - disagree 11.4%

3. Course offers ample opportunities for interaction and communication student-to-student, student-to-instructor, and student-to-content.
4. Course provides some visual, textual, and/or auditory activities to enhance student learning.

- strongly agree 57.1%
- agree 42.9%

5. Course optimizes Internet access and effectively engages students in the learning process.

- strongly agree 54.3%
- agree 37.1%
- disagree 8.6%

6. Lab equipment and technology used supported the learning activities in the course.

- strongly agree 62.9%
- agree 25.7%
- disagree 8.6%
- strongly disagree 2.9%

Comparison of in-person and online classes: a statistical analysis

To assess student performance, five EET courses, taught in both in-person and online settings, were used. All five courses in both settings were offered in the fall of 2007. The courses were taught by the same instructors for the in-person setting and online setting. We tested the hypothesis that the average student scores for the two settings would not be significantly different. We carried a student t-test to test this hypothesis. The average class scores for in-person and online formats are given in Table 1 below.

<table>
<thead>
<tr>
<th>Course</th>
<th>In-person class</th>
<th>Web-class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>86.88</td>
<td>90.78</td>
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<tr>
<td>2</td>
<td>89.12</td>
<td>81.90</td>
</tr>
<tr>
<td>3</td>
<td>93.19</td>
<td>87.78</td>
</tr>
<tr>
<td>4</td>
<td>87.81</td>
<td>83.65</td>
</tr>
<tr>
<td>5</td>
<td>81.88</td>
<td>82.75</td>
</tr>
<tr>
<td>Average</td>
<td>87.776</td>
<td>85.372</td>
</tr>
</tbody>
</table>

Table 1
The t-test statistic is 0.966935183. For the level of significance of 0.05, the critical value is 2.306004133. For the test statistics, the p-value is 0.361894518. Based on these, we conclude that there is no significant difference in the average student scores, affirming our hypothesis.

**Descriptive statistical analysis of a class**

The following graph compares the grades of students in the in-person class and online class. There were 11 students in the in-person class and 15 students in the online class. Both classes were taught by the same instructor. As seen, this graph also proves the above hypothesis.

![Course Grade Comparison Graph](image)

**Conclusion**

When an online course is well designed with a full hands-on component included, it can be very helpful, especially for non-traditional students who must work full-time, travel for business, or attend to family responsibilities and are not able to attend classes at prescribed hours at educational institutions. The advantage of online learning is that the course material is accessible at all times, at all places where computers can be accessed, as opposed to the traditional in-person setting, where the students are instructed only for a specified time duration.

This conclusion is drawn from the students’ replies to the open-ended survey question, “What aspect of the course do you like most?” Hands-on lab experience gained by the students using the real lab kit and components was most appreciated by students in their feedback surveys. The comparison of in-person and online student performance using the average class score and grade shows that there is no significant difference in the online students’ performance from that of the in-person students.
When the challenges encountered in offering online courses are met, it is possible to offer quality online degree programs. With the availability of new technologies, there is always room to improve course delivery.

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