Signature Assignment for ETEC 501

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Winter, 2016

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 The chosen subject is Electronics Drawing, Assembly, and Fabrication, which is currently a Face-to-Face (F2F) course that is designated as ELECTR 155, and found under Electronics in the college catalog. It is taught at a local community college, and is now being offered each fall and spring semester. The student population is primarily males, who range in age from about 20 through their 40's, on average, with a few older students. The ethnic mix is approximately 75% Hispanic, 10% black, 10% white and 5% other. This will become a blended/hybrid class where the lecture portion will be online, and the lab work will be done F2F, in the traditional computer lab classroom, on campus.

 This course will use Blackboard as a primary resource at the college. Many of the students are familiar with it, as they already use it for various classes in this program. Edmodo will be incorporated into the class as a supplementary resource to Blackboard. The students will have access to the information on this independent Edmodo Learning Management System (LMS) 24/7. It has been repeatedly proven that having a resource not directly connected to the school is beneficial. There are times when the school's Blackboard will be down for weekly maintenance. Therefore, having this auxiliary site gives the students this added insurance of access. According to Diaz and Diniz (2013), "A typical LMS embeds agents that belong to an interactive learning environment assisted by mediating tools that support, for example, inter/intra-action, collaboration, training, communication and sharing information amongst the LMS users" (p. 308). Students are discouraged from doing the work for their fellow classmates (cheating), yet are rewarded for tutoring them, whenever a peer gets stuck and needs assistance to move forward. In this way, the tutoring students project teacher presence within the course, which is empowering and demonstrates competence in that subject area. This can occur in both the F2F, or online, through the Community of Inquiry, either on Blackboard or Edmodo.

 The basis of the class is to impart specific information to the students. A way to achieve this is to have a number of student learning objectives (SLO) that each individual student must accomplish before completing this course. Below are the objectives that are set forth by the instructor, as a way of measuring the individual student's capabilities. By the end of this course the student will be able to: (1) Identify electronic component symbols from a given schematic diagram; (2) Produce a schematic capture from a hand sketch using best-practices for CAD drafting; (3) Evaluate the importance of Node Layout; (4) Explain the benefits of Node Listing; (5) Compare and contrast the features of expressSCH and Multisim; (6) Design a given Printed Circuit Board (PCB) from a given schematic drawing; (7) Solder parts onto a given Printed Circuit Board (PCB); and (8) Evaluate the attributes of another student's PCB design.

 (1) Identify electronic component symbols from a given schematic diagram--this would fall under the Psychomotor domain because the student is doing something in the form of recognizing the electronic component symbols. Without this basic knowledge, it would be impossible for that student to continue. Then, (2) produce a schematic capture from a hand sketch using best Computer Aided Design (CAD) drafting practices--this would be a combination of Cognitive and Psychomotor. The student is synthesizing the steps necessary to take his/her hand sketch, and transfer that information into a professional schematic drawing. Therefore, using both applied knowledge and good drafting skills to complete this assignment, on the computer using CAD. The invention of Node Layout (3) and Node Listing (4) has made a huge difference toward students learning Electronics. This is a two-step process in documenting a circuit, for either electrical or electronics. When students learn this method, they will be able to rewire the same circuit in a new configuration. They also will be able to take an existing circuit and reverse engineer it back to a schematic drawing, especially when a schematic does not already exist. So, that is why it is crucial for students to be able to evaluate the importance of Node Layout. This part is where a student outlines each node in a different color, around the circuit. A Node is comprised of the wires that connect the other terminals (constituents) together. So, a node continues until it hits a constituent, then turns and continues on until it returns to its starting point. This makes a full circle. There will be a number of nodes in one circuit. Node Listing is where the student is now writing the various bits of information about each node onto a custom form. This form is comprised of seven columns. The node list will direct the viewer as to how to hook up that particular circuit, no matter in what order the components and devices may be arranged. Thus, being able to explain and justify the benefits of Node Listing should be relatively easy, if the student understands this process. Both of these objectives would therefore be considered attitudinal because the student is valuing and justifying the reason for incorporating these two steps into the overall plan and design of the assignment. Since the introduction of CAD software programs, more industries are turning to the computer to design the work than the old fashion drafting with T-squares, triangles, templates, vellum and pencils. The two software packages used in this class are expressSCH, and National Instruments (NI) Multisim. The first one mentioned is a free download. The second is through a site license owned by the college. There is a student version available for one year at a nominal fee. So, having the students (5) compare and contrast the features of expressSCH and Multisim is to determine to what depth each student understands the software programs that are required in this class. The students are thinking as they analyze the differences, this falls under cognitive domain. As their confidences build, the students learn to (6) design a given Printed Circuit Board (PCB) from a given schematic drawing--this will be done on the computer, using the software mentioned above. Design is considered to be a synthesis of cognitive thinking this is where part of the objective lies. The other part of the design falls under Psychomotor domain, because of the physical act of creating a design layout on the computer, which takes skill to accomplish. When the virtual design is completed, and sent to a fabrication house to be manufactured, the student will need to assemble, and (7) solder parts onto a given Printed Circuit Board (PCB) for the final results. This is all hands-on work at this stage. It requires skill of the actual soldering of the parts onto the PCB. Then, the PCB must be tested for functionality. This is psychomotor domain without a doubt. As proof of understanding is to have the students (8) evaluate the attributes of another student's PCB design. If these students can take someone else's work and totally read and understand what was done, the originator presented a clear and concise package. If not, then the second student must figure out what is wrong and how it can be corrected. This is using the cognitive knowledge and skills acquired throughout this class and program, then applying it in a whole new level to show their understanding. A rubric will be used to assess the competence and quality of each student's work for the SLOs which are for the college's accreditation. Using a four point scale, with four equaling excellent, three is good, two fair, but still passing, then a score of one signifies incompetence, and zero is failing which both are not acceptable. Students do have the opportunity to redo this work, to achieve a higher score. A second rubric was designed to evaluate and assess these students in-class participation, quizzes, and their individual lab work accumulated in an ePortfolio along with their final PCB working, to the given specifications.

 It is becoming a necessity to accommodate the current student population by transitioning this traditional electronics class into a blended/hybrid class. According to Garrison (2011), "The creation of knowledge in an educational context is a reflective and collaborative process made possible by a community of learners" (p. 19). Too many students find it difficult to be in a classroom setting for each class. Adult learners usually have jobs, family and other obligations that make it difficult to always attend school. So, a blended class would give these students more freedom with their personal schedules, while still able to complete work outside of the class, yet, stay abreast of the current assignments. According to Arbaugh, Bangert and Cleveland-Innes (2010), "Another factor that may predict the likelihood of higher order learning is the nature and level of the course content" (p. 38). When designing e-learning classes, whether they are fully online or blended, there is much information that needs to be included to make it a truly effective class. The Communities of Inquiry (CoI) structure has been proven as a great tool for instructional designers. It is comprised of three main categories: social presence, cognitive presence and teaching presence. According to Garrison (2011), "… a community of inquiry provides the environment in which students can take responsibility and control of their learning through negotiating meaning, diagnosing misconceptions and challenging accepted beliefs--essential ingredients for deep and meaningful learning outcomes" (p. 22). Therefore, students will become more interested and interactive when they have time to participate on their own schedules in the blended environment, while the instructor becomes more of a facilitator.

 While designing a blended class, there are certain things that must be considered. There must be Americans with Disabilities Act (ADA) accessibility for all students to the materials that are presented in the class. According to Wattenberg (2004), "Access to higher education is one of the few areas that have significantly improved since the enactment of the ADA" (First & Hart, 2002; Levy, 2001) (Wattenberg, 2004, p. 126). At the community colleges, within California, there is the Disable Student Program Services (DSPS) in place. At these schools, these programs have aided students who have some type of disability. So, when designing blended or online classes, this is a key factor that must be remembered and implemented. According to Wattenberg (2004), "It is time for online educators to look beyond mere compliance of the ADA to fulfill educational goals of preparing all students to be productive citizens" (p. 137). Transcripts of text materials will be available in this hybrid course for those who may benefit from them. Also, closed captioning will accompany any video or MP3 audio file that is contained in the materials. Screen-readable text will be made available to accompany PowerPoints and other text-based lessons. All of this will comply with the ADA requirements.

 Universal Design for Learning (UDL) is another concept that is widely accepted and implemented for e-learning classes. While researching UDL this article, Addressing Learning Disabilities with UDL and Technology: Strategic Reader by Hall, Cohen et al was discovered. According to them (2015), "teachers are in need of innovative supports, strategies, and tools that will make it possible to meet the educational needs of all students" (p. 72). As instructors using UDL, there needs to be understanding and knowledge on how to impart the variety of information to all students. There are many types and kinds of disabilities that students may have; and all of these must be addressed. To do so, the materials must be offered in not one form, but in multiple representations, so as to accommodate all students' needs and requirements, from physical to cognitive barriers, and including perceptual ones. Any one of these, or a combination, could hinder the learning process while engaging the students through innovative ways to make them curious, so that they become motivated and want to learn more.

 When dealing with information used in class, an instructor must be aware of the copyright and fair use issues that may be a problem with some readily available material. According to Daphyne and Forcht (1998) in their article regarding the legal use of the Internet, "The Internet contains a wealth of information. The information can be viewed, downloaded, printed, and passed on to other individuals. It is very easy to copy information that is found on the Internet, and it is done thousands of times each day. But is it legal and ethical to do so?" (p. 5). In order to protect the instructor, that person should be very aware of the copyright and fair use restrictions. According to Bartrom (2009), "It is a doctrine in copyright law that allows limited use of copyrighted material without requiring permission from the rights-holder. It provides for the legal incorporation of copyrighted material into another work *under limited conditions"* (p. 14). This hybrid course will follow the copyright and fair-use exceptions by being screened before use by experts in such use. Any probable infringement issues will be corrected prior to final posting and implementation, even if this requires getting permission from the copyright holder(s) in advance.

 By incorporating all of these considerations, the hope is that this conversion from F2F into a blended format will be successfully implemented, using the learning theories and strategies covered in ETEC-501. Revisions will be made to the course design, as needed, following an objective evaluation after each implementation has completed. With the conversion to blended learning, there is hope for greater student satisfaction and retention.

Employing Keller's ARCS and Eisenkraft's 7Es will help to transition the students over to the flipped classroom as well as the blended learning environment--this will create a strong community of learners.

References

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