EDUC-607 Winter 2017

What effective methods can be used to improve the technological literacy of my CTE students?

Implementation Paper

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Introduction

The topic chosen for this implementation paper is Technological Literacy. Taking that topic and focusing it as “effective methods to improve the technological literacy of my CTE students” clarifies it even more. The rationale is that all people need to be technologically literate in today's competitive global economy, and changing environment.

Review of literature consisted of five peer reviewed journal articles that discussed the need for teaching technological literacy (tech lit) in the classroom. Four of the five articles were discussing how to integrate this topic specifically into curriculum. The fifth article was giving information back, from a national survey that had been conducted over numerous years, to see the results of how the tech lit standards were being implemented.

Draft of Guidelines consisted of a lesson plan on how to present this technological literacy topic to my college students. The proposal was to use custom pre- and post-quiz surveys with an informative PowerPoint (PPT) presentation that I created, to be used as a teaching aid between quizzes, as part of the instructional procedures.

Data collection came from my experts through private discussions with each of them, about the PPT and survey quizzes. Future data will come from the students, when they take the quizzes and view the PPT.

Analysis of the data collected results from my experts’ suggestions regarding my PPT, along with the pre- and post-questions of the survey. I have analyzed this data to help me to understand better ways to teach tech lit, and to sensitize my students. Based upon patterns of agreement from my experts, I am now better prepared to rewrite my guidelines for greater effectiveness and efficiency.

Rewrite of the Guideline are where most of my experts made modifications to my PPT, and/or pre- and post-survey questions. I will integrate those changes into the material I plan to use during the implementation phase with students.

Research Question

The research question was derived from the original quote above. What effective methods can be used to improve the technological literacy of my CTE students?

Review of Literature

Several journal articles agreed about the need to increase problem solving skills by introducing critical thinking into the classroom curriculum. More recently, a third article stressed the need to revamp curriculum by incorporating teaching technological literacy, and breaking away from the traditions of language literacy, and numerical literacy as the basic learning tools. As a teaching aid, a fourth journal article stressed the use of labs with artifacts where students investigated, and determined how these things were created and functioned. These CTE students work with their hands a great deal of the time. These four articles helped to strengthen the need to teach critical thinking and problem solving skills. The last article was more a summation of an on-going multi-part national survey, stretching over years. The initial survey started in 2001, and this fifth edition was in 2014-2015. It was done by the International Technology Engineering and Education Association (ITEEA). They are responsible for creating *Standards for Technological Literacy: Content for the Study of Technology (STL); Advancing Excellence in Technological Literacy Student Assessment, Professional Development, and Program Standards (AETL); and Next Generation Science Standards (NGSS).* These are three publications regarding technological literacy standards that are well received and respected within the educational community, since they are from International Technology Education Association (ITEA), and now known as International Technology Engineering and Education Association (ITEEA). Within the article, their survey questions 8, 9 and 10 were directed to supervisors who were being asked if they incorporated these standards into their existing programs. The answers followed immediately, as to how these standards were used within their states. A few other articles are incorporated in this paper, as support, for specific points that were made.

Experts

The experts I chose were selected based upon their years of teaching experience within higher education, plus their willingness to advise me on this project. Their specialties within education varied, which helped to give a broader view on this subject. I asked each of them, separately, to participate—and, they agreed. When discussing my research question with my experts, these are the results that surfaced, for my two-hour college class, within the Electronics Department. I asked them whether, or not, they had taught technological literacy in their own classes. They all had done so, to some degree, which made them knowledgeable about my focus area. Therefore, these experts who are either recently retired university professors, or currently active college instructors, reviewed my original short PowerPoint presentation (17 slides), and my custom-designed 10-question quiz that I plan to give my class. They agreed, that this PPT would be a good teaching tool to introduce this tech lit topic, following the pre-quiz. Another suggestion was made by four of the six experts--that was to use the same survey questions for both the pre- and post-quiz. In that way, the students would be familiar with the questions on the second exposure to them, on the post-quiz. The PPT was dissected slide by slide, with each expert. It was determined to be very effective by five of the six experts, as an introduction lesson to tech lit. One active associate professor, at a local community college, is not a big fan of PowerPoint presentations. He prefers straight lectures. Yet, he did not object to my using the PPT and survey in this application.

Patterns and Suggestions

No one felt that there were any glaring gaps within this PPT presentation. They all liked that the PPT defined what tech lit meant. I took that a step further to define technology. All the experts agreed that these two definitions should help educate and clarify this topic to the students. During discussions, three of the six experts did tell me to pay attention to how my students might react to the PPT, and to pay close attention to the students’ feedback, as well. These experts felt the students may see things differently than they did, from a teachers point-of-view. With that said, these three experts agreed there might be changes to be made to the PPT, based upon student feedback.

When each of the experts and I went over the survey quiz, question by question, there were only one or two very minor typing errors that had to be corrected. The overall opinion was that the first three background questions on: age, gender and ethnic background were concise and easily understood, and could be applied anonymously to disaggregate the resulting student data. Therefore, no changes were necessary there. The last 5 questions are to be open-ended, so each student will enter their answers on the computer, in the spaces provided. The last 7 of 10 questions are:

1. Have you ever heard of technological literacy before this class session? Yes, or No
2. Do you believe you are technologically literate? Yes, or No
3. Please define technological literacy in the space provided.
4. List items you think are technology.
5. List everything you see in this classroom that you identify as technology.
6. List all technology that you brought into the classroom today.
7. List how many things that you have on your own person that are technology.

These seven questions were well received and accepted by all the experts. Four out of six experts thought the list answers were a simple way to collect data. This tech lit presentation will be done in one, two-hour class period. So, all students who are present that day, will participate.

Scaffolding

The second concept of my methodology provoked deep thought and discussion from all my experts. What was discussed was the 7Es of Learning model by Arthur Eisenkraft (2003) as a framework for teaching tech lit, and emphasizing what the literature was recommending. These seven steps are: **Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend,** that I incorporated into the students’class assignments, lab experiments, and projects. Rodger Bybee’s 5Es were familiar to my experts. I had to define Eisenkraft’s 7E Learning design model. Here are the descriptions I gave to each expert, so that we would all be on the same page:

1 - **Elicit** prior knowledge from the students, as a starting point through class discussions, and sometimes in one-on-one meetings.

2 - **Engage** the students quickly into whatever the specific project/task they are given, so they are involved from the beginning. This is done in teams of two or three students.

3 - **Explore** by having the student teams do their own research, as needed, on the different topics, assignments, and projects to gain knowledge and information, so they can proceed forward.

4 - **Explain** is when the students (teams) are taking the information they gathered, and presenting it to the instructor and the class-at-large, as required. A Q & A session may be a part of this process for clarification. This shows where they applied their problem-solving skills.

5 - **Elaborate** is where the presenters can expand on the information they give, during a question and answer section. Critical thinking surfaces here where they can go beyond just the basic information, and show their in-depth understanding that they have acquired.

6 - **Evaluate** by having their peers evaluate them on a provided form, as a team, and individually. If each student knows that their classmates will be judging them, they tend to put more effort initially into their work. The instructor is also grading them individually, on their fairness, of each evaluation.

7 - **Extend** the critical thinking knowledge and problem-solving skills gained from each assignment, experiment and project to newer endeavors, is the goal. Each step builds from the previous ones. This is where students synthesize new knowledge.

Experts opinions on the scaffolding

One retired professor from UCR said that she thought this 7E design model was a very direct way to teach students to use critical thinking, and to learn how to problem solve at the same time. The community college assistant professor thought that this approach was a fast way to get the students involved, in any class project quickly. The retired professor from CSUSD, agreed that this design model had a strong chance for high retention, within this class, from day one. The UCR professor emeritus was intrigued by how quickly this 7Es design model would captivate the students’ attention. The community college associate professor liked this design model very much. There were a few suggestions, from three experts, on how to transition from one step to another, to make it a smoother delivery, which was well received by me, and will be implemented in the next phase of this program. The 7Es will span several class periods to finish, per project. Some projects that the students do, will take the whole class time, just to complete, without any presentations. Therefore, their presentations might be held the following class session. Each project gets more complex therefore, the time allotted for these 7E steps will vary accordingly. Teaching the tech lit using the 7Es is making the students more independent. All these experts thought that this framework is a valid and reliable approach to teaching tech lit. The experts also see flexibility in this approach. They understand that class dynamics change with each new group of students. Therefore, no one set of approaches will work every time. What the experts all agreed on was that the 7Es allow the students to use their own newly acquired awareness. Then, they will apply it to each new project and situation that they are encountering, within this class, as they progress through the semester.

Effect, Final Product and Conclusion

Technological literacy is a subject that cannot be taught in just one class period, or even a quarter, or semester. There is so much depth to it that it is a lifelong learning endeavor. What I am hoping to do is to introduce my students to become aware, and thus start to be able to expand on the skills that they have acquired toward critical thinking and problem solving. We are living in times of convenience. We need to teach people how to be able to function in any given situation without simplistically thinking, “I can just go to the store to get whatever I need.” That may not be possible when a major disaster occurs—then, how will they survive, especially when there is no store available? If they know how to apply technological literacy to problem-solve a situation, and use critical thinking skills, they will be on a viable road to survival. So, teaching tech lit is an ever changing and challenging endeavor, and must be constantly evolving to stay relevant within society and our constantly changing environment.

The changes and suggestions from my experts have been incorporated, herein. My methodology and implementation plan encompasses many facets. As my guidelines have evolved toward full implementation with my students, it is hoped that I have unlocked the best and most “Effective methods to improve the technological literacy of my CTE students.”

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