

## **AC 2008-344: WRITING CRITICAL REVIEWS IN TECHNICAL COURSES IN A BSEET PROGRAM: STUDENT PERCEPTIONS**

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# WRITING CRITICAL REVIEWS IN A TECHNICAL COURSE IN A BSEET PROGRAM: STUDENT PERCEPTIONS

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To support TAC of ABET Criterion 2 points (g) and (h), we have incorporated the writing of critical reviews in an *Electronics Design* course –junior level- in the Bachelor of Science in Electrical Engineering Technology program offered at the campus. The students are asked to read and submit a critical review for each one of 5 articles previously selected by the instructor. These articles are all technical in nature extracted from professional and trade publications, written by engineers for engineers. At the beginning of the semester the instructor explains to the students the reason for this classroom activity as well as its weight on the final grade. The instructor also emphasizes that it is very unlikely that the students will be able to fully understand all the topics presented in each article and this has been chosen on purpose as these articles now become a tool for the students to learn in more detail the topics presented in each article. It also serves to emphasize to the students that learning does not stop on graduation as professional and practitioners use these publications to continue learning and refreshing their knowledge. The instructor provides feedback for each to each student on the technical contents of their review as well as grammar, spelling and clear transmission of ideas.

At the end of the course the students were asked to respond to an anonymous survey about this activity. The survey focused on questioning the students on the technical concepts that they learned from the article reviews as well as how they felt about writing the reviews. The main findings can be summarized as follows:

- a) Students didn't like having to write the critical reviews.
- b) Students acknowledged the value of the critical reviews as a tool that gave them a broader insight into the topic of the course, analog electronic design.

This paper describes in detail the results from this activity as well as provides information and insight for colleagues in any engineering or engineering technology program who want to incorporate similar activities into their courses.

## INTRODUCTION

Incorporating communication elements into technical courses, while totally necessary, can be a challenge for both, instructors and students. While we are all aware of the importance of being proficient on communication skills<sup>1</sup>, it is necessary to develop activities that make this feasible while maintaining the level of interest of the students<sup>2</sup>. In the experience described in this paper, the students enrolled in EET 330 (Electronic Design) course at the Wilkes-Barre campus of Penn State were asked to submit a total of five critical reviews of articles previously selected by the instructor. These articles, listed in the Table below, have been carefully selected to both, emphasize and complement the main topics covered in the course. At the beginning of the semester, when the instructor describes the syllabi and tasks to be covered in the course, he explains the reason behind these critical reviews to frame them in the context of the course. The instructor also emphasizes to the students that these are documents written by engineers for engineers at a different level than a textbook, and therefore it is expected that students will not be able to understand all the details in the article<sup>3</sup>. However, the instructor also emphasizes that this can be a common thread that they can expect after graduation when they will have to use their knowledge to learn new technical skills and concepts.

Review #	Title of article
1	Ask the Applications Engineer: Op-Amp issues
2	Ask the Applications Engineer: Capacitance and Capacitors
3	The PCB is a component of Op. Amp. design
4	Ask the Applications Engineer: Noise in Op. Amps
5	Electronic adjustments made easy

Table 1: List of article reviews

The instructor also emphasizes the dual goal of this activity, that is for the students to learn new concepts related to the course as well as to improve their communication skills as both of them are critical to their future professional success.

## MEASURING STUDENT PERCEPTIONS

Anecdotal evidence and informal comments from the students during the three years that the article reviews have taken place suggested that students were unhappy with this activity. This is not surprising as writing seems to be one of the activities that our students dislike the most. However, the same anecdotal evidence suggested that although students didn't like to do these article reviews, they were aware of the importance of writing and communicating in their future professional careers.

In order to have a better understanding of the student perception of this activity as well as how they perceive the importance of communications in the field of Engineering Technology, we developed an anonymous survey that was administered at the end of the Spring 2004 semester. The survey contained 30 questions chosen to cover 4 different topics that were interlaced to avoid repetitiveness by the students and an open question regarding their feelings about the article reviews. A total of 12 students answered this survey. The questions and the area they covered are displayed in the Table below.

<p>ELECTRONIC DESIGN AND ENGINEERING</p> <ol style="list-style-type: none"> <li>1. Articles were an open window to the engineering profession</li> <li>2. Helped realized that although I do not master all the details, I have a good knowledge</li> <li>3. Reviews helped me to become more confident in my technical skills</li> <li>4. I plan on re-reading the articles</li> <li>5. I plan on keeping them after graduation</li> <li>6. Helped me to expand concepts beyond textbook</li> <li>7. Reviews were a bridge to real life engineering</li> </ol>
<p>CONTENT</p> <ol style="list-style-type: none"> <li>8. Articles too focused on OpAmps</li> <li>9. Less technical and more application-oriented would be better</li> <li>10. Reviews were a waste of time</li> <li>11. Reviews helped me realize that I will have to continue learning after graduation</li> </ol>
<p>READING and WRITING</p> <ol style="list-style-type: none"> <li>12. They made me read articles would not have read otherwise</li> <li>13. Articles were mostly boring</li> <li>14. I would have enjoyed similar activities in other courses</li> <li>15. I would have liked to expose the articles to the rest of the class</li> <li>16. Writing is boring. Does not belong into a technical course</li> <li>17. Feedback should not take into account spelling, grammar or style</li> <li>18. It became easier as we did more reviews</li> <li>19. First article was the most difficult to do</li> <li>20. I would prefer to choose the articles to review from a given set</li> <li>21. Reviews helped me to write more fluently</li> </ol>
<p>GRADING</p> <ol style="list-style-type: none"> <li>22. Weight adequate</li> <li>23. I would eliminate this part of the course</li> <li>24. I would have submitted them even if they didn't count for the grade</li> <li>25. They were an easy grade</li> </ol>

Table 2: Survey questions

Students were asked to grade each one of the previous statements from 1 (strongly disagree) to 7 (strongly agree).

## RESULTS

The summary of the relevant results for each one of the sections can be found below:

- a) Electronic Design and Engineering. The following graph summarizes the averaged responses of the students:

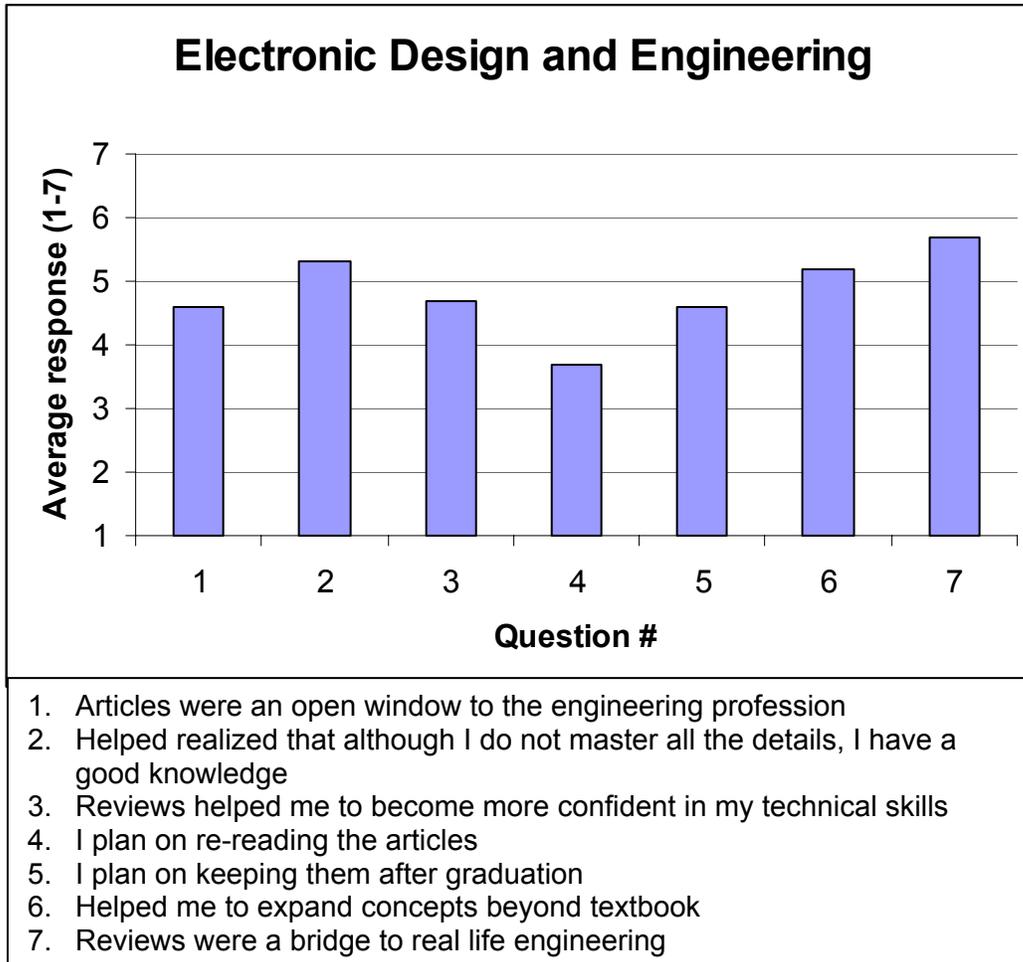


Figure 1: Student response – overall

From the chart it is possible to recognize how the students seemed to appreciate the effect of the article reviews in increasing their technical knowledge. The questions with the higher marks (Question 7: Reviews were a bridge to real life engineering and Question 2: Helped realized that although I do not master all the details, I have a good knowledge) clearly indicate this perception by the students surveyed. It is interesting to note how although students will not re-read these articles in the near future they still consider them as a valid tool for their professional career as they plan to keep them as a resource once they graduate.

b) Content of the articles. The responses to these set of questions are summarized in the following chart:

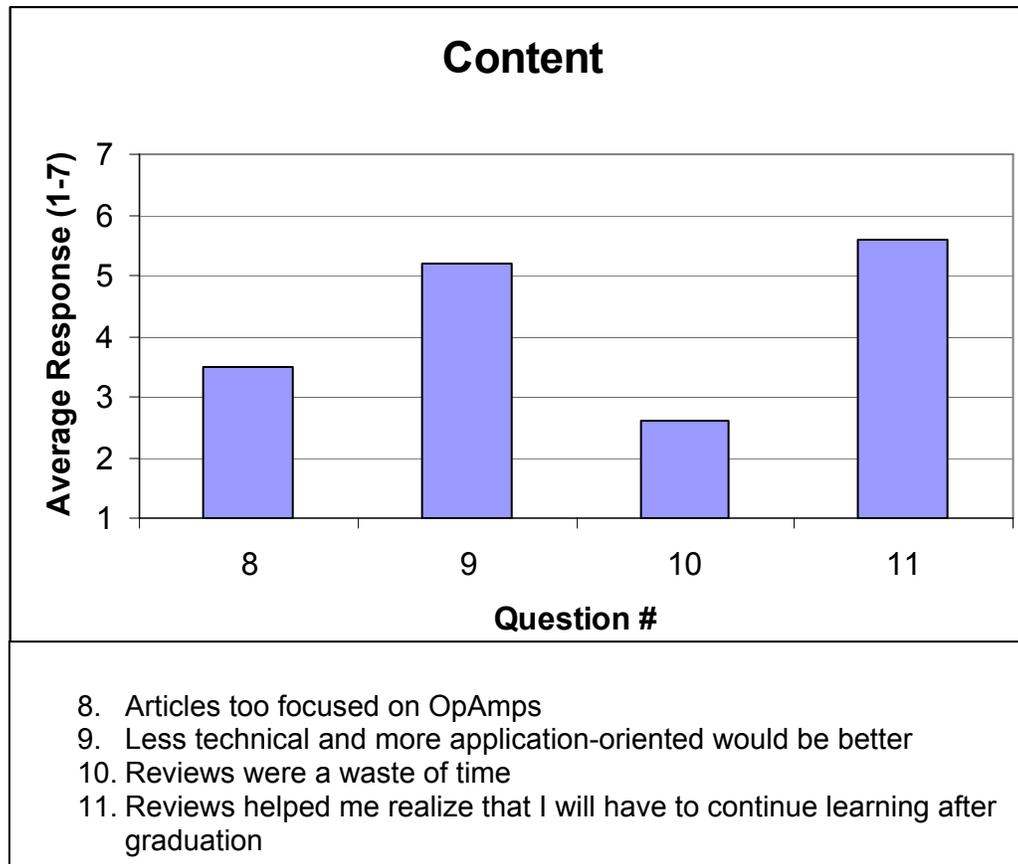


Figure 2: Student responses: Reviews content

It is interesting to note that although the anecdotal evidence gathered over the years indicate that the students did not like doing the article reviews, they do not consider it a waste of time (Question 10: The reviews were a waste of time) but a tool to increase their knowledge as the summary of the previous section indicates. Furthermore, these reviews also have a positive effect in helping students to realize that they will have to continue learning after graduation as shown by the high response to Question #11 (Helped me realize that I will have to continue learning after graduation).

c) Reading and writing: The summary to these questions can be seen in the chart below. They can provide some light and ideas for those who try to incorporate similar activities into their courses.

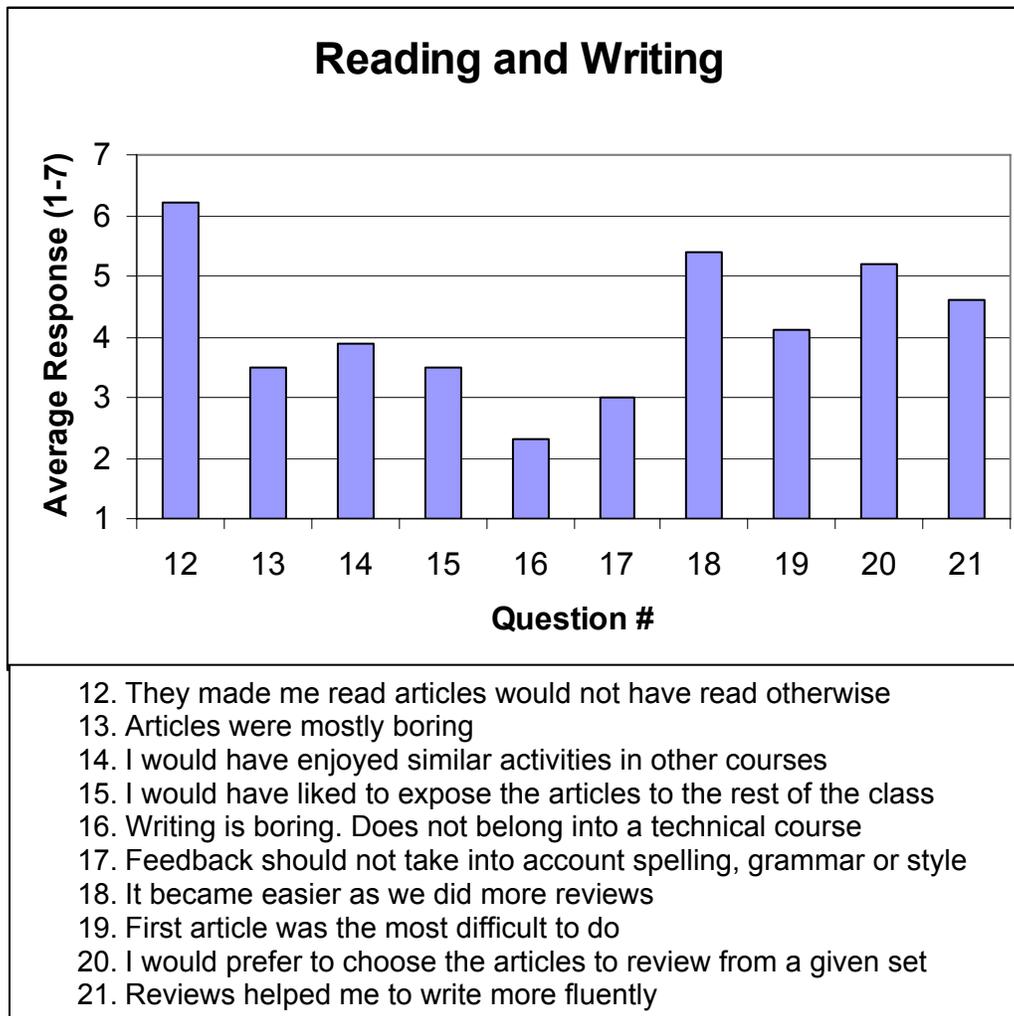


Figure 3: Student responses – Reading and writing

The response to the first question in this chart clearly shows that the students recognize the effect that this activity had on making them read a series of articles that are used in the profession, thus further cementing the importance of this activity. The responses to question #16 (Writing is boring. Does not belong into a technical course) can be seen with some surprise as we sometimes tend to assume that students believe that writing is not an essential part of a technical course. This type of response should deserve additional research so we can all plan our activities accordingly. This statement is further supported by the answers to the next question (Question 17: Feedback should not take into account spelling, grammar or style) in which the students recognize that in addition to the content, how the information is presented is also critical. On the writing process itself, the responses clearly indicate that the first review was difficult to do for the students, mainly due to being a new activity that became easier to do as the semester progressed. This was also corroborated by the quality of the reviews that steadily increased due to the feedback that the instructor provided to the students. Based on the responses to question #20 (I would prefer to choose the articles to review from a given set), it can interesting to consider a set of articles from which the students need to choose several for the reviews when this activity is repeated next year. Giving students these choices can help them in making the decision of which ones they need to read in detail. The answers to question #15 (I would have liked to expose the articles to the rest of the class) is very interesting because while the average value is right at the middle of agreement/disagreement the answers by the

students were the mi-modal with half of the students in the 6-7 area and the other half in the 1-2 area. This last type of response should not be a surprise either as one of the activities that the students typically enjoy the less is oral presentations. However, it is interesting to note the relatively large number of students that thought they would benefit from exposing and discussing these article reviews in the classroom.

d) Grading. The article review had a weight of 10% on the final grade for the course. The responses of the students to these questions are summarized below:

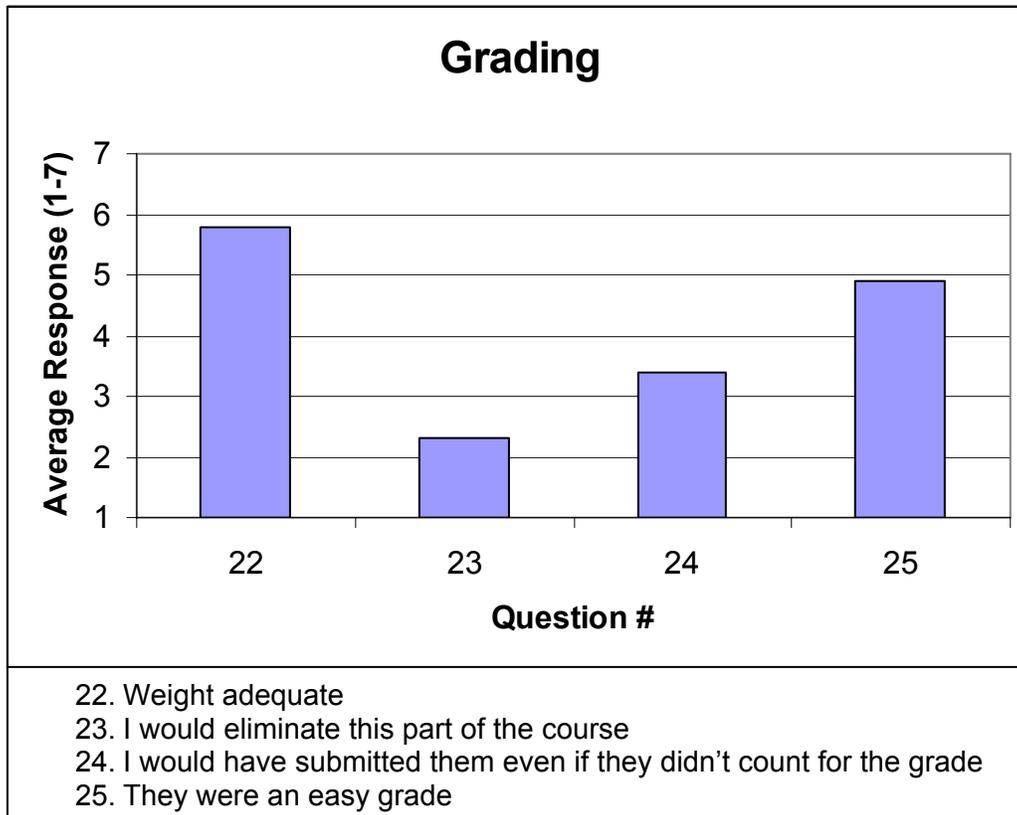


Figure 4: Student responses – Effect on grades

The students believed that the impact of the article reviews on the final grade was appropriate and if they had to take this course again, they would keep this activity in it. Part of the reason for this answer may reside on the last question (Question 25: The reviews were an easy grade) in which the students admit they feel adequately compensated by their efforts in this activity. We need to keep in mind the ultimate goal of the article reviews as exposing students to the profession rather than being a difficult activity for them. This way, students may feel less reluctant to doing this type of work.

e) Open questions. At the end of the survey, the students were asked to write their comments in an open-ended question regarding the article reviews. The following are the comments from the students:

- I learned something in each article that I would not have learn in a classroom environment

- Boring and consumed hours, but gave me a lot of “out of look” info
- Good stuff. They should be discussed
- Enjoyable. Busy work. Some topics hard to understand
- Enjoyable. Exposed to things that were not specifically covered in course
- Some topics (noise) appeared in several articles
- Helped our grade and brought awareness of the engineering field

These answers are consistent with all the responses to all the previous questions. The students recognize the value of reading literature that has been developed for working engineers even given the amount of work that it involved. They also valued the ability to learn new topics that are not typically discussed in textbooks. The last answer to the open question can be used to summarize the feeling of the students regarding the article reviews.

## CONCLUSION

Incorporating writing activities in a technical course can always be a challenge, not only to balance this activity with the technical contents of the course, but also to convince the students on the importance of improving their writing skills. By asking the students to review a series of articles selected by the instructor on the general topic covered by the course, we can achieve this balance. Furthermore, reviewing articles written by professionals for professionals helps the students to realize that they cannot stop learning after graduation, but they will have to continue learning as they advance in their respective professional fields. Students also value a fair compensation in the weight of this type of activity on their final grade.

## REFERENCES

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