Reflective Writing to Include Advanced PDC Content into Existing Coursework

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***Abstract*— Faculty sometime skip certain PDC content in a course because of time limit or mandated student learning outcomes and assessment plans or the lack of student preparation etc. This poster presents an approach to incorporate such overlooked or not covered content in an existing course and evaluates student performance after adopting it in classroom.**

Keywords—NSF/IEEE-TCPP; Education; Operating systems; Writing assignments.

I. Introduction

In a traditional CS/IT course, syllabus content is mostly dictated by different learning outcomes set by the department, university, accreditation institutions and academic standard organizations. Faculty always has a delicate task of maximizing the student learning while balancing within these requirements: the allotted time for the semester, the motivation level of students and the application trends in the real world situations. Therefore, sometimes faculty is unable to cover some of the advanced content for a course because there is a lack of enthusiasm among students, or lack of lab facilities or no learning outcome associated with such topic or lack of time in the semester. Winston-Salem State University currently offers a single elective course focused on parallel computing for its CS majors. However due to the recent explosive growth of multiprocessing systems, including multicore processor, clusters and distributed data centers, we believe that it is essential for both CS and IT majors to have some key knowledge about parallel computing even though they choose not to take that elective course. Traditionally, we cover some of these key concepts during lectures and typically cannot afford to ask students to perform any critical work on these areas due to the abovementioned factors. This poster presents an approach to incorporate such topics in an existing required course where students have to participate actively, read critically and write analytically.

II. Reflective Writing Assignments

A. The need for reading the textbook

Students acquire critical knowledge during their undergraduate years in variety of ways. One such process of acquiring knowledge is intensive reading. Numerous researches [1]-[2] have found the positive affects of intensive reading of the textbook with higher student achivements. Reading is an important tool for learning and plays a key role for student's academic success. However, because of several reasons [3] there is a lack of extensive use of the textbook in the class and therefore students are getting less involved in reading related activites. Since faculty can not include all topics during a class, reading assignments, where students have to intensively read the textbook content that faculty did not cover, will not only help faculty to include more content, but will also help students to broaden their knowedge.

B. Why reflective writing?

The process of becoming a good reader is tedious and students do not participate in reading willingly. We need to use motivation as a factor to involve students into this process. Reflective writing [4] and associated grade can work as an incentive to engage students more into reading those parts of the chapter, which are normally not covered in a traditional setting. Reflective writing is observed [5] as an effective way to improve student's critical thinking skills.

C. Format of the reflective writing assignments

Each of the reflective writing assignments (reflections) assigns students with couple of sections (around 30 pages of the text book) of a particular chapter to read within two weeks. Before the due date, the students are required to write a reflective paragraph (within 400 to 500 words) on their reading of the content. The following guideline is provided to help student formulate each reflection:

- What are the sections about? What is important?
- What is the focus of these sections?
- What are the main points that one should know?
- What have you learned reading these sections?
- How these sections relate to the topics that we covered in the class from this chapter?

Word count was imposed strictly and students are obliged to write their reflection within one paragraph while emphasizing on organization and continuity of their answers and connection among concepts. Three such assignments were offered during Fall 2015 semester while teaching Operating Systems Concepts with the first one focusing on an easier reading content (i.e. inter-process communication) and the last one with the hardest reading content (i.e. process synchronization and deadlock). In a traditional semester, these contents are not covered in depth and with the help of these assignments, we are now able to cover them in class. Also, since students are reading the content in their leisure, it is not adding an excessive workload to their schedule.

D. *Selected course with modified assessment plan*

This poster presents efforts to incorporate TCPP curriculum content in a junior-level course titled CSC 3321: Operating Systems, a required course for both CS and IT students in the department, which is offered in Fall, 2015. The prerequisite for this course is knowledge in fundamentals of hardware organization and CS2 programming experience. Along with covering basic operating system constructs, this course traditionally include one week of lecturing to introduce students with process synchronization primitives. In a traditional semester, to reinforce learning, students are provided with programming assignments to apply the theory in practice while experimenting in a single processor environment to work with different kernel tasks and perform simulation with different operating system algorithms. In previous offerings, students would normally do three take home assignments, each of which has few analytical questions to answer and some might have a programming problem. To introduce the TCPP curriculum into the course, we revised the assessment and took a two-pronged approach. In the first prong, we introduce the new type of writing assignments (3) as described in Section II.C. On the second prong, we introduce a dedicated lab time to expose students to Java threads and then create a new programming assignment where students have to solve multi-threading programming problems. Therefore, instead of having three analytical/programming assignments throughout the semester, now we offer two, where the first one remains the same as previous offerings and the second one contains the multi-threading programming problem.

III. Evaluation

To observe the effectiveness of the new pedagogy, we consider individual grades of assessment items and overall course grade and compare that to corresponding grade in previus offering of the class in Fall, 2014. First, we look at the distribution of grades for the newly intorduced reflective writing assignemnts as showin in Fig. 1. Although students struggled at the beginning, their grade improvd as they master the skills needed for intense reading and reflective writing. Next, we look at the grade distribution of the modified programming assignments as shown in Fig. 2. To evaluate the grade distribution, we compare the average grade distribution of assignments (2 in Fall 2015 and 3 in Fall 2014). It is noted that having more dedicated labs helped students to comprehend the programming assignments better, which is reflected in the reduction of D's and F's. However, since the programming part now includes multi-threading problem, fewer students successfully finished them and therefore there is a reduction of the number of A's.

The overall grade distribution of the course is also compared as shown in Fig. 3. It is encouraging to see that even after covering more and difficult contents in the course, the number of D's and F's has reduced than before. Finally, we looked into any qualitative response from students in the course evaluation survey conducted by the university. Although students favorivly rated the course, its content and faculty's delivery and instruction, in general, students complained about the amount of extensive reading and programming component in the assignments. In future, we would like to apply this approach in more course offerings to understand its full potential and pitfalls.

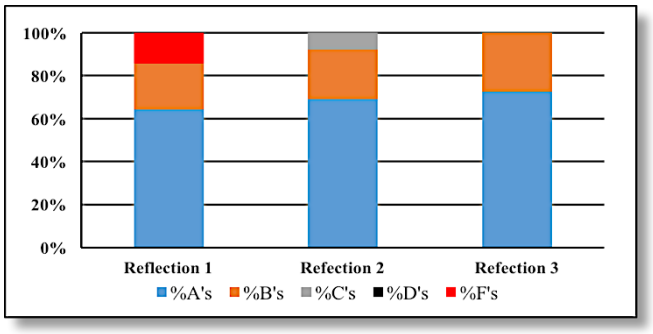

Fig. 1. Grade distribution of reflective writing assignments.

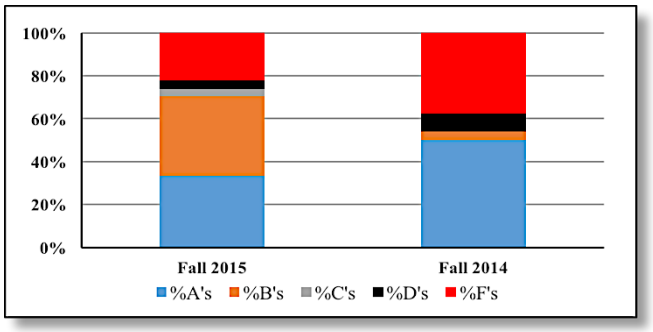

Fig. 2. Grade distribution of traditional assignments.

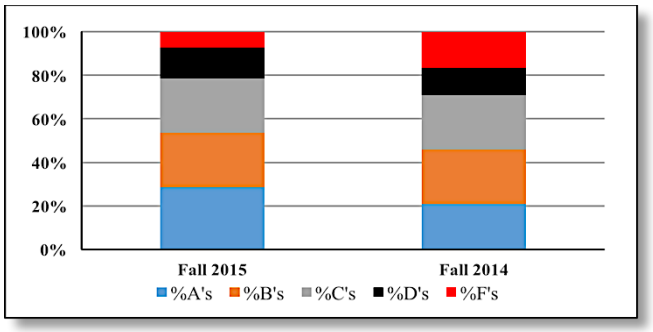

Fig. 3. Overall course grade distribution.

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