Common Assessment of Two Related Courses to Reduce Grading Bias and Improve Readiness of the Students for Corporate Environments

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Abstract

This paper presents an approach to assess students attending two related computing courses. To demonstrate our approach, we evaluated students taking either Fundamental Networking or Fundamental Database courses. Towards the end of the semester, students taking both courses were asked to individually finish a common term project resembling a scenario in the corporate environment. One of the objectives of this assignment was to let students recognize benefits of mastering different but related areas of study. Another goal was to teach them that various computer technology courses are interconnected and that a computer specialist can use skills learned in one area to better understand concepts of the other one. The students were evaluated based on their abilities to combine knowledge from the subject they studied with researched information about a related area in computer technologies. Each student's project was assessed by two professors and the results were analyzed to better prepare future interdisciplinary assignments while eliminating potential grading bias. This type of assessment methodology could benefit students, by introducing them to advantages coming from broader knowledge, and educators, by letting them develop cross-disciplinary assignments that are resilient to instructor's grading bias while stimulating students interests.

Keywords

Assessment, common assignment, grading bias, interdisciplinary courses.

Introduction

Student learning outcomes are commonly defined as "any change or consequence occurring as a result of enrollment in a particular educational institution and involvement in its programs"[1]. Assessment is the process of defining, selecting, designing, collecting, analyzing, interpreting, and using information to increase students' learning and development[7]. A well-defined framework is often useful in organizing and coordinating the assessment process to ensure consistent methodology and data analysis.

Assessment of students requires a systematic gathering of information about student learning and the factors that affect learning, undertaken with the resources, time and expertise available, for the purpose of improving the learning. The three main steps in assessment include: *(a)* articulating learning goals, objectives or outcomes, *(b)* gathering information about how well students are meeting the goals set, and *(c)* using the data obtained for improving the process of

learning. The purpose of assessment is to outline an informed decision-making process while including information about student learning.

In the United States, regional bodies accredit institutions of higher education based on the voluntary association of schools and colleges[3]. Regional associations responsible for six specific geographical United States areas accredit educational institutions[12]. The associations are Middle States Association of Colleges and Schools, New England Association of Schools and Colleges, North Central Association of Colleges and Schools, Northwest Association of Schools and Colleges, Southern Association of Colleges and Schools, and Western Association of Schools and Colleges. Their purpose is to evaluate the quality of the institution as a whole and normally they do not try to ascertain quality for individual academic programs within the given institution. Regional accreditation provides recognition to institutions that meet a quality standard. Institutions then must strive to maintain this level of quality while seeking to improve human, physical and financial resources; programs and services; and impact on students and other constituents. In order to maintain accreditation, an institution must respond to any criticism or suggestions given and work to improve the problems identified. Through this process, regional accreditation provides opportunities for institutional improvement and accountability. Our Computer Systems Technology department at the New York City College of Technology (CUNY) is accredited by the Middle States Association of Colleges and Schools.

In this paper, we focus on assessing two related courses using a common assignment and rubric. Current research in this area on interdisciplinary studies suggests borrowing methods from the disciplines that it encompasses but having research process of its own in order to produce knowledge while avoiding reuse of recognized expertise[8]. Interdisciplinary work may be assessed based on a level of integration of two or more disciplines or measured by the degree to which it achieves its purpose[5,14]. Besides purposefulness and integration, disciplinary grounding, metacognition or critical awareness can be assess to better evaluate interdisciplinary work[6].

Assessing students involves fairness of treating all students equally by giving them an equal opportunity to earn their grades[10,11]. In other words, grades should be based on what students learn and how they perform rather than on other factors such as gender, race, political affiliation, attractiveness, previous students' performance, a group membership, emotional state of a grader or an order in which assignments are graded[2]. Some of the factors that can reduce bias are student anonymity, detailed grading criteria and well written rubrics[4]. In this paper, we attempt to reduce grading bias by using a common assignment and an external grader along with the professor teaching the course.

Motivation for Assessment at Our College

The Department of Computer Systems Technology (CST) at New York City College of Technology (City Tech) of City University of New York (CUNY) is one of nine departments in the School of Technology and Design. CST offers two degree programs, an Associate of Applied Science in Computer Information System (CIS) and a Bachelor of Technology in Computer Systems (CIB).

CST has continued to update its curriculum in both degree programs and improve faculty resources in an effort to keep pace with the rapid advances in computer based technologies. The CST department researched current industry technologies, and after several meetings with CST industry advisory committee, we re-organized the modular structure of the curriculum into four tracks: *Database, Networking and Security, IT Operations, and Software Development*[13]. Each track includes 7-8 required courses and 1-2 elective courses. Each track covers a wide range of knowledge and skills in the respective area. In addition to the common required Business and Liberal Art courses, students will elect one track to study so that they may gain thorough knowledge and skills which will prepare them well to enter the workforce in the computer systems industry.

We follow a three-year cycle of assessment at City Tech, as depicted in Fig. 1. This paper demonstrates Year 1 of assessment where we evaluated two related courses during the summer of 2017 semester.

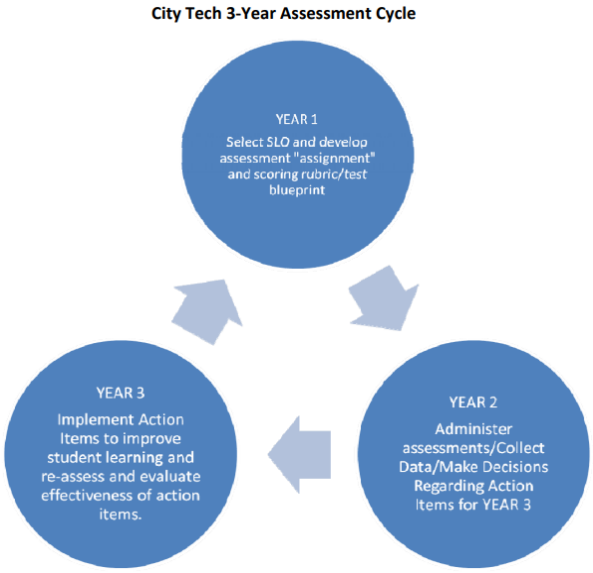

Fig. 1. CityTech 3 year assessment Cycle steps

In this paper, we focus on assessing two courses from two different tracks in our department. We chose courses from the Networking and Database tracks, namely Networking Fundamentals and Database Fundamentals. Two tools that we used across both of the courses were common assignment and common rubric for evaluation. We attempted to tackle problems associated with: *(a)* interpretation of scores assigned by different instructors in different but related courses and *(b)* how to improve mutual common assignment to be more immune to individual graders while better preparing students for a real-life challenges. The detailed methodology of our approach is described in the next section.

Our Methodology

Two freshmen courses in networking and database fundamentals were selected with 24 students in each class of the summer of 2017. We used the publicly available national rubric called: *Foundations and Skills for Lifelong Learning VALUE Rubric (AA&C)*. We chose this particular rubric as it is designed to assess the skills and dispositions involved in lifelong learning, which we felt would be ideal for assessing two foundational, related computing courses. Both courses required students to write a common term project used for assessing five criteria, such as Curiosity, Initiative, Transfer, Independence and Reflection.

The common assignment was divided into two parts. In the first part, students were asked to demonstrate their understanding of the subject taught to them during the semester. It comprised questions about basic database concepts, for students of the Foundations in Database Systems class, and basic networking concepts for students of Networking Fundamentals class. In the second part of the assignment, students were asked to research how both fields interact with one another in the corporate environment.

For example, students of Networking Fundamentals class were asked to design a network for a middle sized medical office and understand importance of securely maintaining a database of medical records. In this context, the students were supposed to describe the importance of database design, technologies that a database administrator would use and how the goals as a network engineer align with the goals of the database administrator. The professor who taught the database course was a guest lecturer to the networking class to introduce some key database concepts. Similarly, the database students were asked to research how they would collaborate with a network engineer in the same medical office and to demonstrate basic proficiency in networking.

One of the goals of this assignment was to stress the need of understanding related fields and how one can benefit from a broad knowledge in different but related areas. This should help students realize that courses are not isolated but are interconnected to one another and that they can use the skills learnt in one course to easier grasp concepts of the other one for creating better inter-corporation collaborations.

The common assignment was graded by both professors who taught the two foundational courses. The reason for doing it was to understand and eliminate potential bias that an instructor could have towards his/her students. Results of our first round of this intradisciplinary assessment are presented in the next section.

Results

Students work of the common assignment was graded by both professors for all five of the criteria (i.e., Curiosity, Initiative, Independence, Transfer and Reflection). Each student was graded on a scale of 1-4 on each of the five criteria.

Figure 2 shows the average grades of all 24 students enrolled in the Database Fundamentals course. We see that professor who taught the course (i.e., Prof. 1) appears to be more lenient towards his students as compared to the other professor (who taught the Network Fundamentals

course). We also note from the graph in Fig. 2 that the Curiosity and Reflection criteria scored highly while Initiative remained relatively low among all students. It would suggest making adjustments to the common assignment or explanations of thereof in the way that could encourage students to fuller incorporate personal experience in their respective essays.

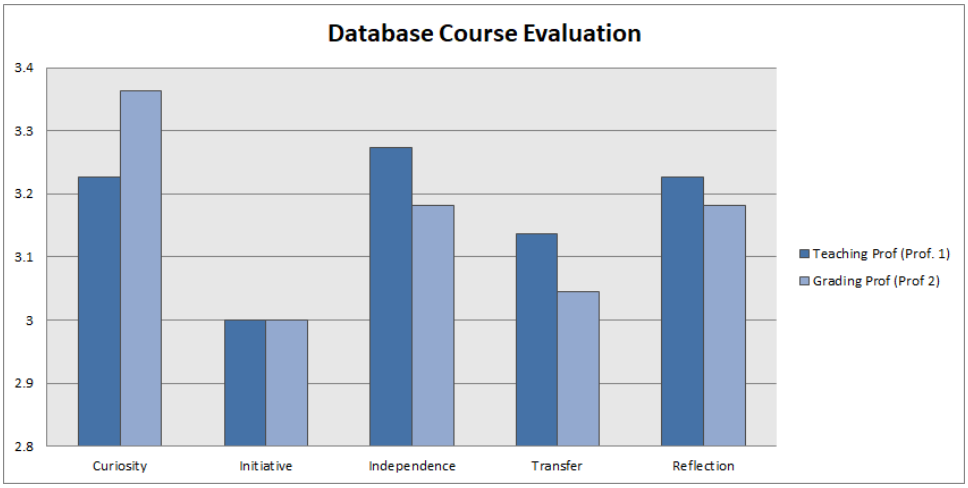

Fig 2. Evaluation of Database fundamentals course by two professors involved in the common assignment.

Figure 3 shows the average grades for the common assignment of 24 students enrolled in the Networking Fundamentals course. We see that professor who taught the course (i.e., Prof. 2) is more strict towards his students as compared to the other professor (who taught the Database Fundamentals course and graded the students without any prior information about them). Thus from both graphs, we see that Prof. 1 is more lenient in grading that Prof. 2. This information provides feedback to both professors about their grading policies and allow for, for example, averaging the grades to better reflect actual student's achievements.

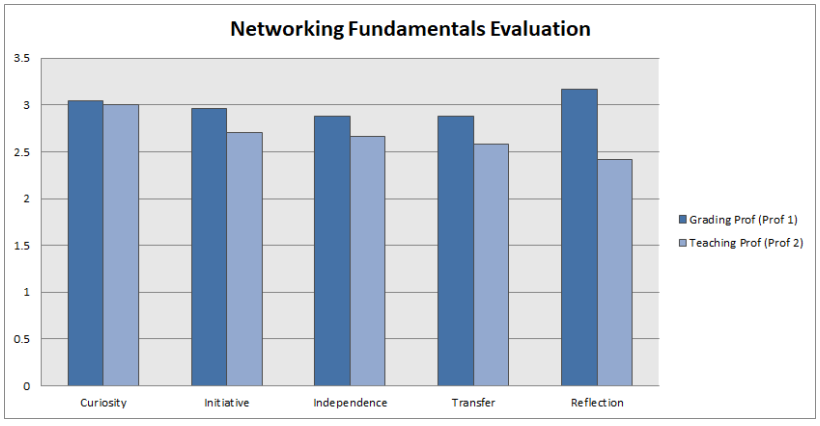

Fig 3. Evaluation of Network fundamentals course by two professors involved in the common assignment

Figure 4 shows the grade distribution of all 48 students evaluated by both professors. This type of grading can alleviate grading bias by clearly demonstrating actual discrepancies in a way professors assess students. For example, since Prof. 1 is a lenient grader and Prof. 2 is a strict

grader, by using the grades from both professors (over all students), we may mitigate effects of subjective criteria in the grading process.

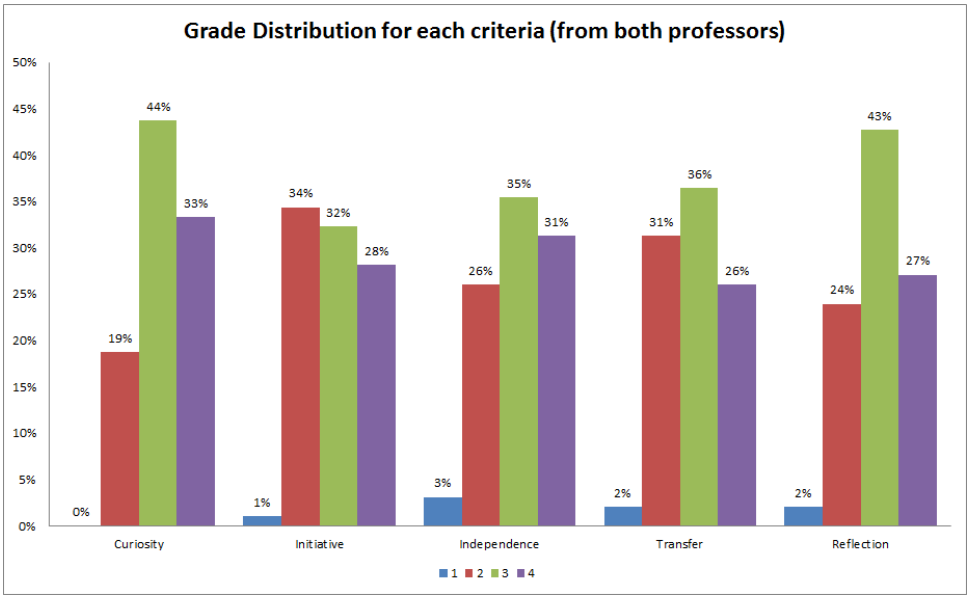

Fig 4. Combined grades of both professors involved in the common assignment.

Conclusions

In this paper, we presented our interdisciplinary assessment model with a common project and rubric. We demonstrated that our methodology provides valuable feedback to professors on their own grading to eliminate grading bias and provide a more accurate reflection of student knowledge. This process also provides students with a broader knowledge (of two related fields) in the area of computer technologies, while preparing them to face diverse challenges of corporate environment.

Future work

We want to expand our common assignment to Software Engineering and IT operations tracks. Furthermore, we intend to repeat our methodology over multiple semesters, compare obtained results and accumulate data to better guide us in program developed for our department. Our methodology would help students understand that in any corporate company, these four tracks co-exist and cross fertilize.

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