Best Practices in a Redesigned Online Computer Ethics Course

Cynthia Y. Lester
Department of Computer Science and Engineering
Georgia State University, Perimeter College
Dunwoody, Georgia, USA
e-mail: clester6@gsu.edu

Abstract – **The Babson Survey Research group, in its 13th annual survey of higher education, reported that one in four students is enrolled in online courses. The report also stated that the number of students taking online courses has continued its growth trend of the last 13 years where nearly 5.8 million students take online courses. Furthermore, approximately 28 percent of higher education students are enrolled in at least one online course. While these numbers are not surprising, they do confirm what most educators now know and that is students want to learn on their own terms and in their own environments. However, challenges in the perception of online education still persist, especially in the wake of the most recent scandals surrounding online for profit institutions. Moreover, how to best deliver quality online instruction still plagues many institutions whether they are traditional brick and mortar with an online campus or an online institution where the majority of the programs and students are fully online. Consequently, the objective of this paper is to provide a discourse on best practices in an online learning environment. More specifically, the work uses as its context an online computer ethics course aimed at students in a 2-year degree pathway, at a Research I university that was first piloted in 2014. Since then, the course has been revised and has become a regular offering, part of the required computer science curriculum. Also presented are challenges and lessons learned with hopes that they further the dialogue among educators on how best to design online courses and meet the needs of online students.**

Keywords – computer ethics; community college; learning outcomes; online education; undergraduate computer science.

I. INTRODUCTION

The United States Department of Commerce, Economics and Statistics Administration in its July 2011 report stated that Science, Technology, Engineering, and Mathematics (STEM) occupations are projected to grow by 17.0 percent between 2008 and 2018, compared to 9.8 percent growth for non-STEM occupations [1]. According to the U.S. Bureau of Labor and Statistics in its January 2017 report, there were nearly 8.6 million STEM jobs in 2015, representing 6.2 percent of the U.S. employment [2]. Moreover, STEM degree holders enjoy higher salaries, regardless of whether they are working in STEM or not and they command higher wages, earning 26 percent more than their non-STEM counterparts [1]. In fact, ninety-three out of 100 STEM occupations had wages above the national average [2]. But these higher wages also come at a price. According to the report, over 99 percent of STEM employment included occupations that require some postsecondary education [2]. Additionally, of the ten fastest growing STEM occupations, nearly all required at least a bachelor's degree [2]. So, where does this leave students who are attending 2-year institutions and/or community colleges and choosing STEM disciplines?

In a report entitled, "The Role of Community Colleges in Postsecondary Success," by the National Student Clearinghouse Research Center, it is noted that community colleges play a critical role in increasing the opportunity for many to experience postsecondary education [3]. In particular, these institutions provide a critical pathway for the under-served and disadvantaged students, working adults, and students with family and employment responsibilities [3]. In a report by the Community College Research Center, the leading independent authority on 2-year colleges in the U.S., it was reported that in fall 2015, 38 percent of undergraduate students attending college, were attending a public or private 2-year institution [4]. Moreover, the report stated that of the students who completed a degree at a 4-year institution in 2015-2016, nearly 49 percent had enrolled in a 2-year institution during the previous ten years [4]. Consequently, the need to ensure that students who are attending 2-year institutions receive quality instruction and be exposed to opportunities and various learning experiences is a must. Furthermore, for many of these institutions being able to offer online education for students is also important, because it allows them more flexibility to reach the student population which they traditionally serve.

The Babson Survey Research group, in its 13th annual survey of higher education, reported that one in four students is enrolled in online courses [5]. The report also stated that the number of students taking online courses has continued its growth trend of the last 13 years where nearly 5.8 million students take online courses [5]. Furthermore, approximately 28 percent of higher education students are enrolled in at least one online course [5]. While these numbers are not surprising, they do confirm what most educators already know and that is students want to learn on their own terms and in their own environments. Yet for many students, online education provides the only opportunity for them to achieve their lifelong goal of earning a college degree and provides even more accessibility for those students attending community college.

Online education is especially important for first generation college students, adult learners, students with family obligations, students in remote areas where college/universities are not easily accessible and veterans returning to school. *41 Facts about Online Students* by College Atlas revealed that 37 percent of online students were

Copyright (c) IARIA, 2018. ISBN: 978-1-61208-619-4

the first among their family members to attend college and that 60 percent were employed full-time [6]. To this end, 68 percent of those surveyed indicated that the reason they enrolled in online courses was the ability to balance work, family and school responsibilities, while 64 percent stated that they appreciated the ability to study at their convenience [6].

Although online education continues to grow and public institutions continue to seek new and innovative ways to reach today's students, there continue to be challenges. For example, faculty members have reported feeling less confident about online programs [5]. According to the Babson Survey Research report, only 29.1 percent of chief academic officers reported that their faculty accept "the value and legitimacy of online education [5]." Additionally, academic leaders who regard online learning as critical to their long-term strategic efforts dropped 7.5 percentage points from 70.8 percent in 2015 to 63.3 percent in 2016 [5].

When it comes to community colleges and online education, researchers have found differing opinions. In an Inside Higher Ed survey, published April 17, 2015, it was reported that "50 percent of two-year-college presidents agreed that more courses could be moved online without adversely affecting students at their institutions [6]." This stands in contrast to reports that community college students are also less likely to do well in online courses [7]. For example, in a report by the U.S. News and World Report, researchers at the University of California-Davis, found that community college students throughout California were 11 percent less likely to finish and pass a course if they opted to take the online version instead of the traditional face-to-face version of the same class. The work was presented on April 18, 2015, at the American Educational Research Association's annual conference in Chicago in April 2015 [8]. Furthermore, one of the authors of the paper went on to note that in their study they found that in every subject, face-to-face students were doing better than their counterparts taking the online version [8].

Consequently, the objective of this paper is to provide a discourse on best practices in an online learning environment. More specifically, the paper presents an update on an online course intended to teach computer ethics aimed at STEM pathway students who are enrolled in an Associate's degree granting pathway within a Research I university. The author first presented the development of the course in the proceedings of the Seventh International Conference on Mobile, Hybrid, and On-line Learning in the work entitled, "Developing a Computer Ethics Course for Online Learners [9]." The current work focuses on course improvements and results, challenges faced and lessons learned.

The paper is organized into the following sections. Section II introduces the course and provides the rationale for course revisions. Sections III and IV present a course overview and the redesigned modules. Section V includes the results, while sections VI and VII present the discussion and concluding thoughts.

II. FRAMEWORK

A. Background – Pre-consolidation

As previously stated, course development was described in the work entitled in "Developing a Computer Ethics Course for Online Learners [9]." The course description, topics covered and learning outcomes remained the same. However, there was one significant change in the course design which included the prerequisites of the course. When the course was developed and implemented in 2014, it only had one prerequisite which was the successful completion of *CSCI 1301 - Principles of Computer Science I* with a "C" or better, or permission of the Instructor and Department Chair [10]. At that time, it was decided that CSCI 1301 would be the course prerequisite because it emphasized structured, top-down development and testing of computer programs. At the conclusion of the course, students would be able to utilize critical thinking and analytical skills to successfully analyze, develop and implement programs in a modern programming language.

In 2014, when the course was developed it was done so as a part of Georgia Perimeter College. At that time, Georgia Perimeter College was the largest 2-year institution in the state of Georgia with the largest freshman and sophomore enrollments in the state, making it the top producer of transfer students to 4-year institutions within the state [11]. It had five campus locations throughout the Atlanta-metro area and serviced approximately 22,000 students either face-to-face or through its online campus. Roughly 10 percent of the student body took all their classes online [11]. The number of students choosing one of the STEM disciplines was roughly 10 percent [12].

B. Background – Post-consolidation

In 2016, Georgia Perimeter College consolidated with Georgia State University. As a result, the new Georgia State University has six campuses throughout metro Atlanta, an online campus, and is a national leader in serving students from diverse backgrounds with a student population of over 51,000. Perimeter College became the 2-year arm of the university and provides instruction to approximately 21,000 students, still at its five campus locations throughout the Atlanta metro area and online. It is through Georgia State University's Perimeter College, that students can still earn an associate's degree. However, as a result of the consolidation, many associate degree pathways made significant changes to their curricula and one of those was the computer science pathway.

In consultation with the Director for Undergraduate Studies for the computer science department at the Atlanta campus and with the author (who serves as the computer science and engineering department chair at Perimeter College), it was decided to change the prerequisites for the computer ethics course such that it mirrored prerequisites for 2000-level courses at the main campus. To this end, the new prerequisites for the course became *CSC 1301 and CSC 1302,*

Copyright (c) IARIA, 2018. ISBN: 978-1-61208-619-4

each with a grade of C or higher or permission of the department [13]. The addition of CSC 1302 further strengthened the skill set of students had coming and hoped to ensure that students were ready for the rigor of 2000-level computer science courses. The next sections provide an overview of the course followed by the redesigned course modules.

III. COURSE OVERVIEW

A. Course Description

CSC 2920- Ethical and Social Issues in Computing, is a three hour course dedicated to the study of social, ethical, and legal effects of computing on society and its users. Ethical concepts, professional codes of ethics, and the influence of computing on individuals, organizations, and the global economy will be addressed. Students will utilize critical thinking and problem solving skills to analyze and debate case studies on topics some of which include privacy; intellectual property; computer crimes; system failures and implications; and, the impact of technology on society [13].

The course continued to utilize the College's Desire 2 Learn (D2L) learning management system as its online portal. Although redesigned after the consolidation with enhanced features, this allowed the author to disseminate information, engage students in discussions and perform student assessments.

B. Topics Covered

The topics covered in the CSC 2920 remained the same which included [13]:

- Basic concepts and historical overview of computer ethics
- Introduction to issues and themes in ethical computing
    - Privacy
    - Freedom of Speech
    - Intellectual Property
    - Computer and Network Crime
    - Evaluating and Controlling Technology
    - Error, Failures and Risks
- Professional ethics and responsibilities

C. Learning Outcomes

By the end of the course, students were still expected to [l3]:

- Explain and evaluate the ramifications of technological advances brought by the advent of the computer on individuals, organizations and society
- Identify ethical and legal issues related to computer use
- Develop solutions based on the computer professional code of ethics
- Effectively and succinctly communicate through speech, writing, and presentation the themes of the course

D. Student Assessments

One change that was made was in the area of student assessments. In the pilot study of the course, students were required to write and submit a term paper (8 percent of the course grade). Although in the pilot study survey, students noted that at first they were somewhat apprehensive about writing a "term paper" for a computer science class, they enjoyed the assignment and that overall the class average was a B [9]. However, the author removed the paper in order to give more weight to class participation and incentivize students' online interaction in the course. Consequently, the new areas (with grade weight) in which students were assessed included:

- Class Participation = 10%
- Case Study = 10%
- Programming Assignment = 5%
- Exams = 50%
- Final exam = 25%

The next section discusses three areas of changes in course content. The first is the addition of a new module entitled the Class Passport and the other two areas of change are to the student assessment areas of class participation and case studies.

IV. REDESIGNED COURSE MODULES

A. Class Passport

To engage students from the very beginning, a class passport module was developed. Much like the definition of the word, "passport," the passport module symbolized a travel document for the rest of the course and once students completed viewing it, they were granted access to the rest of the course material. This high-level of interaction ensured that students reviewed the following: 1) online honor code policy; 2) the attendance and participation policy; 3) the dropping and withdrawal policy; 4) instructor's expectations which were presented in video format; and, 5) the course syllabus and semester schedule. Also, as part of the passport module, the first discussion post was presented which asked students to address the following:

- Where you are from?
- Why you are taking this class?
- What area of computer science interests you the most?
- What are your career plans?
- Is this your first online computer science or online college class?

In particular, it was the answer to the last question that helped the author gauge how best to interact with students.

B. Class Participation

Previously, class participation accounted for only 2 percent of the overall course grade [10]. However, based on recommendations from students and from colleagues who reviewed the course, the instructor changed the weight of class participation to 10 percent of the course grade.

Copyright (c) IARIA, 2018. ISBN: 978-1-61208-619-4

Participation now carried as much weight as student case study presentations, which emphasized to students that participating in discussion posts was just as important as the case study that they were to present to their peers. It should be noted that an increase from 2 percent to 10 percent for participation in an online class seems negligible, especially when students report feelings of loneliness in online classes. However, because exams and the final exam must be weighted 75 percent of the course as required by the college's curriculum committee, only the additional 8 percent was available for use in the class participation category. Hence, the author redistributed the weight and increased the class participation category.

There were total of five discussion posts based on central themes. Discussion questions were posted in concert with student case study presentations and students were given approximately one week to respond. To guide their response, they were asked to:

- Provide an overview of the theme based on textbook concepts
- State their opinion
- State the student presentation that best supported their opinion
- To encourage responses and replies, the instructor would often comment on student posts.

C. Case Study Presentations

The author re-worked this module completely. When the course was first developed, this module was named class debates. The intent was for students to be assigned opposing sides to discuss course topics. However, many students did not understand how to "debate" a topic but instead just recounted the topic background that was initially presented by the author in the directions.

Therefore, to encourage more critical thinking where arguments and solutions could be presented, the author asked a question at the end of the case study background and challenged students to:

- Use the case study background as a framework only for the presentation
- Provide an introduction to the topic utilizing theoretical concepts covered in the textbook.
- Discuss how the use of technology impacts your given role
- Use similar cases/scenarios to further explain your position (news articles, cases in the textbook, etc.)
- Present your opinion of the situation (even if it differs from your given role).

An example of a case study based on the themes, "Privacy, Technology, and Security" is as follows:

In March, the House of Representatives approved the Congressional Review Act (CRA), undoing privacy restrictions imposed on ISPs during the Obama administration. The Senate also passed the CRA]. Advocates who support privacy noted that the move means Verizon, Comcast or AT&T can continue tracking and sharing people's browsing and app activity without permission. While supporters of broadband providers said the privacy rules were onerous and unfairly strapped regulations on telecom carriers, but not on web companies such as Facebook and Google that also provide access to online content. As asked in the textbook, "Technological and social changes make people feel uncomfortable, but does that mean the changes are unethical?"

Directions once again included that the presentation of the material should be no less than ten (10) minutes and no more than fifteen (15) minutes. The presentation should include at least three (3) scholarly references from which the information was gathered. Additionally, students were encouraged to be creative with technology beyond the use of PowerPoint in order to promote interaction and advanced technology use. Students were also informed that use of PowerPoint only, would garner very few points. Lastly, students were informed that they would be assessed on their use of technology, style and delivery of the content.

D. Programming Assignment

The programming assignment which counted for five percent of the total course grade was designed to engage students' critical thinking and problem solving skills while also focusing on the course content of ethics. As a result of the new prerequisites, the programming assignment was also redesigned to include not only the concepts from CSC 1301 but also some higher level concepts taught in CSC 1302. Since Java was taught as the programming language in both courses, the program description was specific to a Java implementation. Yet, keeping in mind that this was not a "programming course," students were informed that they would be assessed on their design, efficiency, and implementation of the program as a whole.

E. Exams

Since exams counted for 75 percent of the course assessment as required by the curriculum committee, the author added another module which included lectures and videos on how to adequately prepare for the exams and the final exam (which was comprehensive). Students were told how many questions would be on each exam and the types of questions (i.e., multiple choice, matching, essay, etc.). Students were also informed that the exam would be available for 24 hours, but that once started, it would end 120 minutes later. By providing this level of detail, it was the anticipation of the author to level the playing field between those who had not taken an online course previously and those who had (approximately 36 percent had not taken an online course). Also, the announcement feature with e-mail in D2L was heavily used as a reminder about upcoming exams and logistics.

Once the exams had been graded and reviewed by the author, exam review notes were posted. The author utilized the question statistics and question details features in D2L to

Copyright (c) IARIA, 2018. ISBN: 978-1-61208-619-4

determine questions themes on which students had difficulty. If 25 percent or more of the students answered a question incorrectly, the instructor reviewed that question and its corresponding theme and also engaged students in feedback.

The next section presents the results of student assessments in two areas, class participation and the exams. Results were not available from the case study presentations for reasons explained later in the discussion section.

V. RESULTS

A. *Class Participation*

As noted, class participation was worth 10 percent of the overall grade and was implemented through discussion posts. There were a total of five discussion posts. Figure 1 shows the overall number of students participating in the discussion posts. Figure 2 shows students participating by discussion post.

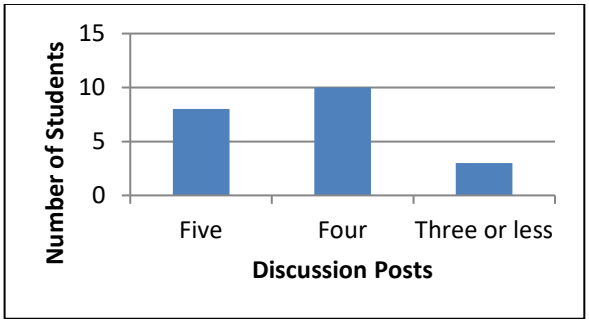

Figure 1. Participation in Discussion Posts

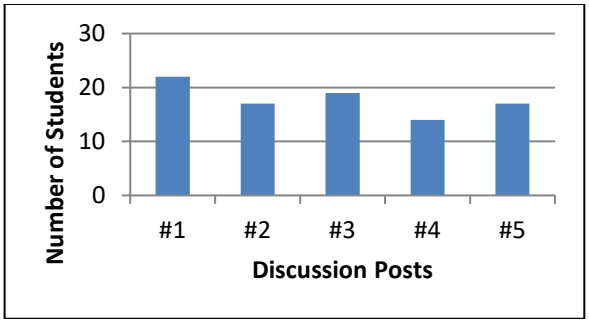

Figure 2. Participation by Discussion Post

B. *Exams*

There were total of three exams and one final exam. The instructor used the statistics in the D2L to gather information not only about the class performance as a whole on each exam, but also how students performed on individual questions. By utilizing question statistics and question details, the instructor was able to develop exam review notes which focused on the themes covered in the question. Figure 3 shows the number of questions on which 25 percent or more the students answered incorrectly. Figure 4 shows the types of question by exam on which 25 percent or more of the students answered incorrectly.

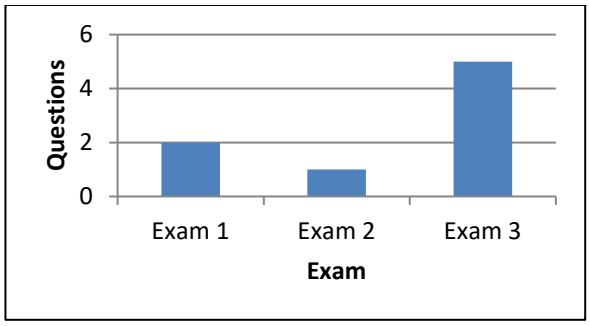

Figure 3. Number of questions by exam for review

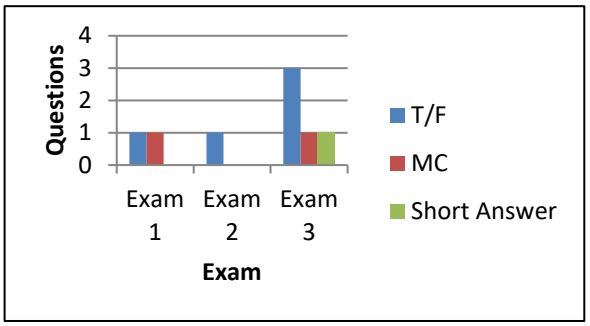

Figure 4. Questions for review by question type

The next section provides an overview of the results presented, followed by concluding thoughts.

VI. DISCUSSION

Overall, the instructor was pleased with the changes in course content and the heightened level of interaction. Results show that on average, the majority of the students participated in the discussion posts (approximately 18 each time). The results also show that participation varied according to topic, but remained strong throughout the semester.

As it relates to the exams, while it was not presented in the results section, the author can attest that with the heightened level of communication and constant reminders about the exam and exam logistics, no students missed taking any of the exams, a first since the author began teaching the course in 2014. However, what is presented in the results section that needs more attention is on the concepts and wording of the questions for exam #3. It may be that the wording of the T/F questions need to be revised and/or that the short answer question was too challenging to complete in the time provided. Only little over half of the students attempted to answer the question.

While the author was pleased with the overall modifications to course, one point of concern and an obvious challenge is the case study module and student assessment. The author spent significant time redesigning the module with updated content and directions. The author had hoped that students would submit case study presentations that encouraged a higher level of critical inquiry which promoted discussion and challenged ways of thinking. Although

Copyright (c) IARIA, 2018. ISBN: 978-1-61208-619-4

students were challenged in their way of thinking and conveying the ethical implications of the material, many presentations lacked the critical analysis of the literature needed to support their claims. This is a work in progress, one that the author will again revisit.

VII. CONCLUSION

In closing, the purpose of this work is to further a discussion on how best to teach computer ethics in an online environment and to identify best practices. The author presents revisions to a course that was initially offered as a pilot study. Since the first offering in 2014, the course has been offered each year and has grown in popularity. However, certain challenges still remain which include how to truly assess if by the end of the course students are able to meet the learning outcome of being able to, "Explain and evaluate the ramifications of technological advances brought by the advent of the computer on individuals, organizations and society." The author thought that by redesigning the case studies and providing students with a framework that presentations would engage critical thinking. However, results from this module were inconclusive.

Another challenge that the author did not anticipate was that the redesign of several modules and the addition of a new module would significantly increase course development time. In an article title, "Does it take more or less time to facilitate and develop and online course? Finally some answer", twenty-nine percent of survey participants stated that they spent over 100 hours developing their first online course [14]. The article went on to explain that number of hours was probably due to the fact that 59 percent of respondents developed over 90 percent of the course without any assistance, which included developing content, assessments, assignments, and time associated with course design [14]. Although the author used lectures from the first implementation of the course, the assessments, assignments, and other materials associated with the course redesign were new. Additionally, because the intent was to increase the level of interaction and engagement in the redesigned course, additional hours were spent on this aspect. Therefore, the author spent approximately 70+ hours in the redesign.

However, through these efforts some best practices did emerge, which were in the redesign of the course and that the author will carry forward into the next course offering:

- Use of the introductory discussion post to gather insightful information on students' background
- Restricting access to course content until the Class Passport module has been completed
- Expanded use of the announcement feature with email
- Utilization of the question statistics with details

In closing, as more and more students choose to take classes online and institutions increase their offerings to meet the demands of those students, so does the debate on how best to offer quality instruction. This is especially important to educators who are interested in increasing opportunities for those who desire to experience postsecondary education and in expanding the STEM pipeline. By carefully examining course content, delivery, and also understanding who our students are, we further our goal as educators in helping students who cross our "virtual pathways" to succeed.

REFERENCES

[1] D. Langdon, G. McKittrick, D. Beede, B. Khan, and M.Doms. "STEM: Good jobs and for the Future," U.S. Department of Commerce, Economics and Statistics Administration. http://www.esa.doc.gov/sites/default/files/reports/documents/stemfinalyjuly14_1.pdf. *[Retrieved: February 2018]*.

[2] U.S. Bureau of Labor and Statistics, Spotlight on Statistics. https://www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf *[Retrieved: February 2018]*.

[3] National Clearinghouse Research Center. The Role of Community Colleges in Postsecondary Success. https://studentclearinghouse.info/onestop/wpcontent/uploads/Comm-Colleges-Outcomes-Report.pdf. [*Retrieved: February 2018]*.

[4] *Community Colleges for International Development.* https://www.ccidinc.org/single-post/2017/05/04/Community-College-Enrollment-and-Completion *[Retrieved: February 2018]*.

[5] 2015 Online Report Card - Tracking Online Education in the United States https://onlinelearningconsortium.org/read/online-report-card-tracking-online-education-united-states-2015/ [*Retrieved: February 2018]*.

[6] 41 Facts About Online. Students https://www.collegeatlas.org/41-surprising-facts-about-online-students.html [*Retrieved: February 2018]*.

[7] Free Community College, Structure Pathways: Survey of 2-Year College Leaders. https://www.insidehighered.com/news/survey/free-community-college-structured-pathways-survey-2-year-college-leaders. [*Retrieved: February 2018]*.

[8] Studies: Online Courses Unsuccessful at Community Colleges. https://www.usnews.com/news/articles/2015/04/27/studies-online-courses-unsuccessful-at-community-colleges [*Retrieved: February 2018]*.

[9] *C.* Lester, "Developing a Computer Ethics Course for Online Learners" Proceedings of the Seventh International Conference on Mobile, Hybrid, and On-line Learning. Pp. 27-32. ISBN: 978-1-61208-385-8.

[10] C. Lester, 2014. CSCI 2900-099- Ethical and Social Issues in Computing. Course Syllabus, summer 2014. Unpublished syllabus, Department of Computer Science and Engineering, Georgia State University, Perimeter College, Decatur, GA.

[11] The University System of Georgia, 2012. http://www .usg.edu/. *[Retrieved: February 2018]*.

[12] C. Lester, Georgia Perimeter College STEM Annual Report Form 2011-2012. Report submitted to the USG STEM Initiatives II Office. Unpublished report, University System of Georgia, STEM Initiatives, Atlanta, GA.

[13] C. Lester, CSCI 2920-Ethical and Social Issues in Computing. Course Syllabus, spring 2017. Unpublished syllabus, Department of Computer Science and Engineering, Georgia State University, Perimeter College, Decatur, GA.

[14] D. Morrison, "Does it Take More or Less Time to Facilitate and Develop an Online Course? Finally, Some Answers," https://onlinelearninginsights.wordpress.com/2015/05/08/does-it-take-more-or-less-time-to-facilitate-and-develop-an-online-course-finally-some-answers/ *[Retrieved: February 2018]*.