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Re-designing a Large Enrollment Online Course Using a Learner-Centered Approach

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Redesigning a large enrollment online course using a learner-centered approach.

This paper is a follow-up to my experience redesigning my online course in problem-solving CGS2531 Problem-Solving Using Computer Software [1]. In that paper, the instructional developer and I described the design decisions to improve students' engagement. In this second paper, I am reporting what has happened after its implementation.

My primary motivation for writing this paper is that in 2020, because of the COVID-19, several instructors worldwide had to move their courses to online environments. My experience transitioning from teaching face-to-face to online learning environments two years before COVID-19 could help other instructors strengthen the skills and knowledge needed for succeeding in online teaching. Besides the typical challenges related to being a subject matter expert and even a pedagogical expert tied to teaching any course, online teaching of large course environments offers additional challenges. For example, mentoring several undergraduate peer mentors (AKA undergraduate teaching assistants) and developing strategies that engage students and retain students until the end of the semester. Besides, as an online course instructor, I become the content manager and first support provider of my Canvas web course, which implies the execution of tasks like course visual design, modules creation and publishing, and grade book manager and administrator.

CGS2531 does not have pre-requisites, it enrolls in Spring and Fall between 450 and 550 students, and 120 and 150 in summer.

The course before its transformation

The Department of Engineering Education offers this online course, and it is required for students in all the academic majors in the Business school. Therefore, it is expected that the course contributes to developing students' professional engineering skills of problem-solving aided by software applications. The course description in the catalog says:

> A problem-solving introduction and thorough exploration of word processing, spreadsheet management, data analysis, graphical display of data, and multimedia presentations. The problem-solving approach also aids students in their specific majors through software applications requiring major-specific professional communication skills in written, graphical, and presentation forms.

Before doing the course transformation, the course objective was written as follows:

> Effectively use Microsoft Word for professional word processing and written technical communication. Effectively use Microsoft Excel for spreadsheet data creation, data organization, numeric analysis, function solving, graphical display of information, and industry specific data analysis. Effectively use Microsoft PowerPoint for software-based presentation of ideas and graphics.

Later, I slightly modified this version, trying to make it more measurable. However, as you will see, extensive work in redefining these goals was needed:

> By the end of the course, you must show me that you can use some of the advanced tools that Microsoft Word, Excel, and PowerPoint offer to analyze and evaluate data (using Excel), to prepare a technical report that presents this data professionally (in word), and to give a short presentation of your results to an audience.

Regarding assignments and their assessment, the course had five significant assignments: one for Word, three for Excel (basics operations, pivot tables, and regression), and one for PowerPoint. Each was due approximately every three weeks. There were three (3) quizzes (Syllabus, Statistics, and Regression). In the Word module, students were asked to format a document. A video from the previous instructor going about this formatting task was offered to students as a guide. For the problem-solving component, they were asked to reflect on their professional development path, find job postings interesting for them, and write their resume and cover letters that they could use to apply for each of these job postings. If students needed to learn Word for these tasks, they were suggested to complete a course in Lynda.com.

For the first Excel module (module 2), students were asked to use basic formulas to create one worksheet with their monthly expenses. Another one compared the cost of living in three different cities based on the job postings cities they identified in the previous module. Students were asked to take the Excel training at Lynda.com to complete the different tasks asked.

The following module (module 3) was on Summarizing Data. Statistics and Pivot tables were the core of the assignment, and students were asked to find a data set on the Internet that they can use to calculate such descriptive statistics and create the Pivot Tables. Students were asked to watch videos on Lynda.com for the Pivot tables component, and there was a video created by the previous instructor explaining regression.

Module 4 was on regression, and they were asked to download a data file from the web and perform linear regression. The linear regression content was taught through a video recorded by the previous instructor.

Finally, in module 5, students had to create PowerPoint slides for practicing interview skills. So they had to come up with answers to possible interview questions like "tell us about yourself," or "why did you apply for this job position," "what type of position do you see yourself working five years from now?" Links to the Career Resource Center were provided.

As you can see, the MS Office component was taught through Lynda.com, with low involvement of the instructor on this topic. On the other hand, the problem-solving component of the course offered students well-defined problems. Still, they had to work on thinking about their future professional path.

The instructor's presence was limited to the weekly messages sent at the beginning of the week and the emails written in response to students' situations. The instructional videos in which content was taught were the ones the previous instructor had or the ones at Lynda.com. Not being in the teaching videos minimizes my presence in the course. Office hours were by appointment only.

Regarding the visual design of the course, the course home page was text only. A screenshot that shows the first two modules can be seen below:

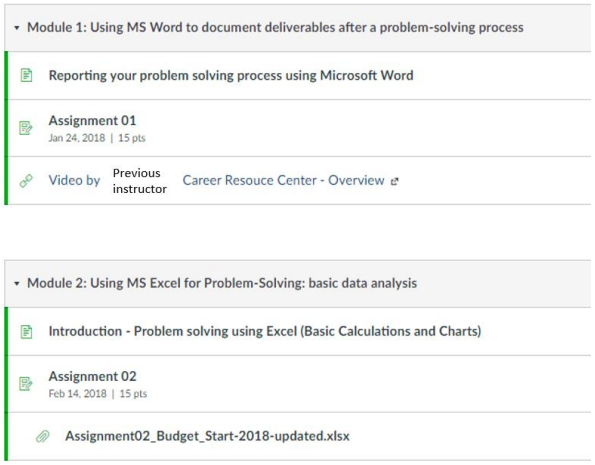


Figure 1 - Layout of Canvas course before its transformation

Similarly, instructions for assignments were described in text, and there were discussion boards in case students had questions about them. The course was missing guidance on how a proper solution for the assignment looked like, and it also lacked opportunities for self-assessment like rubrics. Rubrics were only provided to peer mentors for grading. These were focused on taking points off to student deliverables.

Students, in general, were dissatisfied with the course. My teaching evaluations were low. Although I adjusted add helpful content that contributed to their professional path reflections and provided lots of interactions in discussion boards, the teaching evaluations showed that students were dissatisfied.

The course redesign process

The instructional developer and I used different frameworks when redesigning the course. The main goal was to satisfy the high-quality standards for online courses described in the University of Florida (UF) + Quality Matters standard for online courses [2]. Since Quality Matters has copyright, I will not be doing specific traceability to Quality Matters criteria. However, I can say that this standard has 11 general items that encompass different online course aspects regarding the course content, assessment, and pedagogy. These standards are (the following descriptive text is borrowed from the Center of Teaching Excellence at University of Florida [2]):

1. Course Overview and Introduction
2. Learning Objectives (Competencies)
3. Assessment and Measurement
4. Instructional Materials
5. Course Activities and Learner Interaction
6. Course Technology
7. Learner Support
8. Accessibility and Usability

The following standards, also in UF + Quality matters, are specific for my University:

9. Instructor Team Presence
10. Community and Relationships (additional items than the one proposed by Quality Matters)

11. Feedback

Additionally, for creating the activities, I was inspired by the frameworks provided by How People Learn (HPL) [3] and Making Learning Whole (MLW) [4], and the alignment between course, assessment, and pedagogy proposed by Streveler, Smith, and Pilotte [5].

Defining the course goals

Following the premises of Backwards Design [6], the first step was to redefine the course goals and make them measurable. The definition of relevant course goals requires identifying what contributions to the program outcomes are expected. Such information is available in the Academic Learning Compact for each of the programs. In these, I found that it is expected that the course introduces students to the following Student Learning Outcomes (SLOs) for most of the programs in the Business School [7]:

1. Demonstrate knowledge and understanding of elements of economics, financial accounting, marketing, operations management, organizational behavior, business law, information technology, business statistics and social responsibility.
2. Demonstrate proficiency in the use of business-related software applications.

The program of Accounting, also in the Business School, expects that the course contributes to students' ability to [8]:

1. Apply mathematical concepts and technology to interpret, understand and communicate quantitative data.

These SLOs guided me when defining the course goals and the assessment I needed to measure if students reached the course goals. The course also gives students credit for general mathematics, which contributes to the general mathematics credits all the students need to take in their programs and contributes to the SLO in the Accounting program related to the course. Besides the SLOs, the course title is Problem-Solving Using Computer Software. Accordingly, the course should include a component of problem-solving.

Wiggins and McTighe [6] propose the concept of enduring understanding as *the "big ideas… that we want students to 'get inside of' and retain after they've forgotten many of the details"* [6, p. 10]. I identified the following two enduring understanding goals. First, recalling and using the language of the engineering design process [9] when asked to address an open-ended problem (which is similar to the language used for the problem-solving process [10]). Second, performing data analysis and communicating their results using the MS Office package.

Since the engineering design process and the problem-solving process share similar stages when addressing open-ended problems, learning about the problem-solving process was included in the SLOs. These are the final course goals included in the syllabus:

- Students will use Excel, Word, and PowerPoint to aid in their problem-solving process.
- Students will write a plan on how they would address an open-ended problem using the language of the problem-solving framework.

- Students will analyze real-world data, such as applying business statistics techniques and mathematical models and create data visualizations for problem-solving.

In addition to the course goals, I define a set of student learning objectives that will provide partial evidence of fulfilling the third course goal (see the list above). For example, these are two of those student learning objectives: "Calculate descriptive statistics for a data set" and "Create visual representations of summaries of large data set." This goal definition process gives me the basis to define the content I needed to deliver to students to achieve the specific learning outcomes.

Inspiration for course design and action

HPL [3] states that a successful course should develop a learning environment that is learner, assessment, and knowledge-centered, while at the same time is also community-centered. Similarly, Perkins [4] in Making Learning Whole (MLW) states the need to consider seven fundamental principles when designing the course. Although I did not follow these principles verbatim, I used the recommendations when considering students' engagement and motivation.

HPL proposes that, in a learner-centered environment, it is relevant to pay attention to what students bring to the table [3], so identifying student's previous knowledge and connecting the course to their context and possibilities was vital. It is also relevant that the course offer students possibilities for intrinsic motivation [11] and opportunities to set their own learning objectives, select and implement learning strategies, and monitor their learning [11]. Besides, it is best if students can do problem-finding, and real problem-solving, which increases the potential for transfer of learning.

For establishing such a learner-centered environment, I engage in action research (cycle observe, reflect, plan, act) to investigate my current students' background, misconceptions of the content, and possible learning barriers. I do this through three different surveys (1) Previous knowledge of Word, Excel, and PowerPoint in which students self-report their current understanding of the tools in terms of what they can do, (2) Pre-assessment of problem-solving style using the social problem-solving assessment instrument developed by D'Zurilla, Nezu, & Maydeu-Olivares [12], (3) a survey in which students share demographic questions like in which program they are, where are they coming from, gender, and other demographic questions, and (4) information about their monthly expenses on different items such as groceries, rent, and school supplies, information that is used later by students. The knowledge survey allows me to identify if the course content is relevant for most students. Such relevance has been consistent, showing in general, for example, that the percentage of students who come to the course with a good command of Excel, Word, and PowerPoint is lower than I expected. There are students whose knowledge of these tools is scarce and need to be taught the basic functionalities of the packages. Similarly, I use their expenses information to ask them to compare their expenses with the class' one. In module 6, to figure, using statistics and histograms, what would be a reasonable price for a product that wanted to be sold to the class.

In a knowledge-centered environment, it is relevant to consider students' previous knowledge that facilitates identifying possible learning barriers and misconceptions. I provide students with different ways to develop the required knowledge and skills described in the course goals. I also tackle their motivation to learn the course content by asking them to investigate how the course content and skills will help them in professional practice. Developing intrinsic motivation in students is needed for more in-depth learning [4], [11], and such motivation was very relevant for this course. I found in the teaching

evaluations that students saw the value of the course's technical component (learning Microsoft Office tools) but did not have a similar appreciation for the activities related to learning and applying the problem-solving process. For example, one student commented that they learned the problem-solving process at school because their whole lives, they have tackled problems.

For developing intrinsic motivation, I was inspired by one of the principles in curriculum design proposed by Perkins [4] that says that it is essential to "Make the game worth playing," meaning that students need to know why, what they are learning, is worth to be learned. It is also relevant to "play out of town" to facilitate the transfer of learning. To tackle these needs, I created excursion activities in which students must bring content that help them find out collectively how what they are learning in the course is applied in the real world. For example, in one of the modules, I am teaching about decision-making. In the related discussion, students must interview someone in a management position and ask her/him about their process when making decisions. Then, they are asked to compare what the practitioner said with what the course is saying. Then, they are asked to create at least two replies with specific guidelines for their replies. In another discussion, students are asked to interview a person in industry that can tell them about the problem-solving process that the organization follows and how it is compared with the one taught in the course. In that way, students find meaningful connections between the course content, their context, and how this "game" is worth playing. They also see opportunities for transferring what they are learning to the professional context. Both teaching strategies impact their motivation to learn and develop the skills for the course.

For developing the knowledge and skills expressed in the course goals, students have different ways to learn. In many assignments, students address real-world problems connected to data from students in that cohort. Besides, I record videos that explain the assignment and guide them in the completion; we (the undergraduate peer mentors and I) offer several office hours to help with the assignments. There are also assignment-related discussion boards where they can ask questions, and as mentioned above, discussions that offer the opportunity to reflect on what they are learning. I also point them to videos and courses provided by LinkedIn learning on the course topics, in case they want to get additional material on the course-related content.

In an assessment-centered environment, there are several opportunities for feedback and revision, and what is assessed should be aligned with the course goals [3]. In this course, the understanding of students is continuously checked through formative and summative assessments. For formative assessment, the course offers rubrics for each assignment, so students can self-assess their deliverables before submitting. Additionally, students have two attempts for quizzes. There are also three different moments students perform peer reviews, two for their problem definition (students have to find a problem) and one for the final presentation. This last presentation is also a self-assessment and summative assessment. This activity is like a portfolio in which students provide evidence of reaching the course goals, and the instructional team evaluates it after the student's submission of an improved version. The excursion discussion boards are also opportunities for students to self-assess their understanding of the course content. Finally, office hours also provide an opportunity for formative assessment, in which students are asked about what they understand and get guidance and help to complete their assignments. Students can also assess their progress if they complete the pre-post surveys that ask for their Social Problem-Solving style and their knowledge of Word, Excel, and PowerPoint.

In a community-centered environment, it is crucial to provide opportunities for students to learn from each other [3], [11], and to be connected "to a larger community" [3] (These connections can be, for example, with other students in the same program, college, and University as a whole, and with business).

Based on the need to create a community-centered environment to facilitate learning, I included the following course goal:

- Students will demonstrate professional, inclusive communication.

The discussion boards tackle this community-centered environment since they share their experiences with other students in the school. They are asked to reach out to student organizations or different business vendors at the University. Besides, they also connect with someone in an industry relevant to them. When sharing these connections and views from people in other contexts, they all create the feeling of belonging to a more extensive community beyond the virtual classroom. Besides all of these, in a community of learning, it is relevant that students feel safe. I included in my syllabus statements in support of the LGBTQIA and Black Communities. Besides, in my weekly messages, I share with the course students part of the class demographics like Gender identity, race, ethnicity, major, country of origin to build on this safety, and in the long run, to develop in students the sense of belonging to a community of learning.

These activities allowed me to satisfy the UF + Quality matters standards in the Community and relationships section:

- Instructor provides space and encouragement for students to develop an online learning community.
- Instructor creates an inclusive, supportive, and engaging climate, through a variety of methods.

In the development of expertise, metacognition is critical. Metacognition is the "ability to monitor one's current level of understanding and decide when it is not adequate" [3, p. 47]. Therefore, the course design also provides metacognition opportunities for students, in which they reflect and submit improved versions of their deliverables after getting feedback from their peers.

Still, teaching online requires additional considerations on the delivery, which were performed following the guidelines provided by the University of Florida. Below I will discuss one of them: instructor presence.

Instructor Presence

When I started teaching the course, most of the videos included were from other instructors or Lynda.com (a well-known training site recently purchased by LinkedIn, currently known as LinkedIn Learning). Several of the comments I got in the teaching evaluations showed me that students did not perceive my presence as the facilitator of their learning process. These are some of the comments that make this situation evident:

- *the instructor wasn't involved in teaching this class*

- *The professor didn't actually teach in this course. Instead, we learned through Lynda videos and more provided by the other professor who handled mathematical concepts and computations on Excel.*
- *there is no learning done due to our professor. Everything I have learned was on my own or because I was referenced to another website.*
- *the professor added none of his own knowledge to the course, he relied on outside sources like Lynda.com to teach it for him.*

Accordingly, one of the challenges was to provide instructor presence. As proposed by the Community of Inquiry Framework developed by Garrison (see citation by Wertz [13]), it is relevant to provide teaching presence which should be split into course design and course facilitation. According to that framework, the instructor should be visible through frequent text, audio/or visual communications, be responsive to student concerns in the short term, demonstrate enthusiasm for the course subject, and use a positive, supportive tone in all communications. The standards included by University of Florida make similar statements for online teaching in the instructor presence section:

- The instructor team is visibly present throughout the course via frequent text, audio and/or visual communications.
- Instructor proactively addresses problems as they emerge and is responsive to student concerns.
- Instructor consistently demonstrates enthusiasm for the course subject matter.
- Instructor uses a positive, supportive tone in all communications.

And in the Community and relationships section:

- Course includes regular and substantive interaction between the instructor team and students.

Accordingly, I recorded all the course videos following the suggestions given by the Center of Instructional Technology: short videos in which students can ask questions, started a fixed schedule for office hours (instead of having them by appointment), continue sending a weekly message to discuss the activities of the week, and kept reply to their questions and concerns through email and discussion boards.

Besides increasing my presence, I made the course more inclusive, accessible, and warmer for diverse students. The course is embracing diversity through my statements in support of LGBTQIA and Black communities. I also included in my signature my preferred pronoun and encouraged students to add them to theirs. Besides, since students from underrepresented groups like first-generation Latinos or Black do not ask for the opportunity to be peer mentors, I encourage them to apply. Similarly, I recorded the "who am I video" that I present in the first week of classes. In this video, beyond introducing myself to students, I show students that having me as their instructor will contribute to their development of diversity awareness and cultural diversity skills.

The redesigned course outline

The course now has 14 modules, and instead of 5 large assignments, there are 14 smaller ones. The Problem Solving process (similar to the Engineering Design Process) is taught across all the modules. The functionalities of the MS Office Package are shown as support for performing data analysis and

communicating their results. Besides, students are asked to meet with professionals in industry who can tell them about the usability of the course content. For example, they have to ask what open-ended problems they face in their company and its problem-solving process.

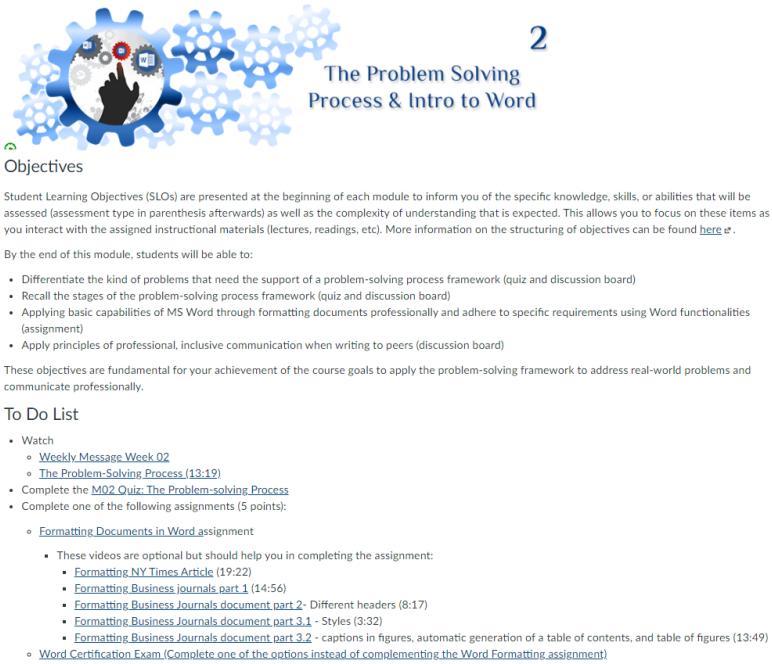
Similarly, they have to ask professionals about their decision-making process and compare it with those taught in the class. After their meetings, they report what they found on a discussion board, and students must reply. Students also have to engage in problem-finding through an iterative process. They get feedback from their peers to build a better problem definition and project goal submitted to the instructional team after several weeks. The course ends with a summative assessment in which students are asked to present evidence of their achievement of the course goals. A detailed layout that shows the course goals and the learning objectives can be found in Appendix A.

Accessibility

Regarding accessibility (in compliance with the ADA) and in addition to the learner-centered activities already explained, the course design was modified to make sure it was electronic reader-friendly, and in general, more straightforward for all the students to follow. The landing homepage was modified to make it more user-friendly and visually attractive. The modules were arranged by week, and the course has deliverables every week for 14 weeks (previously, there were only five (5) modules) (see Figure 2).

Figure 2- Home page of the course after its redesign

Each module page now includes the module learning objectives and uses page Headings and Hyperlinks to access several videos where I explain the assignments and the course content (see Figure 3).



2

The Problem Solving Process & Intro to Word

Objectives

Student Learning Objectives (SLOs) are presented at the beginning of each module to inform you of the specific knowledge, skills, or abilities that will be assessed (assessment type in parenthesis afterwards) as well as the complexity of understanding that is expected. This allows you to focus on these items as you interact with the assigned instructional materials (lectures, readings, etc). More information on the structuring of objectives can be found here.

By the end of this module, students will be able to:

- Differentiate the kind of problems that need the support of a problem-solving process framework (quiz and discussion board)
- Recall the stages of the problem-solving process framework (quiz and discussion board)
- Applying basic capabilities of MS Word through formatting documents professionally and adhere to specific requirements using Word functionalities (assignment)
- Apply principles of professional, inclusive communication when writing to peers (discussion board)

These objectives are fundamental for your achievement of the course goals to apply the problem-solving framework to address real-world problems and communicate professionally.

To Do List

- Watch
  - Weekly Message Week 02
  - The Problem-Solving Process (13:19)
- Complete the M02 Quiz: The Problem-solving Process
- Complete one of the following assignments (5 points):
  - Formatting Documents in Word assignment
    - These videos are optional but should help you in completing the assignment:
      - Formatting NY Times Article (19:22)
      - Formatting Business journals part 1 (14:56)
      - Formatting Business Journals document part 2- Different headers (8:17)
      - Formatting Business Journals document part 3.1 - Styles (3:32)
      - Formatting Business Journals document part 3.2 - captions in figures, automatic generation of a table of contents, and table of figures (13:49)
  - Word Certification Exam (Complete one of the options instead of complementing the Word Formatting assignment)

Figure 3 - Module page including page Headings, hyperlinks, and the learning objectives

The PowerPoint Slides and videos have a high color contrast, are close captioned, and show the attributions for images borrowed from the Internet. The pdf files were tagged. Similarly, the syllabus design follows the premises of the *Accessible Syllabus* design proposed by Tulane University [14]. Such work enables the course to satisfy the Quality Matters standards and the following University of Florida quality standards for online teaching:

- Course meets accessibility standards including but not limited to use of headings and subheadings, alternative image text, and color contrast.

Results

After the modifications presented above, the course has had several versions. I will shortly show its impact on students learning, the reported student satisfaction, and the university satisfaction represented in the evaluation of the course made by peers at the Center of Teaching Excellence.

Students learning

I identify students' learning through their self-reported ability to perform tasks related to the course content. I capture these through two pre-post surveys.

In figures 4 to 7, you can see students' self-reported perception regarding their improvement on the course technical component when I run the course's pilot. For example, you can see that the number of students who feel strongly confident about using advanced Word features increased from 17% to 61% (see Figure 4 and Figure 5). Similarly, you can find that the percentage of students who feel strongly confident about using Excel's advanced features increased from 7% to 24% (see Figure 6 and Figure 7).

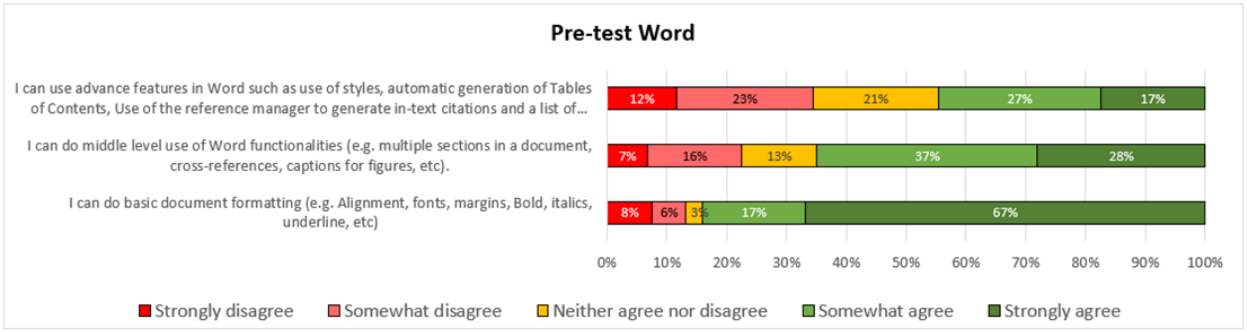


Figure 4 - Self-reported knowledge of MS Word before taking the course.

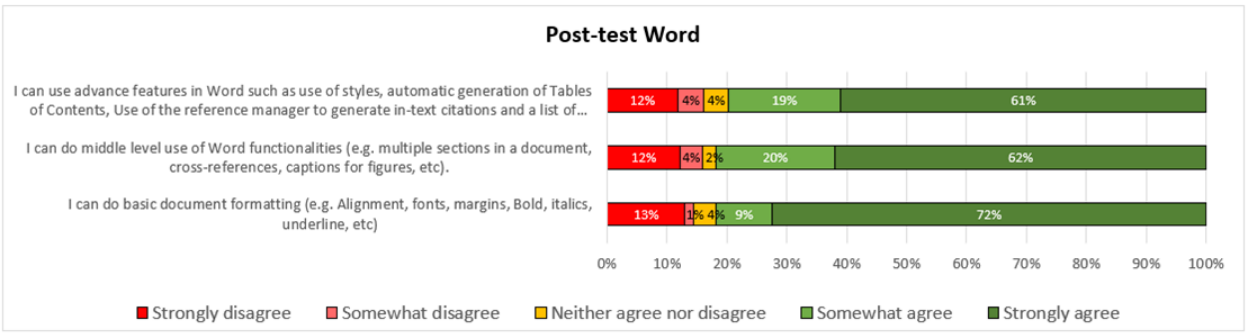


Figure 5 - Self-reported knowledge of Word after taking the course.

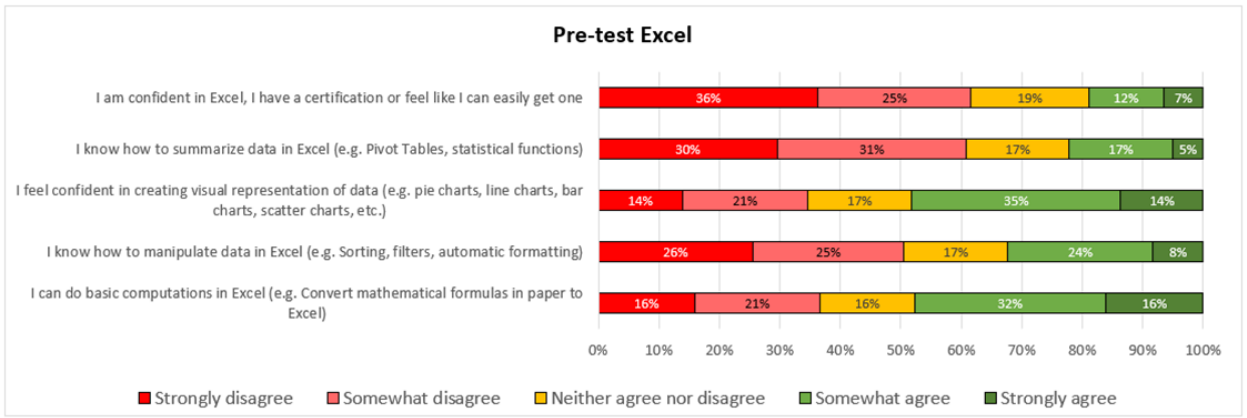


Figure 6 - Self-reported knowledge of Excel before taking the course.

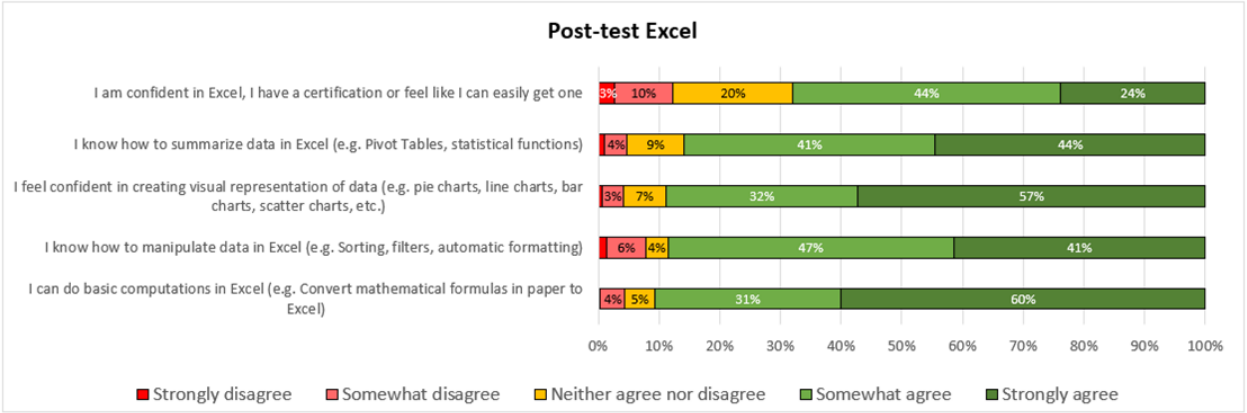


Figure 7 - Self-reported knowledge of Excel after taking the course.

Similarly, student's orientation toward problem-solving also improves (see Table 1). As explained by D'Zurilla et al. [12], it is best if the values in avoidance style, negative problem orientation, and impulsivity/carelessness are low. At the same time, Rational Problem Solving and Positive Problem Orientation are expected to be high. As you can see, after being in my class, students' mean for Rational Problem Solving and Positive Problem solving increased (11.55 to 13 for RPS, and 11.29 to 11.61 for PPO) while keeping similar standard deviations.

Table 1- Results of the pre-post test for the Social Problem-Solving style

Field		Maximum	Mean	Std Deviation	Variance	Count
Avoidance Style	Pre	20	6.04	3.84	14.74	168
	Post	18	5.99	3.99	15.94	142
Rational Problem Solving: RPS.	Pre	20	11.55	4.15	17.24	168
	Post	20	13	4.14	17.14	142
Negative Problem Orientation	Pre	20	7.22	3.96	15.65	169
	Post	16	6.61	3.83	14.69	142
Impulsivity/Carelessness	Pre	17	5.24	3.62	13.12	169
	Post	15	5.17	3.36	11.28	142
Positive Problem Orientation: PPO	Pre	20	11.29	3.03	9.15	169
	Post	20	11.61	2.9	8.41	142

Students' satisfaction

Teaching evaluations at University of Florida have a component regarding the course and another describing students' perception of the instructor. The mean of my teaching evaluation increased by approximately 0.54 points (3.8, which was below department and college means, to 4.34, which is above department and college means). Students comments also reflect their satisfaction; below, you will find 4 of those:

> *I just wanted to say thank you for a great semester! The things you have taught me will set me up for success in my future job as a Data Manager, and I cannot thank you enough for making everything so easy to understand. Your weekly lectures and explanatory videos always made things so easy to learn, and you made them very entertaining.*

> *The powerful student praise for the instructor's commitment to student success and his passion for preparing students for today's diverse global workforce illustrates why this course was chosen.*

> *The professor is passionate about a seemingly mundane subject. It is inspiring and helps me in this course.*

> *I liked how clear the instructor made the assignments. He provided videos and examples to help…He was the most interactive and helpful professor I have ever had for an online course.*

The third comment shows that at least one student transformed his perception of the problem-solving-related course content. Fortunately, there are more comments along these lines.

University satisfaction

The course has received different awards and recognition from the University. It got the exemplary course certification because it fulfilled all the required standards for a high-quality course.

Figure 8 - Exemplary course badge

It also received the "Exemplary Online Award" in the large enrollment strategies category, precisely because of the excursion activities that should be reported in the discussion boards.

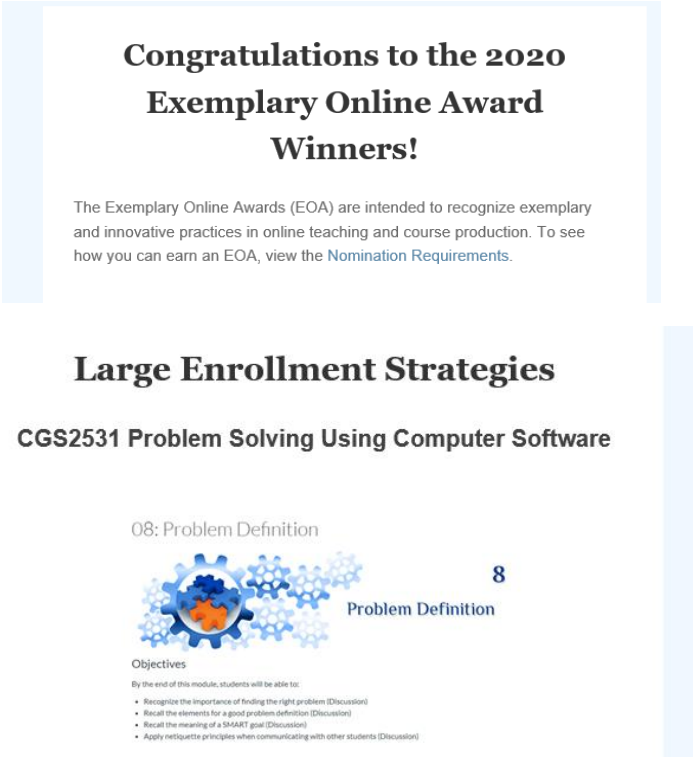


Figure 9 - Large Enrollment Strategies award recognition

Finally, the course was the runner-up for the Exceptional Course Development Award that recognizes instructors who make outstanding contributions to student learning through intensive work on course design and implementation.

Lessons learned from this process of moving to online learning.

After the process of transitioning to online teaching, these are my key takeaways:

- It is crucial to take some time to apply the backward course design process. Redefining the course goals, the learning objectives first, and the assessment is beneficial for defining the relevant content and the delivery.
- Students 'engagement is tied to students' perception of a community of learning. In large enrollment courses, students could feel isolated, and strategies that promote interaction between them can mitigate this effect. Discussion boards and peer reviews are vital strategies I used in my course to build such a community. In the same way, allowing them to bring and present relevant content based on their own experience and interest and provide feedback contributes to building the community and student's learning. Accordingly, the instructor taught not all the course content, but students build knowledge from their interactions.
- Instructor presence is crucial for students. Constant communication with the instructor motivates students and positively impacts teaching evaluations. Accordingly, instructors should be the face in the videos, especially if teaching the course content. Weekly messages and regular office hours are also vital for connecting and motivating students.
- Developing students' autonomy in their learning impact positively the students' satisfaction. For example, by providing rubrics in advance, students can self-assess their work and learn what is needed to satisfy the task requirements. Similarly, allowing them to engage in problem-finding and defining some learning objectives contributes to this takeaway.
- Considering strategies for Universal Access pay off because you are eliminating barriers and facilitating course accessibility to all students.

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Appendix A – Course Goals and Learning Objectives after its redesign

Course Goals

- Students will use Excel, Word, and PowerPoint to aid in their problem-solving process.
- Students will write a plan on how they would address an open-ended problem using the language of the problem-solving framework.
- Students will analyze real-world data, such as applying business statistics techniques and mathematical models and create data visualizations for problem-solving
- Students will demonstrate professional, inclusive communication

Learning Objectives and Assessment Method

Module	Learning objectives and assessment method
Module 1: Introduction	• Recall key components of the syllabus for successful completion of this course • Recall principles of netiquette when writing to course facilitators
Module 2: The Problem-Solving Process & Introduction to Word:	• Differentiate the kind of problems that need the support of a problem-solving process framework (quiz and discussion board) • Recall the stages of the problem-solving process framework (quiz and discussion board) • Applying basic capabilities of MS Word through formatting documents professionally and adhere to specific requirements using Word functionalities (assignment) • Apply principles of professional, inclusive communication when writing to peers (discussion board)
Module 3: Open-ended Problems and Introduction to Excel	• Recognize essential elements of the Excel environment (quiz) • Differentiate how to use basic Excel functionalities (quiz) • Perform basic calculations (quiz) • Identify open-ended problems in real-life (discussion)
Module 4: Data gathering and use of cell referencing	• Differentiate cell referencing uses in Excel (quiz) • Identify an open-ended problem and differentiate the kind of data that could be necessary for problem definition (discussion)
Module 5: Data analysis I: Simple Data analysis:	• Manipulate data by importing, transforming, and generating information from it (assignment) • Transform raw data into problem-solving information by summarizing and creating simple data visualizations (assignment) • Compare and contrast the problem-solving strategies used in professional practice vs. the process taught in the course (discussion) • Apply netiquette principles when communicating with other students (discussion)
Module 6: Data analysis II - Statistics:	• Calculate descriptive statistics for a data set (assignment) • Create visual representations of summaries of large data set using Excel (assignment)

	• Interpret a histogram (normal, bimodal, right/left-skewed, random, outliers), and propose implications (assignment) • Identify an open-ended problem and differentiate the kind of data that could be necessary for problem definition (assignment)
Module 7: Pivot Tables and Reporting.	• Apply pivot tables to answer questions from a data set (Excel component of the assignment). • Differentiate data distribution characteristics based on descriptive statistics and histograms (Quiz and Word component of the assignment). • Create professionally formatted documents (Word component)
Module 8: Problem Definition.	• Recognize the importance of finding the right problem (Discussion) • Recall the elements for a good problem definition (Discussion) • Recall the meaning of a SMART goal (Discussion) • Apply netiquette principles when communicating with other students (Discussion)
Module 9: Idea generation strategies.	• Recognize different techniques that can generate idea solutions (or courses of action) to a well-defined problem (assignment). • Create a mind map with different idea solutions or courses of action to solve a well-defined problem (assignment). • Create a mind map using a computational tool such as Mind Jet Mind Manager or Free Mind (assignment).
Module 10: Decision-making.	• Create a weighted decision-making matrix using middle-level features of Excel (Excel part of the assignment) • Identify, summarize, compare and evaluate the critical aspects of possible solutions to a problem using a weighted decision-making matrix (Problem-solving part of the assignment) • Recognize the contribution of diversity to problem-solving (discussion) • Apply netiquette principles when communicating with other students (discussion)
Module 11: Regression Analysis.	• Explain why a dataset is suitable for being analyzed using linear regression (Math - assignment) • Explain the meaning of a relationship between two variables in a linear model (Math - assignment) • Describe different real-world applications of linear regression (quiz) • Create, analyze and evaluate data visualizations for linear regression (Excel - assignment) • Follow the correct procedure to find the best-fitted line for a given data (quiz- Excel assignment) • Use the data analysis Toolpak to find the best-fitted line for a given data (Excel assignment) • Transform the mathematical equation of the best-fitted line into an Excel formula, and use it to calculate predicted values (y') (assignment) • Identify opportunities to use cell-referencing (absolute, or relative, or mixed), and use it whenever it is possible) (assignment) • Compare and contrast the decision-making process learned in the course with one followed by someone in professional practice (discussion)

	• Apply netiquette principles when communicating with other students (discussion)
Module 12: Reporting your findings professionally.	• Identify different real-world applications of linear regression (quiz). • Differentiate the distributions that can be modeled through a linear model after analyzing a scattered chart (quiz, assignment). • Find the best-fitted line for a given data and use it to predict future values (quiz, assignment). • Compare the R-value of two linear regression models and select the best linear regression model (assignment). • Use advanced features of Word (equation editor, styles, cross-references, sections, etc.) to create professionally formatted documents (Word component of the assignment).
Module 13: Using the Problem-Solving Process.	• Apply the problem-solving framework for addressing an open-ended problem (a problem-solving component of assignment) • Create slides in PowerPoint using the middle and advanced features of it and good practices for visual aids (PowerPoint component of the assignment) • Create an evidenced-based argument, and present it to other students (Presentation component of the assignment).
Module 14: Communicating your solution.	• Analyze and evaluate other student's deliverables showing achievement of the course goals using a rubric (assignment). • Use the mail-merging feature of Word to write a letter to different recipients, customizing information (Word assignment). • Tailor the language of the problem-solving process when discussing how he/she would find a solution to a real-life (open-ended) problem (Problem-solving component in the Word assignment). • Analyze best practices for creating Visual aids (discussion) • Apply netiquette principles when communicating with other students (discussion)
Module 15: Final Submissions	