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Benefits of Codesigning with Educators as Faculty Development

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Benefits in Co-Designing with Educators as Faculty Development

Introduction

Professional development is an intentional approach to learning new skills to improve one's teaching practice and pedagogy. In this lessons learned paper, we present the co-designing of exam wrappers, or activities to aid students in reflecting on their exam experience and/or performance, with undergraduate-level engineering educators across different institutional contexts. We share how co-design provides a different engaging format for professional development (PD). In this instance, we are defining co-design as the collaborative process among the research team and educators to create exam wrappers for their specific course needs. The research team created an opportunity for educators to learn about reflection practices through the creation of context-specific exam wrappers while the educators contributed context-specific knowledge and ideas from personal experience in the co-creation of their exam wrappers. The research team decided to have the deliverable of the workshop be a usable product to address the common tension faculty face between having limited time, yet wanting to stay up to date on good practices and pedagogy. We asked the question, **"what affordances might co-design provide as a professional development method in contrast to traditional professional development workshops?"** In conducting the workshops, we learned that co-design, as a two-month engagement with educators teaching in different contexts, resulted in an overall positive learning experience for everyone involved. In providing lessons learned from co-designing for professional development, we hope to inspire the engineering education community to continue to explore co-design and other design based methods for PD, not just in the K-12 space [1], but specifically in the Faculty Development space to create opportunities that include what Kelly et. al. concludes after using co-design for PD: high quality professional development that is "contextual, sustained, respectful yet collaborative, and functions through high active learning [2]."

Co-design and Exam Wrappers

Based on the call by Kennedy to "understand 'good' PD based on a nuanced understanding of what teachers do, what motivates them, and how they learn and grow [3]," we look to the commitments of co-design as a method to instantiate this idea of "good" PD. We use co-design for its historical connection to Participatory Design, which allows us to center our work on multiple stakeholders, educators and researchers, working together to create knowledge useful for research, practice, and pedagogy. In using co-design, we acknowledge that educators are experts in the "nuanced understanding of what they do, what motivates them and how they learn." The research team of faculty and students, all with backgrounds in engineering, brought expertise in understanding reflection activities. This specific instantiation of co-design was helpful for exploring the space of exam wrappers, sharing expertise and experience among participants, and providing practical products for the educators.

In this professional development workshop, we chose exam wrappers, or reflection activities given in relation to an exam, an idea originally conceived by Lovett [4]. The research team chose this topic because exam wrappers are an entry point for incorporating reflection as a learning tool in engineering education, given that it does not take up too much time to implement and is backed by research as an effective learning tool. The research team intentionally chose to have a collaborative workshop aligned with our commitment to "design with" and not "for" educators.

Method

A team of researchers from the University of Washington put out a call for participants interested in co-designing exam wrappers for an undergraduate engineering course they, the participants, would be teaching in the spring. To accommodate for remote work, we selected Zoom as our platform to host the sessions. Considering time zone differences, we selected six participants who had similar availability across time zones.

The co-design experience consisted of four one-hour sessions and work to iteratively design an exam wrapper between the sessions. Each session consisted of Google slides as a shared workspace containing the agenda, a five-minute reflection activity to build rapport, space to share progress on the exam wrappers, introducing an idea to think about, an activity, a time to share out, and next steps. During the **first session**, participants were invited to imagine a "bad" exam wrapper, and then the group worked to identify design requirements for a better exam wrapper. Between the first and second sessions, participants developed their initial design of their exam wrapper. During the **second session**, participants shared their initial designs of the exam wrapper assignments. In addition, we discussed the kinds of knowledge gains that could come from engaging in reflection. Between the second and third sessions, participants iterated on their exam wrappers to take into account their increased understanding of what kinds of knowledge they hoped students would gain (and also what they hoped they themselves would gain). During the **third session**, after sharing their iterated-upon exam wrappers, participants were invited to think about how students might react to engaging in the exam wrappers they had designed (participants created personas of students and then imagined the student persona experiencing their exam wrapper). Between the third and final session, participants iterated on their exam wrappers to take into account their increased understanding of the kinds of reactions students might have to the exam wrapper. In the **final session**, participants shared their final designs and discussed plans for implementing their designed wrappers with students. Samples of the exam wrappers are included in Appendix A.

To explore the question of how this functioned as professional development, we engaged in three steps. First, the entire group met to create a set of ideas related to four broad questions: "What's been valuable or helpful in these co-design sessions?," "What do you wish we had more time for?," "What did not work for you?," "What are your thoughts on having worked with other educators?" Second, the group had a discussion about the themes inside of each question, and moved to identification and selection of the broader themes represented below. Finally, these themes were drafted by the participants and then discussed by the whole group. Here we present the affordances and difficulties of faculty development in these co-design workshops, specifically as it relates to hearing different perspectives and time commitment.

Finding: Multiple Perspectives

The co-designing of exam wrappers, as opposed to each individual working on their separate project, provided a diversity of perspectives that aided instructors in developing effective exam wrappers in two main ways: guided exercises from the study designers, and peer-to-peer conversation and learning. The sessions and activities designed by the research team were aimed at creating conversation around a few key exam wrapper concepts, not all of which individual participants may have explored on their own: "what shouldn't an exam wrapper be?," "who is

completing the reflection (i.e. individuals vs. class)?," "what is the format of the reflection?," "how are reflections shared with students and feedback given?" These questions alone offered a variety of lenses through which to view an exam wrapper assignment.

The impact of the guided exercises on exam wrapper development was compounded by the perspectives and discussions between the instructors who participated in the co-design study. Of the six participants, there was a significant range of experience with exam wrappers. Some were completely new to the concept and some had already been using them in their individual courses. A broad range of class topics, styles, and sizes within engineering curricula was also represented in the group. While each instructor came to the study with an exam wrapper in mind targeted at achieving a certain purpose for a specific course, the common goal was aimed at turning assessments into learning experiences through reflection. Some participants brought to the group a focus on student behaviors and study habits, while others brought a stronger focus on improving content mastery. The different goals and experiences of each instructor led to an even broader lens through which to view the development of our own individual assignments.

The participants were given many opportunities to discuss with each other, and a lot of impactful changes to reflection assignments came from these discussions. Compared to traditional methods of pedagogical knowledge transfer such as conference attendance or literature reviews, the process of creating or modifying an exam wrapper through the co-design experience created a more direct and tangible way to incorporate outside ideas and perspectives. One added benefit of creating exam wrappers in this co-design process was that there was the opportunity to receive peer feedback. This highlights an important difference from individual development and iteration of these types of tools, where trial-and-error or student feedback is used to inform adjustments to the assignment. The exam wrapper developed by the neophyte borrows heavily from several other participants' instruments, incorporating the student behaviors focus from some and the content mastery focus from others, but with modifications appropriate to the large scale of her course. On the other hand, the instructors who already had well-developed instruments in use considered how their exam wrapper was inherently or could be adjusted to be useful for both instructors and students, anticipated student reactions toward the reflection activity, and framed the activity to maximize buy-in, knowledge gains, and accountability.

In addition, it was clear from these discussions that each instructor who participated in the co-design study had a passion for teaching and empathy for their students. Reaching outside of our home institutions to interact with new colleagues had an energizing effect. While the diversity of backgrounds and ideas led to well rounded development of impactful exam wrappers, it was the unified goal and attitude which each participant brought to the sessions that made this experience inspiring.

Finding: Time Commitment

With regard to the element of *time*, the co-design process created time and space that participants found useful for their professional development. Overall, we found participants appreciated the *structured time* and the *time in between sessions* to do work. Additionally, participants wished they had *more time*, which we explore further as participants also expressed not having *enough tim*e in their schedule to work on the exam wrappers as they would have liked. In this co-design workshop, the number of hours of participation time were spread over an eight-week period.

Participants were asked to commit to eight hours: one hour for each of the four workshops and one hour in between each workshop. This spread interspersed the exam wrapper activities with other work and life responsibilities. While the time commitment was for an extended amount of time, the co-design process resulted in a final product; each participant left with an exam wrapper ready to implement in their own context.

Although group meetings provided structured time to present and discuss elements of our final product, it was up to individuals to structure their own time between sessions to make timely progress for review. Participants who posted their work early may or may not have had time to go back and review others' work, especially if others posted too close to the scheduled meeting date. On the other hand, participants who posted their work late may not have reviewed earlier posts since they were likely focused on finishing their own work. Even though participants found it difficult to find the time to make both progress on their exam wrapper and give their colleagues feedback, it was surprising that participants voiced a desire for more time between group meetings to do development and review others' work. Often, the time that was set aside for development and review was "scavenged" by other obligations and responsibilities -- in both work and life -- that came up, or perhaps the time was used to make the element better and better, likely in anticipation of the peer review that would occur. Nevertheless, participants left the workshop with an exam wrapper that was co-designed with other educators through careful consideration of knowledge gains and student reactions, with peer review feedback and revisions, ready to be implemented in their own course. We acknowledge that there will always be a compromise when choosing how to spend our professional development time. Here, we offer co-design as a different way to use time for professional development that includes sustained collaboration and feedback on contextualized learning.

Concluding Remarks

The workshop facilitators and participants agreed that this professional development was a positive experience because it was **contextual** [2], in that educators were designing exam wrappers for their specific classroom. It was also **sustained**, in that we met every other week over eight weeks and had about an hour of work in between sessions. It was **respectful yet collaborative** in that as educators received feedback on their exam wrapper, they were able to disagree respectfully, acknowledging that teaching 50 students was very different from teaching 500 students, and yet there was still something to learn from each other. And it was definitely **active learning** in that the educators were creating or elaborating on their exam wrappers based on the topics of the week, the feedback, and their own insights from the conversations. And yet, there was a fifth dimension that seems to be bound up with these four characteristics of co-design for Professional Development. The varying perspectives each educator brought truly enhanced the conversation. The facilitators created workshop activities that allowed the educators to apply them to their ***differentially situated*** classrooms and posed questions that allowed educators' to discuss them from their personal experience and perspective. In doing so, the educators were able to see different uses for the exam wrappers, as each differentially situated classroom and educator provided a unique case study. Educators learned from each other *because* they were all designing for a different course context. In this lessons learned paper, we offer co-design as a method to implement professional development. We see that the commitment of co-design to see all stakeholders as experts allows us to approach professional development with educators in

mind, considering their nuanced, situated roles and keep the educators' motivation at the center of the work.

References

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[2] Queensland University of Technology *et al.*, "Co-design for Curriculum Planning: A Model for Professional Development for High School Teachers," *Aust. J. Teach. Educ.*, vol. 44, no. 7, pp. 84–107, Jul. 2019, doi: 10.14221/ajte.2019v44n7.6.

[3] M. M. Kennedy, "How Does Professional Development Improve Teaching?," *Rev. Educ. Res.*, vol. 86, no. 4, pp. 945–980, Dec. 2016, doi: 10.3102/0034654315626800.

[4] M. C. Lovett, "Make exams worth more than the grade," *Using Reflect. Metacognition Improve Stud. Learn. Discip. Acad.*, pp. 18–52, 2013.

Appendix A

Name:_____

Part 2: Reflection

The following is a mandatory component of your quiz. It will be graded for completion only. In no way will your answer to the reflection component affect your score in the previous portion of this quiz. Completing the following reflection is worth 2 pts.

You have 24 hours after your submission of the quiz to complete this reflection. It is important that your answers are honest representations of your experience and problem-solving process through this quiz. As such, your responses to this reflection will in no way impact your grade on part 1 of this quiz. In fact, the reflections will be graded *for completion* only after Part 1 of every quiz has been graded and posted to canvas.

The purpose of this reflection is to help guide you in thinking about gaps you may have in either your technical content knowledge or problem-solving process. There is a metacognitive difference between doing something and being able to explain clearly how one did that thing. I believe that regardless of your performance on this quiz, this reflection activity should help you understand course content and improve your problem-solving abilities in future quizzes (in this class and others). So, hopefully you find this reflection activity a valuable use of your time. But… at a minimum, it is 10% of your quiz grade which I believe you will all find useful at least for the purposes of this class.

On the following page, please type your responses to item 1. On this page, highlight your responses to items 6-8. Reflection responses to item 5 should be at least a page in length, single space, 12pt font. Please have a copy of part 1 of your quiz handy during this reflection and use it to guide your responses. This reflection should take you approximately 1-2 hours to complete but no longer. Do not worry too much about formal writing formatting, just walk through your process as best you can. :)

1. Please reflect on/describe your process for solving problems 1 through 5. You may use the following questions as prompts for what type of information to include in this reflection:

- How did you decide on a solution strategy for this problem?
- What assumptions did you make while solving the problem? How (ie. Were assumptions stated in the problem, similar to a practice problem, did you guess, question too difficult/un-solvable without making the assumption, etc).
- Were there any parts of the question you found confusing?
- Which parts, if any, of the problem did you get stuck on?
- If you could approach the problem again, what would you do differently to improve your confidence in your answer or answer the question more efficiently?

2. Please rate your confidence in your answer to question 1 of the theory/calculation portion.

a. Not confident at all.
b. Slightly confident.
c. Somewhat confident.
d. Fairly confident.
e. Completely confident.

3. Please rate your confidence in your answer to question 2 of the theory/calculation portion.

a. Not confident at all.
b. Slightly confident.
c. Somewhat confident.
d. Fairly confident.
e. Completely confident.

4. Please rate your confidence in your answer to question 3 of the theory/calculation portion.

a. Not confident at all.
b. Slightly confident.
c. Somewhat confident.
d. Fairly confident.
e. Completely confident.

5. Please rate your confidence in your answer to question 4 of the theory/calculation portion.

a. Not confident at all.
b. Slightly confident.
c. Somewhat confident.
d. Fairly confident.
e. Completely confident.

6. Please rate your confidence in your answer to question 5 of the theory/calculation portion.

a. Not confident at all.
b. Slightly confident.
c. Somewhat confident.
d. Fairly confident.
e. Completely confident.

EGM 3420C Engineering Mechanics **Name:** _____

Exam 1 Wrapper Survey

Date: _____ **Code:** _____

The purpose of this survey is to reflect on your exam preparation and performance. This will highlight some habits that are helpful to continue, as well as reveal some areas that could be adjusted to optimize your preparation and performance in this course. Answer honestly, truthfully, and to your best ability.

1. What was your ***letter grade*** in each foundational subject? Write the most recent *semester* (SMR=summer, F=fall, S=spring) and *year* when you took the course. Mark courses taken at FGCU with an asterisk (*).

Algebra: _____ Sem. & Yr. taken? _____	Geometry/Trig: _____ Sem. & Yr. taken? _____	Calculus I: _____ Sem. & Yr. taken? _____	Physics I: _____ Sem. & Yr. taken? _____

- Rate your *current level of* ***confidence in utilizing*** each foundational subject on a scale from 1 to 10.

	Not Confident → → → → → → → → → →→ → → → Very Confident									
Algebra	1	2	3	4	5	6	7	8	9	10
Geometry/Trig	1	2	3	4	5	6	7	8	9	10
Calculus I	1	2	3	4	5	6	7	8	9	10
Physics I	1	2	3	4	5	6	7	8	9	10

2. What do you consider your typical *level of* ***preparation before class***?

○ Excellent	(watched all videos completely, attempted worksheets, read textbook, noted questions)
○ Good	(watched most videos completely, looked at worksheets, skimmed textbook)
○ Fair	(watched some videos completely, looked at worksheets, did not read textbook)
○ Poor	(watched few videos completely, did not look at worksheets nor the textbook)

- What do you consider your typical *level of* ***participation during class***?

○ Excellent	(took your own notes during examples, involved in class discussions, led group work)
○ Good	(copied examples, listened to class discussions, assisted group work)
○ Fair	(watched examples, distracted during class discussions, watched group work)
○ Poor	(distracted during examples and class discussions, did not do group work)

- What do you consider your typical *level of* ***engagement after class***?

○ Excellent	(always reviewed examples/notes and solved worksheets, usually in online office hours)
○ Good	(usually reviewed examples and solved worksheets, sometimes in online office hours)
○ Fair	(sometimes reviewed examples and solved worksheets, rarely in online office hours)
○ Poor	(rarely reviewed examples and solved worksheets, never in online office hours)

- How many *classes have you* ***missed*** for lessons covered on this exam? _____ ***classes***

3. Approximately how many ***hours in total*** did you spend preparing for this exam? _____ ***hours***

- What *percentage* of this time was in the ***24 hours prior*** to the exam? _____ ***%***
- What *percentage* of your total preparation time was ***individual*** rather than group? _____ ***%***

Exam 1 Wrapper Survey

Date: _____ **Code:** _____

- What *percentage* of your preparation time was spent on the following ***study activities*** *(must add to 100%)*:

  _____ % Reviewing lesson videos _____ % Reworking worksheets _____ % Working new problems
  _____ % Reading the textbook _____ % Looking over solutions _____ % Outside online content
  _____ % Other (please describe / explain): _____

- What *percentage* of your prep time would you attribute to each *level of* ***productivity*** *(must add to 100%)*:

  _____ % Highly productive (studying notes/videos, solving problems, reflecting on approaches/strategies)
  _____ % Productive (skimming notes/videos, looking over solutions, identifying approaches/strategies)
  _____ % Non-productive (locating resources, chatting with others, "spinning wheels" on approaches)

- Frequency you ***sought help*** *from instructor/LA/TA* out of class? Circle one: often / sometimes / rarely / never

4. How many *points* did you ***lose in total*** on this exam? _____ ***points lost*** out of 300 points

- Of those points, how many *points* were due to the following ***sources of error*** *(must add to total points lost)*:

	Points Lost
Approach: uncertainty on how to approach the problem, drew a blank, got stuck, etc.	
Timing: did not attempt or left incomplete or blank due to time consumed elsewhere	
Documentation: any of the following missing or incorrect on free-body diagram… coordinate axes; dimensions or distances; magnitude, units, and direction angle or slope	
Free-body diagram: reactions at supports, zero-force members, two- force members, internal forces	
Equilibrium equations: write equals zero; missing or extraneous term; did not take component so missing ratio or sine or cosine (if incorrect then count as geometry / trigonometry error below); moment arm perpendicular distance (if position vector error then count as vector error below)	
Geometry / trigonometry: sine or cosine of angle; common right triangles (e.g. 5-12-13) and proportional triangles; hypothenuse given slope (e.g. $a^2 + b^2 = c^2$); surface of contact (radians)	
Vectors: coordinates and head minus tail; position; unit vector; force and weight (down); moment	
Computation: miscalculation; wrong direction or sign (+/–); substitution error; solving system of equations simultaneously; unit conversion; orders of magnitude	
Answer format: significant figures too few or too many; units missing or incorrect; direction for vector quantities (e.g. forces) missing or incorrect	
TOTAL Points Lost =	

5. What are the 2 *most* ***valuable habits and/or activities*** that *contributed* to your performance on this exam?

1.
2.

- What are 2 things you ***plan to do differently and/or better*** to prepare for or when taking the next exam?

1.
2.

- What can instructors and/or assistants do to assist or support your mastery of course knowledge and skills? (You may list things you find helpful that are already being done or things we should add.)

Exam 1 Wrapper Survey

Date: _____ **Code:** _____

This course uses a "flipped classroom" blended learning design, where students learn course material outside of class through video lessons and then attend class sessions to practice solving problems.
Use the following scale to rate your feeling towards the statements regarding aspects of this course:

Strongly Agree = SA	Agree = A	Disagree = D	Strongly Disagree = SD

I prefer the "flipped classroom" design over traditional face-to-face instruction.	
The "flipped classroom" design allowed me to make better use of my time learning at my own pace.	
A sufficient amount of time and number of opportunities were provided for me to practice problems.	
I watched the prerequisite lesson videos prior to coming to class for problem-solving. Typically, how many times did you watch each video? *CIRCLE: 0 1 2 4 5*	
Lesson videos were an effective tool for learning the course content on my own outside of class.	
I needed to refer to other videos beyond the videos provided in this course.	
By watching the lesson videos, I could solve worksheet / homework problems on my own.	
I would be able to succeed in this course if regular attendance were not required.	
Even after watching the lesson videos, I still needed "live" instruction to be able to solve problems. What type of instruction do you prefer? *CIRCLE: face-2-face in-person online via zoom*	
I watched the review / summary videos posted by the Learning Assistant (LA) after the lessons. Typically, how many times did you watch each video? *CIRCLE: 0 1 2 4 5*	
I attended online office hours with the LA each week. On average, how many times per week did you attend office hours? *CIRCLE: 0 1 2 4 5*	
In-class worksheets helped me to better understand course topics.	
I continued / finished solving worksheet problems outside of class.	
I tried to solve problems on my own without looking at posted written solutions or video solutions.	
What percentage of homework problems did you attempt to complete prior to quizzes? *CIRCLE: 100% 75% 50% 25% 0%*	
Doing the best that I could on quizzes was important to me.	
The experience of taking the quizzes in class helped highlight what I needed to work on more.	
The graded feedback returned on my quizzes helped me understand and learn from my errors.	
When quizzes were returned to me, I solved the problems correctly prior to looking at posted solutions.	
I usually complete all assigned homework problems in my courses by the time they are due.	
Solving homework problems helps me understand the concepts discussed in the lessons.	
Working homework problems helps me perform better on quizzes and exams.	
I can use my study time more effectively than by working on homework problems.	
I need to have required / graded homework in order to motivate me to do it.	
I need written / verbal feedback on my homework beyond reviewing the posted solutions on my own.	
I practiced the exam review problems without notes or other resources like I was taking an exam.	

Name:
Section:

Exam Wrapper

Instructions: Answer each question after careful consideration of your specific situation. Avoid cliché answers (which show little thought…) such as "careless oversight" or "used wrong equation". A more useful response might be, for example, "I used the wrong equation because I misunderstood what the question was asking" or "I ran out of time for a problem because an earlier problem took me too long." Think really hard to find the authentic answers to the questions. And, of course, please be truthful in your answers – there is no penalty for this activity, just extra credit for thoughtful responses. [You should type directly into the form, save it as a Word or .pdf file, and submit it to the class Canvas where you downloaded this from.]

I. Preparing for the midterm

1. Did you do any of the following to prepare for the midterm?

(Click in the table and type an "X" in the field)	Not enough	Just right	Too much
a. Review class notes b. Review old quizzes & solutions c. Review past homework & solutions			
d. Work extra problems alone e. Work extra problems with someone f. Go for help from instructor			
g. Read textbook or other sources to clarify h. Sleep/rest i. Exercise or recreation			

2. What else, if anything, did you do to prepare for the midterm? [Click on the text box and type your response; the text box will expand with your typing.]

3. What else could you have done before the test to better prepare yourself?

II. During the test

1. What on the midterm gave you trouble? That is, what statics or math concepts caused you problems? (Please give this careful thought before answering)

Name:
Section:

2. What personal (e.g., illness, alertness, etc.) or environmental (e.g., noise, temperature, etc.) issues caused you problems during the midterm? (Please only share information you're comfortable sharing)

III. Preparing for the final exam (please give deep thought to these answers)

1. Based on your answers and thoughts above, what would you do to better prepare yourself for the final exam?

2. What hurdles do you foresee that might keep you from doing those things you described in the question above, and what actions might you take to overcome those hurdles?

1. Which of the following did you do leading up to the exam and to what extent?

	Didn't Do	Not Enough	Enough/ the right amount	Too much
Attend lectures	☐	☐	☐	☐
Attend discussion	☐	☐	☐	☐
Take notes during class	☐	☐	☐	☐
Review your notes	☐	☐	☐	☐
Review the textbook	☐	☐	☐	☐
Rework homework problems	☐	☐	☐	☐
Work extra problems	☐	☐	☐	☐
Solve the practice exam under exam conditions (without peeking at the solutions or using unauthorized aid)	☐	☐	☐	☐
Go to office hours and ask questions	☐	☐	☐	☐
Study with classmates	☐	☐	☐	☐
Sleep/rest	☐	☐	☐	☐
Other positive self-care (relax, exercise, fresh air, healthy food, etc.)	☐	☐	☐	☐

2. How confident were you going into the exam?
   - ☐ Not at all confident
   - ☐ Slightly confident
   - ☐ Somewhat confident
   - ☐ Fairly confident
   - ☐ Completely confident

3. How satisfied are you with your exam performance and grade?
   - ☐ Not at all satisfied
   - ☐ Slightly satisfied
   - ☐ Somewhat satisfied
   - ☐ Fairly satisfied
   - ☐ Completely satisfied

4. Based on your answers to the previous questions, what do you plan to do (or do differently) to prepare for future exams? [open ended]

5. Look carefully at your graded problem 4 (1D heat conduction) and the posted solution Which of these did you find difficult on this problem?
    - ☐ Understanding the problem statement
    - ☐ Understanding the provided solution T(x,t) on the exam
    - ☐ Setting up the Fourier Series problem to apply the initial condition in part (a)
    - ☐ Evaluating the integral for part (a)
    - ☐ Representing the boundary conditions in part (b)
    - ☐ Representing the initial conditions in part (b)
    - ☐ Representing the steady state solution in part (b)
    - ☐ Knowing that at t=1000 the solution will be at or near steady state

6. Still thinking about problem 4, if you had to solve this problem again now, succinctly describe what your solution strategy would be. [open ended]

7. Based on your performance on Prelim 3, which of these skills do you consider to be a particular strength?
    - ☐ Setting up numeric integration via Euler's method
    - ☐ Testing all cases when looking for eigenvalues
    - ☐ Using boundary conditions to solve BVPs
    - ☐ Matching eigenfunctions to eigenvalues
    - ☐ Understanding zero and nonzero terms in Fourier Series function representation
    - ☐ Visualizing periodic functions
    - ☐ Solving for Fourier series coefficients
    - ☐ Sketching solutions to 1D heat transfer problems
    - ☐ Basic algebra
    - ☐ Basic integration

8. Based on your performance on Prelim 3,which of these skills do you consider to be a current weakness? As you answer, think of how you'll address this weakness for future success on the final exam.
    - ☐ Setting up numeric integration via Euler's method
    - ☐ Testing all cases when looking for eigenvalues
    - ☐ Using boundary conditions to solve BVPs
    - ☐ Matching eigenfunctions to eigenvalues
    - ☐ Understanding zero and nonzero terms in Fourier Series function representation
    - ☐ Visualizing periodic functions
    - ☐ Solving for Fourier series coefficients
    - ☐ Sketching solutions to 1D heat transfer problems
    - ☐ Basic algebra
    - ☐ Basic integration