

# WIP: Effects of an Instructor-Provided Study Plan on Students' Exam Preparation

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**Abstract**— This work in progress innovative practice paper describes the implementation of an instructor-provided study plan for students that aims to help them prepare for in-class quizzes and exams. Research shows that students who manage their time and efforts efficiently develop a positive attitude towards learning. A well-designed study plan can help students reflect on their strengths and weaknesses, and consequently allocate time and efforts appropriately while preparing for quizzes and exams. There are several research-based techniques for creating effective study plans. However, many students may not be aware of these techniques, the benefits these techniques can offer, or how to implement them. This research explores the effects of an instructor-provided study plan on students' learning experience. The study plan is designed to (1) communicate the list of topics the students will be tested on, (2) help students identify their level of preparedness in each topic, (3) provide guidelines on how they can allocate their time on topics based on the results of their reflective practice, (4) help students identify study materials and resources available to them. The study plan will provide students with a template that they can print or use on their digital devices. The study plan aims to help students with strategizing and time management. It provides guidelines on managing time and gives them flexibility to create their own schedules instead of forcing a timeline. The study plan aims to provide students with an opportunity to take charge of their own learning. The pilot study will implement this study plan for a sophomore-level undergraduate course in Aerospace Engineering during the fall semester. The course has multiple closed-notes in-class quizzes and two exams. The instructor will provide a template well in advance for each in-class quiz and the exams. Since the exams are cumulative, students can also use the study plan to track the growth in their learning. An end-of-the-semester student survey will gather data on students' experiences using the plan, or reasons for not using the plan. The data from the pilot study can provide an insight into studying habits of this student cohort, and what level of guidance instructors can provide to help students with efforts and time management before an assessment.

**Keywords**—study habits, time management, efforts management, reflective practice, survey

## I. INTRODUCTION

Engineering courses often use tests or exams as one of the ways to assess student learning outcomes. Despite drawbacks such as having a narrowed focus or inadvertently focusing on rote memorization, exams can be an effective way to assess large number of students at a time, build discipline, and to indicate

progress in learning. While there are several other, perhaps more effective ways to assess student learning, exams continue to be a part of several engineering courses.

Research shows that engineering students struggle to develop adequate studying strategies for tests or exams. This lack of self-regulated study habits leads to poor performance, ultimately leading to students dropping out of the program, especially those in the first year [1]. Developing good study habits helps students become self-disciplined, take charge of their learning, and succeed in their academic program.

Research on students' study habits shows that students commonly endorse strategies such as re-reading materials or cramming for tests, which do not always enhance learning [2]. McCabe (2010) reviewed a few such studies on students' studying habits and pointed out that most of these studies arrive at the same conclusion — undergraduates may not utilize the most effective learning strategies [3]. One of the reasons that students fail to utilize effective learning strategies is that their instructors do not formally teach them these strategies [4]. Most often, instructors focus on what students need to know for an exam, without emphasizing much on how students should prepare for the exam. Teaching students how to learn is equally important because developing efficient studying habits promotes lifelong learning [5].

One way to help students prepare for exams is to provide them with a study plan that not only focuses on what to learn but also on how to learn. An instructor-provided study plan may help those students who do not necessarily know how to create one or procrastinate on creating one. It may guide students on how to develop good study habits, thereby improving their performance on exams. One of the goals of the study plan is to help students manage their time, efforts, and resources required to prepare for a test. The goal of this research is to explore strategies that may help students prepare well for an exam. Subsequently, it may help students develop strong studying habits and implement effective study methods, and develop a positive attitude towards learning. The study plan focuses on strategies that students can implement without assistance.

This paper describes the design of the study plan and how I (the instructor) plan to implement it in the classroom. Students unreasonably expect their exam grades to reflect the amount of time spent on studying rather than the quality of studying done

in that time [6]. The study plan prompts students to assess their level of understanding of topics before preparing for a test. This pre-assessment of their abilities may help students prioritize topics that they find difficult. Additionally, recognizing their strengths may boost their confidence and prevent students from getting overwhelmed by the number of topics they need to prepare for. Students may tend to overestimate their knowledge and abilities [6]. Assessing the effectiveness of the plan is essential for students to reflect on strategies that worked for them, and what they must do differently for the next test. The study plan prompts them to reflect on their plan and recognize if they overestimated their skills and abilities.

The pilot study will implement this study plan for a sophomore-level undergraduate course in Aerospace Engineering during the fall semester. The course has multiple closed-notes in-class quizzes and two exams. I will provide students with the study plan well in advance for each in-class quiz and the exams. An end-of-the-semester student survey will assess the usefulness and effectiveness of this instructor-provided study plan. The survey will gather data on students' experiences using the plan, or reasons for not using the plan. The data from the pilot study can offer insight into the studying habits of this student cohort, identify strategies that students found most useful, and provide feedback for further improvement.

## II. DESIGN OF THE STUDY PLAN

The study plan consists of four blocks. Each block focuses on both learning and management strategies aimed at helping students organize their preparation efforts and resources. In addition, the blocks have checklists and tasks to help students implement these strategies. This section describes the content of each block and the intent of incorporating it into the study plan.

### A. Block 1: Logistics

Block 1 lists the logistics such as the date, time, and location of the test. The block states whether the test will be on paper or online, the time allotted, and provides a checklist of allowable materials. Block 1 recommends the students add the test details to their calendar or their preferred tool for keeping track of deadlines. It is no surprise that keeping a calendar helps in organization and visualizing the time available for test preparation. Figure 1 shows the details included in Block 1 of the study plan.

### B. Block 2: Self-Assessment, Efforts and Resource Allocation

Block 2 lists the topics students will be tested on. For each topic, the block asks the students to assess their current level of understanding of the material, the resources (for example, lecture notes, textbook, study group, or office hours) they need to learn the material, and the time they need to allot to learn each topic. Figure 2 shows the design of Block 2 of the study plan.

Having accurate perceptions of their capabilities and making accurate judgements about their knowledge and skills is relevant to student learning. Learners who are aware of their strengths and weaknesses are more strategic and perform better than those who are unaware [7]. Students who are unaware of their low understanding of a specific topic, or overestimate their capabilities, are more likely to inefficiently allocate efforts and resources to those topics [8]. By asking students to assess their current level of understanding of a particular topic, the study plan allows students to find areas where they lack early on so they can seek out help in a timely manner. Identifying the help students would need early on may prevent any last-minute anxiety or frustration, often leading to a negative attitude towards the exam or the course. For topics that students think they understand well, this self-assessment allows for more meaningful learning by building on previous knowledge. The next step in Block 2 is to identify the resources available to fill the gaps in understanding of the listed topics. The goal here is to help them prioritize their learning by focusing on topics they do not have a good understanding of.

The study plan may nudge them to work on these topics first, with more time on hand than leaving it for the last minute when it may not be possible to get help from the instructors or their peers. Lastly, Block 2 asks students to allocate the time they think they need to learn a specific topic.

### C. Block 3: Planning a Schedule

Block 3 provides a template for students to plan their daily test preparation activities. I plan to provide students with the study plan a week before the test, so the template lays out the days of the week and marks the Instructor/TA office hours. The rationale behind implementing this strategy is to help students spread out the learning and avoid facing the entire syllabus at the last minute.

Block 1: Logistics			
<b>Date:</b> May 17 <sup>th</sup>	<b>Time:</b> 8:00 am	<b>Mode:</b> In-class, on-paper	<b>Time limit:</b> 1 hr
<b>Allowable materials checklist:</b>			
<input type="checkbox"/>	Material 1		
<input type="checkbox"/>	Material 2		
<input type="checkbox"/>	Material 3		
<input type="checkbox"/> <b>Noted test details (on calendar or other planning tool)</b>			

Fig. 1. Block 1 of the Study Plan lays out the logistics of the test.

Block 2: Self Assessment, Effort and Resource Allocation			
Topics I will be tested on:	My current level of understanding:	Resources I need to learn this topic:	Amount of time I should allocate to learning this topic:
Topic 1	<input type="radio"/> Do not understand it at all <input type="radio"/> Somewhat understand it <input type="radio"/> Understand it quite well but need some brushing up	<input type="checkbox"/> Textbook <input type="checkbox"/> Lecture notes <input type="checkbox"/> Attend office hours <input type="checkbox"/> Study group <input type="checkbox"/> Other: _____	
Topic 2	<input type="radio"/> Do not understand it at all <input type="radio"/> Somewhat understand it <input type="radio"/> Understand it quite well but need some brushing up	<input type="checkbox"/> Textbook <input type="checkbox"/> Lecture notes <input type="checkbox"/> Attend office hours <input type="checkbox"/> Study group <input type="checkbox"/> Other: _____	
Topic 3	<input type="radio"/> Do not understand it at all <input type="radio"/> Somewhat understand it <input type="radio"/> Understand it quite well but need some brushing up	<input type="checkbox"/> Textbook <input type="checkbox"/> Lecture notes <input type="checkbox"/> Attend office hours <input type="checkbox"/> Study group <input type="checkbox"/> Other: _____	
...			

Fig. 2. Block 2 of the Study Plan focuses on self-assessment, effort and resource allocation.

A study by Hartwig and Dunlosky [2] concluded that students who planned their studies ahead of time and studied what they had scheduled tend to be high performers. In their survey of 324 students from various majors in an introductory psychology course to investigate what study strategies students use, they found that there was an even split between the number of students who spaced their studying and those who massed their studying sessions. However, students who massed their study sessions reported cramming as their study strategy — a strategy that does not always lead to better learning. Spacing studying sessions can allow time to implement learning strategies leading to the distributed-practice effect.

The distributed-practice effect refers to distributing learning over time which typically results in better long-term retention than studying the entire content in a short period [9]. However, just distributing materials to be learned over a period is not sufficient. It is important that students recall the learned material sometime after the initial learning. Studies show that if a to-be-remembered list of words includes repeated items, and if these repeated words are separated by other words, an adult can recall these repeated words more easily than those that were not [10]. Block 3 tasks include asking students to not only

space their studying over a week but also allow time to review critical topics a few days after they first learn it.

Block 3 tasks also ask students to test themselves on material learned. It suggests that students practice homework or example problems and derivations without referring to the solution. Research shows that testing has a positive effect on material retention, thus making it a powerful tool to enhance learning in addition to assessing it [6], [11]. Students can create practice exams for themselves using homework problems, in class examples, and partially filled lecture notes<sup>1</sup>. Self-testing can help students realize what topics need more review so they can take the necessary steps to meet their goals. Figure 3 shows the design of Block 3 of the study plan. The ‘OH’ indicates that the instructor has office hours on that day.

#### D. Block 4: Exam Readiness and Self-Reflection

Figure 4 shows the design of Block 4. First, the block asks students to assess their readiness for each topic they would be tested on. Next, it asks the students to reflect on the effectiveness of their study plan. Students’ indicated estimates of time and effort required in Block 2 may not be accurate. For example, they may realize after the fact that they needed to spend more time on Topic 1 than they expected. Reflecting on

Block 3: Planning a schedule							
For each day leading up to the test, schedule the topics you need to study and what materials you will use to study							
	Day 1	Day 2	Day 3 (OH)	Day 4	Day 5 (OH)	Day 6	Day 7
Topics							
Materials							
<b>Guidelines to schedule your studying</b>							
Start with the difficult topics							
Allow time for review sessions							
Allocate time to practice problems and derivations							
<b>Test yourself around Day 6</b>							
Solve example problems <u>without</u> looking at the solution and assign a time limit for each problem							
After you review a topic, fill out blank lecture notes <u>without</u> referring to the textbook or solutions							

Fig. 3. Block 3 of the Study Plan guides students in scheduling their studying.

<sup>1</sup> My teaching style involves providing students with partially filled lecture notes that act as worksheets. The lecture notes include blanks that we fill out in class. Students can access a

non-filled set of lecture notes and test themselves by filling it in without referring to the solution.

their performance and their ability to follow their designed plan, they may consider making modifications for future tests. Since the final exam is comprehensive, this reflection exercise may help them optimize their time and efforts for the final exam.

study plans provided in class. To the students who indicate that they did, it asks them to specify plans pertaining to which quiz or exam they implemented and to what extent. Next, to assess the plan's design, the survey asks them to indicate the usefulness of the study plan's features in their preparation. To assess the effectiveness of the study plan, the survey asks

Block 4: Exam Readiness and Self-Reflection		
Topics I will be tested on:	How confident do I feel about this topic?	The next time I prepare for this topic, I need to
Topic 1	<input type="radio"/> Not confident at all <input type="radio"/> Somewhat confident <input type="radio"/> Very confident	<input type="checkbox"/> Allocate more time to study <input type="checkbox"/> Allocate less time to study <input type="checkbox"/> Use more resources to grasp the concept <input type="checkbox"/> Utilize class resources (office hours, study groups) <input type="checkbox"/> Other: _____
Topic 2	<input type="radio"/> Not confident at all <input type="radio"/> Somewhat confident <input type="radio"/> Very confident	<input type="checkbox"/> Allocate more time to study <input type="checkbox"/> Allocate less time to study <input type="checkbox"/> Use more resources to grasp the concept <input type="checkbox"/> Utilize class resources (office hours, study groups) <input type="checkbox"/> Other: _____
Topic 3	<input type="radio"/> Not confident at all <input type="radio"/> Somewhat confident <input type="radio"/> Very confident	<input type="checkbox"/> Allocate more time to study <input type="checkbox"/> Allocate less time to study <input type="checkbox"/> Use more resources to grasp the concept <input type="checkbox"/> Utilize class resources (office hours, study groups) <input type="checkbox"/> Other: _____
...		

Fig.4. Block 4 of the Study Plan focuses on students' exam readiness and allows them to reflect on the plan.

### III. IMPLEMENTING THE STUDY PLAN

Over the 2024 Fall semester, I will be instructing a Undergraduate Sophomore-level Aerospace Engineering course. The current student enrollment in this course is about 98. This course has at six in-class quizzes, each about 20 minutes in duration, and two exams. Since the exams will be comprehensive, my goal is that students' reflection on their previous study plans (the ones for the in-class quizzes) helps them better estimate their ability to prepare for the topics on the exams. For example, if they overestimated the time required to prepare for a specific topic or overestimated their understanding of a specific topic on a previous study plan, they can learn from that experience and plan better for the exams.

While I will highlight the intent of providing the students with a study plan and its potential benefits, using the plan will not be mandatory. The study plan will serve as a resource and students can decide when and how they choose to use it. Students can implement the plan to any extent they see fit — from not implementing it at all to following every step in it. They can use the plan for each quiz or exam or try it for a quiz and decide it doesn't help them learn. I will not penalize students who do not use the plan or incentivize students who do.

### IV. PILOT STUDY

The study plan described in the preceding sections is the alpha version of the plan with room for improvement. However, it provides a way to test whether students find this resource necessary, and if so, the effectiveness of this resource. The results from the pilot study will help understand the needs of the students and get their suggestions for further improvement.

At the end of the semester, I plan to survey the students to assess the usefulness of the study plan. The study aims to identify if students used the study plan and to what extent. The survey will first ask students if they used one or more of the

students if they learned any new learning or management strategies, and if they would consider creating similar plans for their other courses. Finally, to improve the study plan, the survey asks students to specify features they may add or remove from the study plan and their reasons for it.

To the students who indicated they did not use the plan at all, the survey asks them to specify reasons they did not implement the provided study plan or why they did not deem it to be useful.

Upon approval of the Institutional Review Board, I will deploy the survey to the class. The survey will be voluntary and will not collect any identifiable information. The survey will be anonymous and the results from the survey will be reported in aggregate. Since this is a pilot study to assess the usefulness and effectiveness of a study plan, I do not plan to collect any data from the study plan.

### V. CURRENT AND FUTURE WORK

This research study, in its current stage, aims to assess the usefulness and effectiveness of an instructor-developed study plan. Post the pilot study described in this paper, the goal is to improve the study plan and implement it in a sophomore-level undergraduate course in Aerospace Engineering in the fall. Each course that I implement the study plan in, I plan to get feedback from the students to make continuous improvements to the design of the study plan.

An extension of this study may include experimenting with different learning strategies to identify what works best for students. Future studies may also explore correlations between exam grades and learning strategies that were implemented in preparing for that exam. These insights could be useful in assessing different learning strategies or even developing new ones.

Future studies can also involve students submitting their filled-out study plans. Analysis of these study plans can provide insights into topics that students find difficult or spend a lot of time studying — this information could be beneficial to instructors in identifying topics that students struggle with the most, and develop their lessons plans accordingly.

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