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## MyOMlab as an enabling e-learning technology: Bridging the gap between student- and instructor- centered learning

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## **MyOMlab as an enabling e-learning technology: Bridging the gap between student- and instructor-centered learning**

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### **ABSTRACT**

*Technology is continually allowing educators to combine didactic and democratic approaches to facilitate learning and produce successful managers. This paper discusses how one such technology, myOMlab—integrated within a learning management system, Blackboard—can deliver a core operations management course, catered primarily to working students i.e., interns and future managers. To confront the bias against online education and engage in serious research on online education, we share our experiences of teaching one semester-long online course. Although robust research evidence is yet to be gathered to convince educators about its benefits, we propose a set of successful myOMlab activities (including manual and Excel-based Dice Game) used within a discussion-based format that will reduce the isolation of online students while maintaining the rigor of curriculum. We conclude that e-learning technology e.g., myOMlab, can be used as an empowering mechanism to pivot from traditional instructor-centered learning toward this improved pedagogical system of student-centered learning.*

**KEY WORDS:** Online teaching, learning outcomes, operations management, myOMlab, Blackboard

### **INTRODUCTION**

The theory of disruptive innovation promoted by Christensen of Harvard Business School suggests that emerging e-learning technologies are serving as a major catalyst to provide personalized and equitable access to high-quality education without challenging the incumbent education system head on (Noonoo, 2012; Arnett, 2014). Although there is lack of consensus among academicians whether technology has truly transformed management education (Gibson et al., 2008; Redpath, 2012; Arbaugh et al. 2013), according to one estimate eighty-eight

percent of public four-year degree-granting institutions have experimented with some form of online education (Parsad and Lewis, 2008; Allen and Seaman, 2011)). At the core of this debate regarding the efficacy of e-learning is the divergent impact that this technology has on two different teaching approaches: *the authoritarian didacticism approach* which primarily utilizes instructor-centered learning techniques and *the democratic approach* which primarily facilitates student-centered learning (Jarvis, 1983; Entwistle, 1997; Walkin, 2000; Schiaffino et al., 2008).

While teacher-centered learning is an effective approach when the subject matter of the course such as operations management (OM) is new to the students, this paradigm of viewing the students as the recipient of knowledge becomes increasingly challenged as the role of educator gets redefined as a facilitator of self-directing learning (Tight, 1996). Once the pedagogical approach of higher education transitions to student-centered learning practices, that model places a greater responsibility for learning course material on the student (The Flipped Class Demystified, 2015). Once introduced to any specific discourse community, students are expected to review new material and familiarize themselves with the upcoming concepts. They do not wait for the information to be presented—as with teacher-centered learning—but, rather, consider their new concepts immediately and engage in a discussion of that material in instructive ways themselves (see for example, a multitude of IT on-line courses offered by Cisco Networking Academy (2017). It is a collaborative student-centered learning approach that challenges students to cooperate and take an active role in learning (Lee and Bonk, 2014).

E-learning technologies, such as myOMlab, are playing an important enabling role in aiding this paradigm shift. After reviewing similar tools, we propose that the myOMlab technology, coupled with experiential learning aids such as the business novel, *The Goal*, and its Dice Game (Goldratt, 1990), collectively masters the potential of offering a student-centered alternative for teaching online OM courses. Subsequently, in practical evidence of how myOMlab works, we will discuss the class structure, assignments, grading components and student responsibilities to demonstrate how active learning is taking place in these myOMlab courses as follows: first, we present myOMlab and its purpose within the student-centered classroom; then we outline the Instructor's role and the duties that are associated with an online OM course; next, we examine each of the teaching-aides and activities that students complete through the course. By dissecting the course in its entirety, we gain a better understanding of the depth and commitment that accompanies the online OM course.

## MyOMlab - new hOMe for learning

MyOMlab is the epicenter of OM learning. Students must purchase an access code to the website and register with the appropriate instructor and course. It provides students with an e-text version of the Pearson book, access to a study plan for each chapter, assignments, quizzes, and chapter resources. Within myOMlab, students have access to the complete textbook online and do not need to purchase or rent a physical copy. However, having the physical text may help some students when working in myOMlab on assignments for easy references without losing one's place. MyOMlab hosts all assignments for the course aside from others given by the instructor. The study plan provides sample problems for each chapter unit, and homework problems and assignments are to be completed and submitted through the website as well as quizzes and tests. Chapter resources provide a checklist for each task students must complete: homework, test, study plan, e-text chapter, and links to specific video examples and supplemental instructions. Students are able to navigate from Blackboard to myOMlab via links set up by the instructor or directly from the website.

### Instructor's role – *OMnipresent professor*

Rather than meeting students formally, an online instructor orchestrates various tools, posts prepared writing to introduce his/herself, and writes consistent feedback to maintain the class performance. Creating a "First Time—Start Here" tab in Blackboard allows students to become familiar with the instructor and class requirements. A brief biography with a photo of the instructor is provided so that students may "meet" the course instructor. Next, the course syllabus is available, and a direct link to register for myOMlab is provided. Then we hyperlink the University's Keys to Success for online learning. We initially discuss the question, "*What is online learning?*" and then students are given information about time requirements, instructor interaction, and course needs. Students are also provided with the University's Student Responsibility guidelines. This document is specific to online courses and outlines the learning expectations, methods of discussion, technical requirements, and professional and ethical standards for all online students. This two page PDF notes two critical components of the University's expectations:

1. This online course *is not* self-paced, as other online courses can be, and students will be required to interact according to the syllabus and schedule.
2. Students should expect to *spend more* time each week working in online classes than traditional classes.

Of all the keys to success, the two above are most important. Students who read this prepare to work longer and harder in the online OM course each week than in our traditional classes. The added rigor is not just based on the typical OM course requirements, it arises from how these active-learning components of e-learning technologies center on engaging students through critical analysis and conversation, facilitated through discussion boards (such as the one featured in Blackboard, an excellent complement to myOMlab modules) that create an omnipresent classroom effect for the duration of the course. From the time students post an introductory board entitled “*Hello my name is*”—giving a brief description of their majors, professional lives, current course load, and expectations for this particular class—onward, the dialogue between these self-motivated students and the professor/facilitator is initiated.

### **ACTIVITY #1: READ E-TEXT – ATOMIC LEARNING**

With myOMlab, students have access to the Pearson *OM* textbook online. Students select the e-text tab and the full textbook is opened onto the desktop, with the Table of Contents appearing on the left side of the screen. The students’ names and course information are found on the top of the page. The textbook is broken into sections, and each section has chapter links for easy reference. The learning objectives of the entire course as well as weekly module are concisely stated at the top page of the schedule. Weekly assignments are broken down into modules on Blackboard, another complementary e-learning platform. By clearly labeling each learning outcome, the instructor is able to guide the students to the appropriate information, and each week’s objectives are outlined in connection to the course’s overall academic goals. Students are able to remain organized and learn while working on a clear path of knowledge. The sequences become apparent to students immediately; for instance, to write a successful discussion post, first students must read the chapter assigned. Then, to assist students in learning the material, real-world application videos are available, and links provided by the instructor for further examples (and highlighted concepts that will be useful on the exams) become accessible through each week’s module. The videos automatically open in a new window, and the playback is similar to all other online streaming videos, so students should be familiar with the format. These videos allow students to grasp the application of each chapter’s material by highlighting its use in real-world professional settings. Beyond the professional application videos, students also have access to videos provided within the e-textbook. These “Author Videos” show the authors working quantitative problems similar to those found in the chapter. These are designed to supplement in-class

instructor examples by providing students with contributor media clips to reinforce the material. Students are able to follow along with examples and apply the fundamental knowledge to homework problems.

PowerPoint slides are available for each chapter and provide students with an outline of important information. Made by Pearson, the slides are intended to accompany each chapter and follow chronologically with the text information. An outline is also a feature of the Pearson setup, with learning objectives and definitions of key concepts. The slides narrow down critical information and help students dissect ideas more clearly.

## **ACTIVITY #2: PARTICIPATE ON DISCUSSION BOARD – COMMUNITY LEARNING**

Another essential teaching-aid utilized in these online OM courses through the Blackboard communication tool is the discussion board. The discussion board provides students and the instructor with an online forum to discuss concepts and engage with one another. Each module has a discussion topic that students must respond to and submit before 11:55 pm on Wednesday night to receive full credit. There are many different prompts throughout the semester including a Manual Dice game, discussions regarding *The Goal*, an Excel-based Dice game, and various chapter scenarios and concepts. To prevent plagiarism and ensure that responses are original to the author and not based on peer responses, students cannot access the discussion board until after posting their response. Although there are many topics for discussion posts, *The Goal* by Eliyahu M. Goldratt is a supplemental OM based novel and provides students with a great opportunity to demonstrate their understanding. The story follows an operations manager, Alex, and common OM challenges and practices are addressed throughout the story line. This discussion topic allows students to relate their understanding of OM to “real-world” situations that are found in the novel. An example of one discussion prompt follows:

In a recent meeting, your colleague overheard you saying that the goal of a company is "to make money". With recent layoffs still fresh in his mind, he does not agree with you. Instead, he thinks that the goal is to have satisfied customers. Before responding, I'd like for you to read a very short chapter where Goldratt (*It's Not Luck*, North River Press, 1994) further elaborates on “the goal” and strategic direction of a company, in his sequel to that first business novel. After reading, discuss how you would reconcile your viewpoint on *The Goal*. In what ways do you think this discussion relates to

the chapter you are reading this week? (Deadline Wednesday 11:55 PM for early response).

Students must discuss the concepts presented, relate them to chapter objectives, and then express their viewpoint on the matter. After submitting the mid-week post, students are able to see their peers' responses. To create an active learning environment, students are tasked with responding to two peers' contributions. Simply agreeing with the author's point is not sufficient participation. Students must critically analyze the post, then ask well-conceived questions to engage in conversation. Here students are able to interact with one another and often learn from others' perspectives. By creating a community through discussion posts, students reinforce concepts and provide different points of view on important chapter information. The final and fourth discussion post of the week is an after mid-week post in which students respond to the instructor's emailed prompt. Students must then continue the discussion by answering the following questions: "How is what's occurring not merely an averaging out of the fluctuations? What's your opinion on how Goldratt's concept of statistical fluctuations (SF) that relates to the two types of variations discussed in the current chapter? When a process is in-control, what does that imply?" The instructor's mid-week email, typically sent on Thursday afternoon following the due date of initial discussion posts, summarizes the main concepts students addressed so far. The instructor is able to address the discussion posts and further conversation by posing additional questions for students to analyze. This reinforces the information and challenges students to continue to think about the concepts and relate them back to the text.

### **ACTIVITY #3: FOLLOW STUDY-PLAN – AUTONOMOUS WORK**

Within MyOMlab, Study-Plans for each chapter are available for students. Accessible through a link found in Blackboard, Study-Plans are optional problems and quizzes for each section of material covered. Each chapter is broken down into sections, and sample problems are provided for students to help master the material. Students must first practice the material before they can be tested on the sections questions. Some sections have multiple problems while others have only one. Along the left side of each problem are tools for students to use while solving the problem. A "Help Me Solve This" button provides students with a similar problem and shows step-by-step instructions on how to solve it. If this function is not enough, students have access to sample problem videos that will open in a new window. As with the step-by-step instructions, the problem that is examined

is not the same as the practice question; however, it is similar enough that students can apply the same procedure.

If students need more in-depth explanations or wish to review the chapter, direct links to the text are provided through the Study-Plan. The specific chapter and section is immediately highlighted and students have the ability to re-read the material. All of these tools are designed to virtually replace the instructor in learning OM. The study plan is a critical aspect in understanding the management material and allows students to demonstrate their “mastery” of concepts. After students have solved the practice problems for each chapter, they are then presented with a quiz. To earn mastery points, students must successfully score 100% on each chapter quiz. Each quiz has problems that are similar to the practice questions for each section. It should be noted that no two problems are ever the same. MyOMlab randomly generates problems. For each practice question and quiz question, new components will be added and variables will be changed. This prevents students from cheating and sharing answers with one another. It can also be frustrating to them, however, as problems are constantly changing and students cannot return to specific problems to correct careless errors like rounding to the wrong place value. Yet students are allowed unlimited attempts at both Study-Plan problems and quizzes and should take advantage of this educational opportunity. Each chapter should be attempted and explored to better understand the chapter material.

#### **ACTIVITY #4: PERFORM WEEKLY ASSIGNMENTS – *FROM THOUGHTS TO ACTIONS***

Weekly assignments are found in myOMlab and are available for the current week. These assignments are designed to be open-book, open-note, and allow students to reference text pages while completing the homework. Each weekly assignment is due on Sunday night at 11:55 pm, and the best score out of three attempts is recorded. Students do not have access to complete previous assignments and they cannot work ahead. When the link to myOMlab Homework is selected, students are directed to the homepage. Students must complete each homework assignment and submit it before the due date to receive full credit. Similar to in-class courses, students are able to utilize their text, notes, and online resources to complete the weekly assignments at their own pace. These assignments do not have time limits and are available in the present week for students to complete. Once the student has finished, the ability to review the homework or improve the score becomes available.



The ability to review their score is similar to turning in physical homework in-class and receiving the corrections from instructors. It is then students are able to see their mistakes and areas in need of more focus. Because online courses are student-centered, there is a great responsibility placed on the student to review assignments and improve his or her grade. MyOMlab software grades weekly assignments, and it is the student's duty to determine where mistakes were made in problems and how to avoid repeating the same error.

Along with the myOMlab assignments, students play both a manual dice game and an excel-based dice game. The manual dice game is the first assignment. Its instructions, written by Dr. Holt, are hyperlinked to the Blackboard assignment description. Students then create a physical process flow game individually and begin to understand the importance of operations management. Theory of constraints, bottlenecks, works in process, and increasing efficiencies—all OM concepts—are not only explained, but also become tangible lessons students learn through playing the game. The manual dice game is the foundation upon which the semester's knowledge will be built. Students are asked to reference *The Goal* and relate their own experience to that of Alex, the novel's plant manager character. By creating an interactive game, students are able to learn these critical concepts through experimentation and then continue their knowledge by relating these lessons to other management aspects. The understanding is better solidified by actively engaging students in the material, and the instructor is able to review the student's comprehension by assessing his or her related discussion post. While the manual dice game is played only at the beginning, the Excel-based dice game is continued throughout the course. Students are able to manipulate variables through the pre-downloaded file. While they can understand the beginning basics of operations management through the manual game, the Excel version builds upon the concepts, with opportunities to manipulate individual variables and observe the direct effects that small changes in production have on the system as a whole. Students learn, "the purpose of this flow chart is to be able to create an image of this simple 5 process assembly line and to be able to generalize the results to more complex production environments such as Job Shops and large flow shops." Each panel within the game reveals different properties and components of an assembly. Panel B shows students the Works in Process, daily mean production rate, and the maximum variation around the mean—which students can manipulate to show different scenarios. The third panel teaches students about the average efficiency of each process and the WIP and raw materials that are required in the production system. Panel D reveals information similar to the third panel; however, it represents processes over multiple runs which allows students to examine the results from specific changes and assess the impact on the production system overall.

While students play the excel-based game throughout the course, theory of constraints measures, operational measures, and competitive measures are highlighted, and students are tasked with relating their findings to current chapter objectives. Students will specifically examine the impacts of variability, of capacity, of WIP, and of constraint locations. Introducing a bottleneck to the process has noticeable changes on the production system. Students are able to visualize the impact and use the Excel table to analyze those changes. The active-learning environment for an online class is nurtured through the interactive game and offers students a break from monotonous work. Similarly to the manual dice game, students are required to post their findings in the discussion board and engage with one another to converse about the activity. Students master the concepts by playing the game, analyzing and explaining their findings, and reading their peers' experiences and insights, while thinking critically and engaging in a conversation about the process.

### **ACTIVITY 5: WEEKLY QUIZ –WISDOM VS. KNOWLEDGE**

After students have completed the discussion post, mastered the Study Plan, and completed the weekly assignment, they must then take the weekly quiz. Similar to the weekly assignments, the quiz is only accessible for the current week and is due before 11:55 pm on Sunday night. It can be accessed through Blackboard from the current week's module. Students are then directed to the Quizzes & Tests homepage in a lockdown browser. Each student must install the proper software on his/her computer and, when beginning the quiz, all other components of that computer become unavailable. Until the quiz has been submitted, students cannot exit the lockdown browser. If they attempt to exit, the system locks the student out of the quiz, and the software will record the attempt with however many questions were answered.

Every quantitative problem is unique throughout myOMlab. Quizzes are not an exception. Therefore, students will be unable to share answers with one another, as each answer is different. Student integrity is essential in online learning, and myOMlab attempts to remove all temptations for cheating.

Besides preventing cheating, another important aspect of online learning and assignments is addressing technology issues and missed assignments. Although it is the student's responsibility to ensure a reliable Internet connection, exiting the lockdown browser by accident or having pop-up blockers turned on can interfere with taking the quiz. If this occurs, students should email the instructor immediately; at their discretion, instructors can re-open quizzes for students with

excusable technology issues, documented illnesses or emergencies. This allows online quizzes to function similarly as in-class courses.

### **MIDTERM AND FINAL TESTS – *KEEPING OMERS HONEST***

Similar to the weekly quizzes, the Midterm and Final are both taken via the Pearson lockdown browser and have time limits on each test of roughly 130 minutes each. This deters students from cheating and helps maintain the course integrity. Students take the test during a window of time that the instructor establishes. These tests are not taken lightly, as many online exams are more difficult than those taken in-class. Reviewing key components of each chapter, discussion posts, assignments, and study plans is essential in preparing for both exams. Because of the variety of questions and test time constraints, students will not have the ability to reference their notes. The tests consist of many questions that vary in nature to test not only the students' conceptual understanding but also their application and use of management techniques.

### **THE STUDENT EXPERIENCE - *A WELCOMED ONE***

MyOMlab offers much needed structure and accountability to online students; they are responsible for completing their homework in a timely manner, which ultimately sets them up for success on subsequent quizzes and exams. Students who have provided course feedback appreciated the individualized aids created by myOMlab's "Help Me Solve This" option and other interactive learning features, such as the videos and immediate feedback. They appear to see the value in the course module's required, weekly assignments and the structure that MyOMlab brings to their studying and learning.

### **Conclusion - *Future Omlab Experimentation Based On Available Data***

MyOMlab is an invaluable platform for any online class or the ideal e-learning component to supplement any physical classroom setting. After our consistent experiences with this tool, myOMlab clearly provides a way to harness the potentially disruptive technology of e-learning in order to assist those of us who teach OM without making us obsolete. Instead, we become the facilitators and moderators of a student-centered instructional pedagogy. The combination of the program's algorithmic problems with students' ability to repeat and review

problems as needed for quiz and exam reviews enables those students to practice as much as they need, remediate issues in their understanding of OM concepts, and master the course content. Figure 1 shows the grade distribution over 150 students who have taken this course in 6 sections each averaging about 25 students and we observed almost normal distribution similar to a typical face-to-face class. The results are consistent with previous research comparing online and face-to-face delivery of courses (Marold, 2004). Figure 2 shows the normality of the data and relationship between various course components i.e., study plan, homework, quizzes, and discussion board with final grade and we observe that there is strong relationship of final grade with Weekly quizzes and Homework. Finally, Figure 3 shows the regression model showing that all the three components are highly significant contributors to the final grade at .001 and R square is 0.94 which implies that the model explains 94% of the variance. The complete model is  $y = 0.33\text{studyplan} + 0.41\text{Discussionboard} + 0.23\text{Homework} + 0.33\text{Quizzes} - 3.7$  which shows the relative importance of each component in explaining variance.

We note that myOMlab can also be customized continually. Currently, we plan to modify the module by eliminating the extra credit points and implementing a new strategy to encourage students to do additional homework problems. Also, while myOMlab quizzes will still count for 30 percent of the final course grade, now those students who complete the Study Plan while doing homework assignments will see their quizzes subsequently drop to 20 percent and the Study Plan will account for the additional 10 percent.

Regardless of the configuration and proportions in grading, we have found that the performance indicators of students' early work in a myOMlab based course will track reliably to the ultimate course grade they earn. The course module includes so many tools that place both accountability and resources on the students and their individualized learning, that data so far has shown a strong positive and linear correlation between homework grades and final grades. Students who earned A's and B's as a final grade earned an average 93.5% grade on the homework assignments; while students who earned C's and D's as a final grade held an average performance on homework assignments that was a significantly indicative 72%.

This myOMlab technology not only contains enough features to re-create traditional classroom settings for OM, it instead establishes a model for learning that exceeds what any one instructor can provide alone. Because myOMlab pivots the approach from one instructor's knowledge and teaching style toward a student-centered learning environment that holds each student accountable for

learning all sequential concepts—while assisting them with a series of complementary tools that reiterate the material in a variety of presentations that account for distinctive learning styles—myOMlab simulates real-world expertise far better than traditional lectures, and ensures that OM instructors are teaching future managers rather than just our current students. In future, we would like to compare the student performance with traditional face-to-face class where we use Blackboard to share course material (Marold, 2004), and even exploring a cloud computing platform for e-learning (Ganesh, 2015).

In conclusion, we argue that myOMlab and several mylab modules (e.g., MyStatLab, MyAccountingLab) for other business functional areas offered by Pearson publisher serve as a catalyst to the rapid developments in the education industry. If not kept a close eye on such disruption opportunities and the symbiotic ecosystem so created, we academicians run the risk of becoming obsolete very much like the Blackberry.

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## APPENDIX: CRITICAL SUCCESS FACTORS FOR STUDENTS IN A MYOMLAB COURSE

e-Text	Discussion Board	Study Plans	Weekly Assignments	Weekly Quizzes	Midterm & Final Exam
Read from a searchable text format that is clearer for reading (such as on a tablet, rather than a PC); possibly use both print textbook and e-text to reference concurrently.	Read the discussion prompts before reading the chapter	Screen shot the “Help Me Solve This” step-by-step instructions, for reference anytime.	Write down homework problems and use them later to study for quizzes.	While in the lockdown browser, take written notes on quiz problems you find difficult. Then once you see the score, you can identify if those were problems you missed, and should rework and review.	Get your attention: some multiple-choice questions, tests are essential elements with any as 20%. Manage just as on standardized skip questions that creating a bottleneck in progress, return to focus on them.
Use the supplemental PowerPoint	Schedule regular times each week to work on	Write down the problems from the videos,	If there is a video for the problem, take notes	Review all notes and step-by-step instructions	Review emails from the instructor, and key



as a chapter outline	discussion posts, similar to a designated class time.	with notes how to solve them, because the assignment numbers will be different but the concepts are the same.	while watching, to improve memory of the steps.	before beginning any quiz.	concepts highlighted there each week. These act as an outline for exams.
Watch author videos and take notes on the concepts throughout	Write each discussion post in Microsoft Word first, before copying it to the discussion board, to allow time to reflect and compose an answer, while checking for errors.	Study Plans are optional for the course, but are vital to performing well, because they replace the instructor in many ways by giving additional examples and providing instant feedback to answers.	Document each result and ultimate findings from each round of the Manual Dice Game.	After the quiz, return to the Study Plan, to verify which concepts were strengths or weaknesses.	Remember that online exams are often more difficult than in-class exams, to ensure integrity and prevent students from feasibly looking up the answers. Prepare for double the estimated study time you

			would normally.
Respond to the online discussion boards with thoughtful posts that engage in genuine conversation. Without interacting in a real classroom, these boards are essential to creating dialogue with peers.	Complete the Study Plan before the homework . It provides step-by-step instructions and video examples for the homework concepts.	Play the Excel-based dice game before reading the chapter. Whether you're a visual or auditory learner, it's beneficial to see the material represented in multiple ways.	

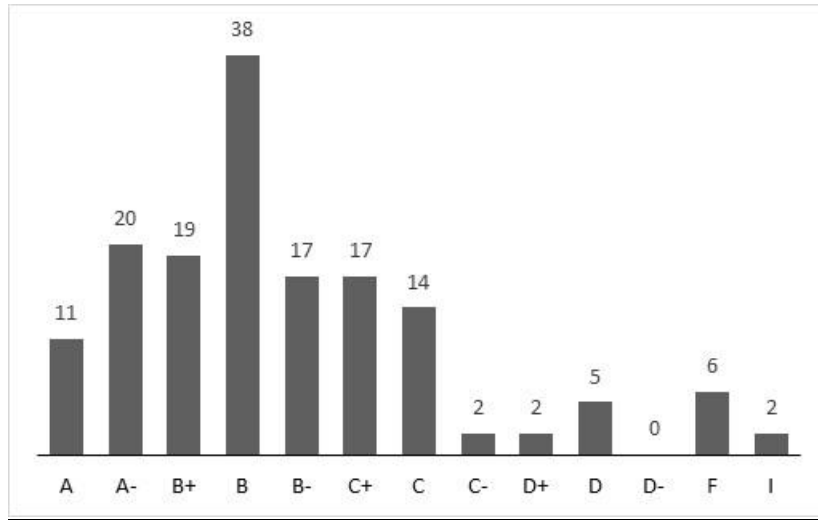


Figure 1: Grade Distribution



Figure 2: Relationship between Average Course Component scores and Final Grade

Regression Statistics								
Multiple R	0.96701425							
R Square	0.93511656							
Adjusted R Square	0.933362953							
Standard Error	0.258141524							
Observations	153							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	4	142.1377	35.53442928	533.2533649	8.79498E-87			
Residual	148	9.862283	0.066637047					
Total	152	152						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-3.69661E-15	0.02087	-1.7713E-13	1	-0.041240699	0.041241	-0.041241	0.041241
Study Plan-s	0.325502377	0.023015	14.14323179	2.84354E-29	0.280022491	0.370982	0.280022	0.370982
DiscussionBoard-s	0.408843082	0.024181	16.90741065	2.191E-36	0.361057881	0.456628	0.361058	0.456628
Homework-s	0.227127769	0.032017	7.093890245	5.00557E-11	0.163857507	0.290398	0.163858	0.290398
Quiz-s	0.332719098	0.031077	10.70620289	3.64094E-20	0.27130669	0.394132	0.271307	0.394132

**Figure 3: Multiple Regression Model of Course Components**