



USING YOUTUBE IN CALCULUS I TO INCREASE CLASS PARTICIPATION

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Abstract

Teaching Calculus course in a community college is very tough. There are many difficulties that the instructor needs to overcome to teach this course effectively and smoothly. Being a teacher of Calculus in Hostos community college for several semesters, I gathered various experience and teaching pedagogy which works very effectively for me. The pedagogy that I will describe in this paper involved pre-lecture video concept based on “youtube” videos. I showed how this technique helped me in my class to increase class participation. I compare two sections of Calculus I which is taught in a regular way without any intervention and two sections of Calculus I which is taught using this pedagogy of pre-lecture videos. The measurement is taken using 15 questions which were fixed in all four sections. For each of these questions, the class participation is measured using the number of students raised their hands. The detailed is listed in the article. This method also has some byproduct benefits which I also discussed in some detail toward the end of the paper.

Introduction: After teaching Calculus I in Hostos Community College for several semester, I have collected developed pedagogy of teaching this subject to community college students specially a Hispanic dominated college like Hostos Community College. This college is located at the heart of Bronx and at least 70% of the population is Hispanic. Usually, in my class of Calculus I, 60% of the students are Hispanic and 30% are Afro American and 10% are other ethnicity. The issue/problem that I have addressed in this article is the “low level class participation”. I will discuss the method of pre-lecture video technique and corresponding implication in my class. This is a broad

methodology which may be employed in a variety of classroom and subjects. This works very effectively for me throughout the semester. You, as a teacher, may find similar difficulties and experience as I did.

Problem: The problem at hand is the “low level class participation”. I always found in my Calculus I class that very few students are willing to participate in the class. I want to increase the number of class participation. So first I asked myself why this is the case?

Why such a low class participation: There may be several reasons behind this problem:

- Not enough background preparation. Students are somehow just passing pre-calculus without thoroughly understanding the materials.
- Break of study. Students are coming back to college after two/three years of break of study. So they forgot the materials from pre-calculus.
- Psychological obstacle “Math is hard” type of mentality.
- Students are not used to read Mathematics textbook. They can read History books or novel but when it comes to Mathematics, it is impossible.

All of the above means less preparation for a student to take a Calculus course. Hence students get confused in the class and cannot catch up. This way students are not even sure what to ask in the class and this result a low class participation.

Solution: Of course, these are some of the common issues that probably all the teachers have to deal with at some point of their teaching carrier. This is one of the reasons that the solutions to this problem are applicable in great generality.

The concept of pre-lecture videos: Any teacher has a limited amount of time in their hand that they can spend teaching background materials that students supposed to know before they come to the class. I found in my class that the majority of the students do not have the proper background. I need a quick method and technique to address this in the current semester. I use the concept of pre-lecture videos. These are videos collected from the internet, usually from “youtube”, and posted them in the blackboard site of the course. The reason I called these pre-lecture videos is that students supposed to and must watched these videos before they came to the class. These are usually very short videos



not more than 10 minutes in length. These videos usually based on some preliminary topics which students need to know to understand the following lecture. As an example, students will watch videos on “factoring trinomials” on the blackboard before they come to my lecture on “Analytic approach to limit” where students need to be able to factor to do problems. Factoring trinomials is a topic that students need to know even before they come to pre-calculus. But believe it or not many students in my Calculus I class did not know how to do it. This way student seems to be confident in my class and understand the lecture more smoothly and not paying too much attention to the preliminary materials. Now students are asking questions on the actual Calculus part instead of asking questions on preliminary materials.

Measurement: The measurement of the class participations are taken over four semesters. This is taken over two sections of Calculus I where no involvement of pre-lecture video techniques took place and two sections of Calculus I where this pedagogy of pre-lecture video technique is employed. All the other variables are kept constant – for example the lecturer, class time etc. are kept same. The 20 questions that are used to measure classroom participation are given below (although the actual content of the question is not that important). These questions are asked various times throughout the semester.

1. What you think the Calculus is about?
2. What is the word “limit” means to you?
3. What is the difference between the limit of a function as “ x approaches a ” and actual value of the function at “ $x = a$ ”?
4. What is the conjugate?
5. What is the slope of a line?
6. Given two points, how to find the slope?
7. Given a point and a slope, how can you find the equation of a line?
8. Can a tangent line intersect a graph?
9. Does every point on a graph must have a tangent line?

10. When a function is increasing, what can you say about its derivative?
11. If a function is continuous at a point, does the function need to be differentiable at that point?
12. Just by considering the graph of $\sin(x)$, where do you think the derivative is 0?
13. Can we distribute derivative under multiplication? Give a counter example.
14. What is the area of a triangle/rectangle/trapezoid?
15. Can we distribute integral under addition and subtraction?
16. Can we distribute integral under multiplication?
17. Can you use power rule of derivative to find integral of “x to the power n”?
18. Is the formula that we found for the integral of “x to the power n” makes sense for all “n”?
19. Why we cannot use FTC to calculate integral of “1 over x” from $x = -1$ to $x = 1$?
20. We know that integral of $\cos(x)$ is $\sin(x)$. How can we use this to find integral of $\cos(2x)$?

Assessment: Each of these twenty questions is asked at various times throughout the semester. Each time, the number of students raised their hands are counted and recorded. This is done for all the four sections of Calculus I throughout a period of two years. The data is presented in the following table. For convenience, I named the section as section # 1,2,3 and 4. Section # 1 and 2 is a regular section where I did not use any pre-lecture video techniques. In section # 3 and 4, I did use the pre-lecture video technique. I presented the data as percent – this gives for example what percent of the students raised their hand compare to the whole class. And only this is what we care about. The numbers are rounded to the nearest whole number.

Question #	Raised hands in section #1 (percent)	Raised hands in section #2 (percent)	Raised hands in section #3 (percent)	Raised hands in section #4 (percent)
1	5%	5%	6%	5%
2	4%	5%	20%	30%
3	10%	12%	30%	40%

4	30%	40%	70%	80%
5	35%	30%	65%	72%
6	43%	34%	67%	85%
7	46%	39%	78%	68%
8	23%	34%	65%	82%
9	33%	26%	56%	72%
10	27%	33%	52%	60%
11	15%	23%	45%	42%
12	13%	20%	50%	65%
13	15%	13%	37%	53%
14	45%	46%	68%	85%
15	25%	32%	47%	40%
16	20%	23%	65%	78%
17	13%	10%	50%	47%
18	23%	35%	60%	56%
19	6%	12%	47%	58%
20	10%	23%	40%	55%

Analysis: It is evident from the above data that the number of class participation increased in section 3 and 4 compare to section 1 and 2. For some unknown reason, we also observed that the number of class participation in section 4 is generally higher than section 3. But in any case, it proves that the technique of pre-lecture videos do increase the number of class participation.

Conclusion: There are some other benefits of this approach that I recognized throughout the semester which is not related to class participation. These are listed below:

1. Students are more prepared to understand my lecture.
2. Students are getting less confused in the class.
3. The grade of students are relatively better (although not significantly).
4. Students are learning more than one way of solving a problem – one from the pre-lecture video and one from my lecture.
5. Students are asking questions on the Calculus part of my lecture instead of preliminary content.



Overall, in this article, I tried to explain my personal experience teaching Calculus in Hostos Community College. I also explained how I use pre-lecture video technique to increase class participation. Other instructor of the same subject may find similar difficulties. I hope this article will give some new direction or teaching pedagogy to all the instructors who are teaching science related subject especially in a community college.