

Teaching Mathematics using OER, ZTC, and Technology

Now we can!

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ABSTRACT

On March of 2020, due to COVID-19, The landscape of Mathematics Education changed. For about a year, long distance learning was no longer a choice but a norm. Under this new scenario, as a Mathematics Professor of a Community College I had to adapt my teaching style to the new conditions, thankfully, I was not caught by surprise, I was already teaching all my courses using OER materials, ZTC for my textbooks, WeBWorK as my homework system, together with websites that I had created for each of my courses. However, I had never taught a course fully online, so I had to attend webinars to learn how to use technology to integrate cohesively all my teaching tools to teach efficiently online. At first, I tried to mimic what I was doing while lecturing “face to face”, but I quickly realized that teaching online with the right hardware and software has so many advantages, compare to traditional “face to face” teaching.

The purpose of this poster is to emphasize the benefits of teaching Mathematics using OER, ZTC, and Technology.

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INTRODUCTION

In this presentation the following must be considered:
“Open Educational Resources” (OER) is used to identify Teaching and Learning materials of different forms that may be used, reused, mixed, remixed, adapted, and shared.
“Zero Textbook Cost” (ZTC) is used to indicate that there is no textbook cost associated to a course being taught.
“Technology” is used to identify software, hardware, or algorithms used to teach Mathematics.
 I have combined the three components described above to teach mathematics such that the materials for all my courses are: **Customizable, Upgradable, Affordable, Efficient, and Accessible.**
 In particular, the OER materials I use to teach my courses allow me and my students to do the following:
1. Retain
 Making copies of the content in different formats is permitted.
2. Reuse
 Content can be reused as needed for Lectures or when studying.
3. Revise
 Content can be modified, adapted, adjusted, or altered.
4. Remix
 Original or revised content can be combined with new content.
5. Redistribute
 Copies of the content can be shared in its original, revised or remixed form.

METHODS AND MATERIALS

For my Learning Management System (LMS) I used BLACKBOARD, within BLACKBOARD I integrated the following:
 Free DESMOS Activities (OER) see figure 1
 Free Homework System from WeBWorK (OER) see figure 2
 Free textbooks from OPENSTAX (ZTC)
 Using Technology such as ZOOM, MS-ONE NOTE, WORD PRESS, BMCC Openlab, I was able to combine, cohesively, all the above to create websites for my courses, where my students had access to free course materials such as recorded videos from live lectures as well as class notes, I adapted all this resources according to my Teaching Modalities: “In person”, “Online”, or “Hybrid”.

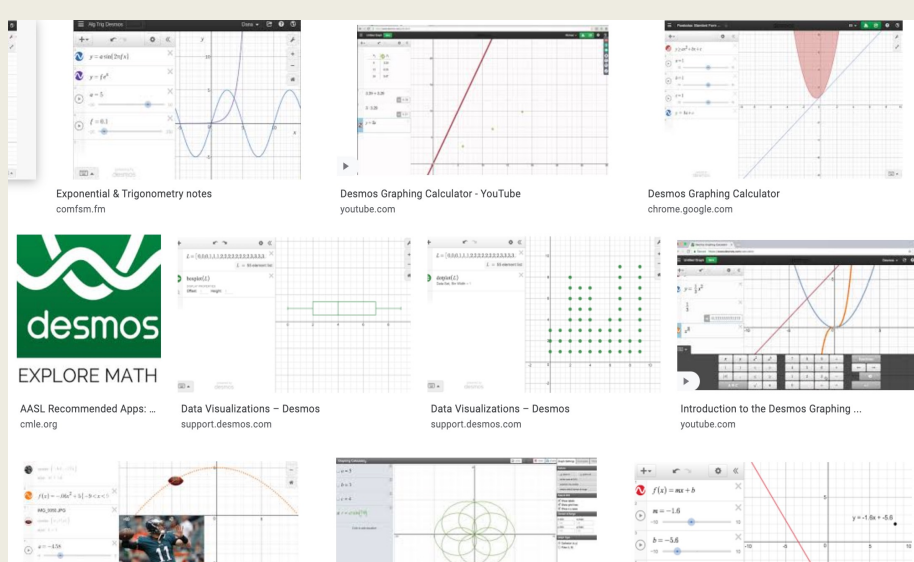


Figure 1. Challenges in DESMOS Activities.

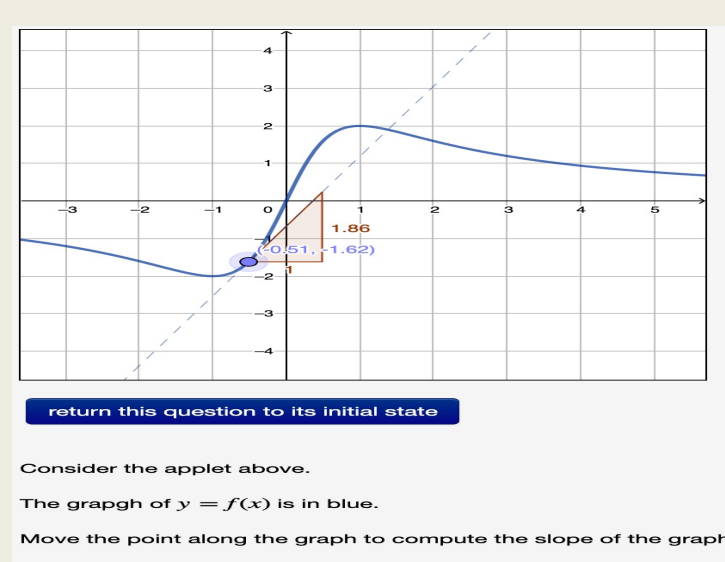


Figure 2. Interactive Question.

RESULTS

During six consecutive semesters, I recorded the mean and the standard deviation of the overall performances of my Precalculus classes as I was increasingly using OER, ZTC and Technology, for the first three semesters the modality was “face to face” for the last three semesters the modality was “online” the data collected is shown in the table 1, and the interpretation of the data is displayed on the Chart 1.

Notice, when I started to use OER, ZTC, and technology there is a slight decrease on the overall performance and a large standard deviation, however as time passes by and I have mastered the use of my tools, Performance increases, in average, and the standard deviation, which measures variation, decreases in average as well.

The data also shows that the use of OER, ZTC, and technology keeps the overall performance as well as the one gained following traditional teaching where students are required to purchase course materials, however using our model, students are financially helped and Diversity, Equity and Inclusion are implemented when Teaching.

Table 1. Evolution of my Precalculus Class before and after COVID 19.

	Average Performance	Standard Deviation	Modality
Fall 2018	75.07	18.78	Face to Face
Spring 2019	70.78	19.47	Face to Face
Fall 2019	73.76	19.24	Face to Face
Spring 2020	84.56	9.26	Online
Fall 2020	80.74	19.85	Online
Spring 2021	81.81	18.82	Online

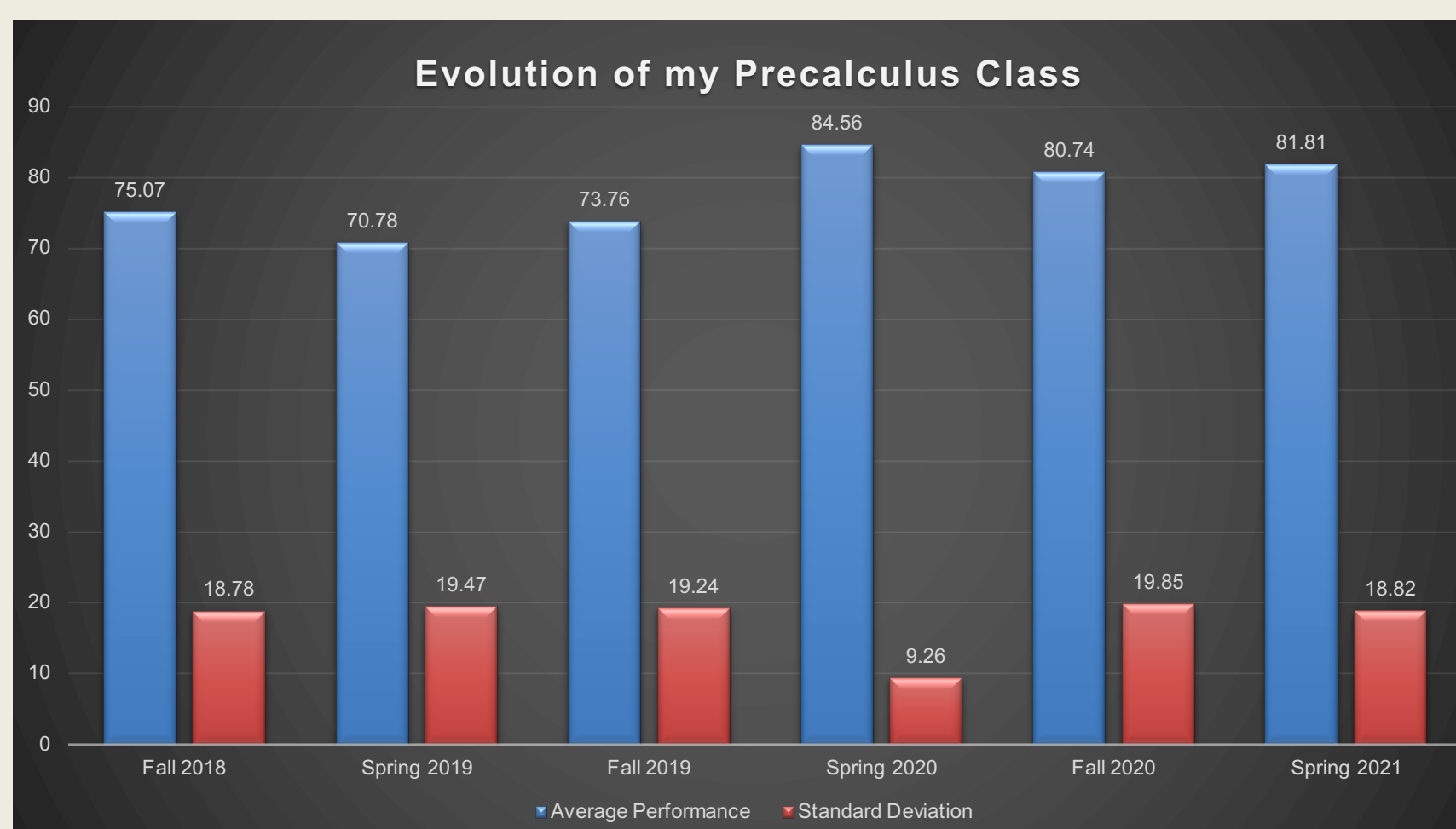


Chart 1. Performance of my Precalculus Class over time.

DISCUSSION

Teaching using OER, ZTC, and Technology: What are the Pros & Cons?

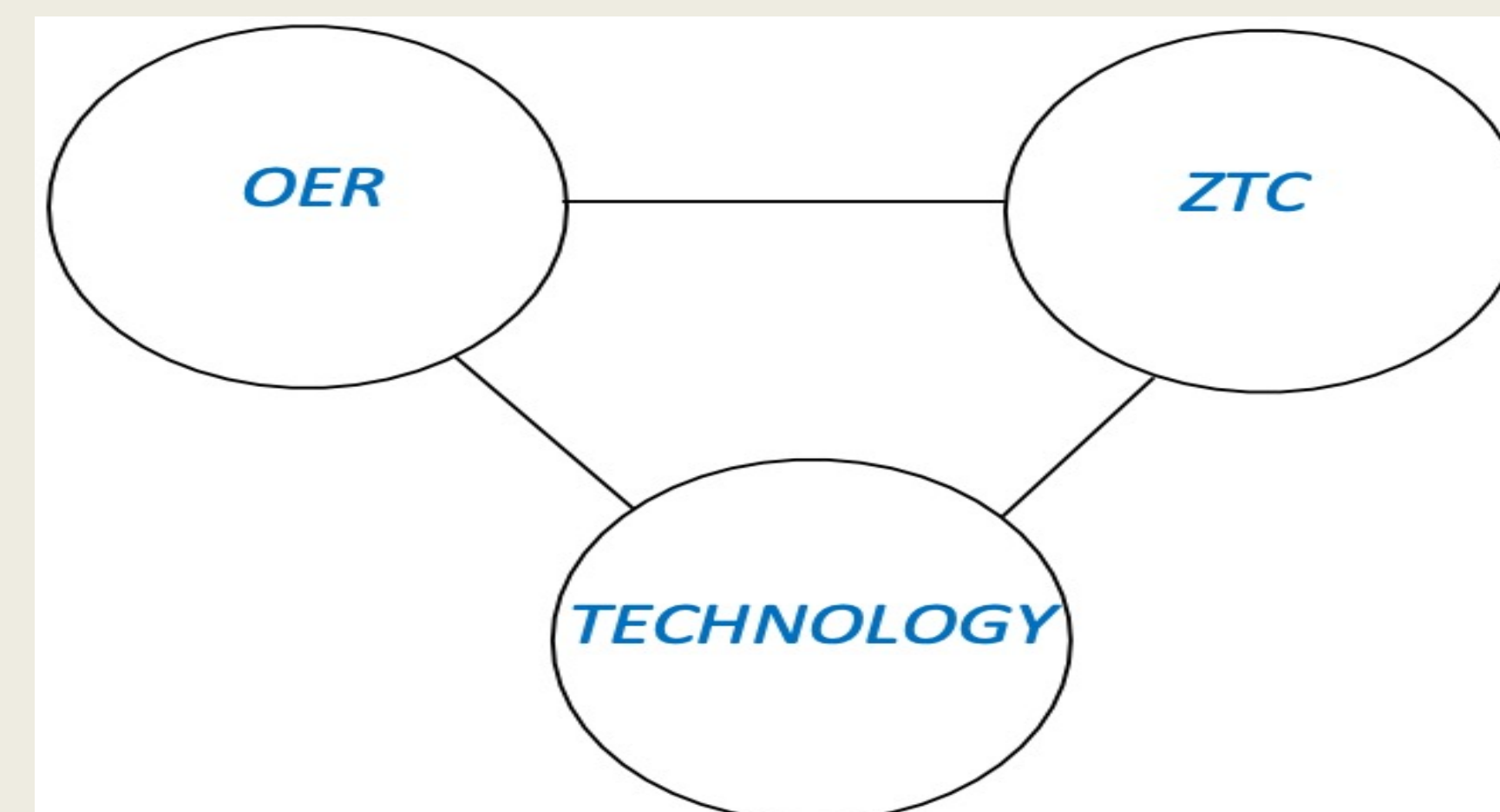
Pros

- All course materials are available for all students from day one.
- Substantial reduction on the cost of course materials for students.
- ZOOM and its tools: Screen Share and annotations can be used.

Cons

- Assessment is challenging when it comes to proctor Exams.
- Lack of human interaction between Lecturers and students.
- Fast Internet connection is needed, not all students can afford it.

Could you think of more Pros & Cons?



CONCLUSIONS

The Data Analysis I did on my Precalculus and Calculus classes, over six consecutive semesters, shows over time, a positive correlation between the use of OER, ZTC, together with appropriate technology and the overall academic performance of my students. Based on my own teaching experience, and knowing that the advantages outnumber the limitations, I suggest that Instructors combine OER, ZTC, and Technology according to their needs and their modality of teaching, to improve the academic performance of their students, and to stay aligned with what contemporary Mathematics Education should be: Accessible, Efficient, and Creative.

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