SUCCESIVE APPROXIMATIONS

TEACHER GUIDE

This Teacher Guide is about the BLOSSOMS lesson "Successive Approximations to Measure Distances." It is useful to those who want to teach this concept through an experiential method. In it, we guide you on how to successfully implement this lesson with your students.

The activity is important because it challenges students in a contained way. In other words, they will acquire a complex concept, that of Successive Approximations, and they are going to apply it to real life, which is one of the most important things for our students at Tecmilenio.

It is important because it models a solution that they can transfer to other problems, and because, indirectly, they will learn other concepts like calculating distance, applying scale when measuring large objects, the use of technologies like EXCEL, and teamwork.

The main goal is for students to learn the concept of successive approximations through measuring different objects of any size, in real life. There are also secondary goals, like using successive approximations with mathematical concepts such as distance and scale. Another goal is the use of successive approximations to measure objects. In this case, we worked with regular geometries but we hope it is useful for irregular geometries.

There are no additional requirements other than the ones we usually have. A video projector and sheets of paper are needed. Students need to use Excel and it is structured for students to work in teams. It is recommended for teams of three students.

The lesson is made up of seven activities that in reality, are part of one activity. All activities are exercises that contribute to meeting the learning goals.

Since our students learn through experience, and the teachers who made this video lesson live in Monterrey, Mexico, we chose the Puente Atirantado. But you can select any other place and follow the proposed methodology. It only has to be a surface or line with an unknown function, so that they students can estimate the measurement without knowing the function. For the approximations, we included up to 4 decimals in calculations. But in the evaluation of the results in each team, up to 2 decimals can be considered. One good criteria to determine when to stop computing the successive approximations, is when there is no more significant change in the results between the current iteration and the previous one, up to 4 decimals.

In this lesson, we worked with the curved side of the bridge, guiding students towards the concept of successive approximations, which we want them to understand well, in such a way that each one learns the importance of the experience. However, the final activity is the most important one. To consolidate learning, the last video can be assigned as a self-study if an online learning environment is set up.

If you want to use this lesson as an online class, there have to be 3 reporting periods during the course, so that the concept is well understood. Activities can be discussed by teams in a forum that is opened for this purpose.

Both face-to-face and online students should be asked for one written report per team, that includes all the activities that the group did.

Other lengths, surfaces, and volumes can also be worked with. This lesson is thought for high school students studying the calculation of the elements mentioned above, depending on their program. Or, for first year college students that are taking Calculus classes.

We think that the activities help to assimilate the ideas, and it is recommended that for the experiential part, students go to the location to be measured, as this will never be forgotten or will be easily remembered.

The time each activity takes may vary depending on the group. The initial video guides us in selecting the examples we want to work with, examples in which measurements can be done in different ways. That is to say, an open-ended problem that can be solved through applying the concept of Successive Approximations.

I hope this lesson is useful, to you and to your students. If you have any question about this lesson or about this guide, you can get in touch with us via email.

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The teacher can use the **Wolflram Alpha**, to calculate the function of the place to be measured, like a stratified function, and using the concept of Arch Length.

Students can also use the **Wolfram Alpha** to make their calculations or to check their results. And they can use Excel.

Vilenkin, N.Ya. Succesive Approximations Method. Publisher: Mier

To evaluate the activity, they will be asked for a report of the activity, in teams of 3 students. They will also be asked for a team report of something they want to measure using successive approximations.