# PERSONALIZED DISCOURSE FOR OPTIMAL DEVELOPMENT

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## Introduction

In 1922, Thomas Edison wrongly predicted a revolution in education, saying: "I believe the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks." It is 2017, and textbooks are still here. In fact, the entire educational system has barely changed for decades.

In this paper, I will present some of the data and findings of the research I conducted in a high school in Oakland, California. I will start by presenting an overview of the way in which this specific high school chose to implement technology in their students' educational curriculum. Then, I will develop the ideas presented here by focusing on an activity for which the school chose not to implement technology, namely, tutoring in Mathematics. I will thereby analyze the students' development in this activity, and pinpoint its limitations, to eventually infer ways in which the activity can be ameliorated for better development of students' learning.

## Research questions

1. How do students differ in their individual learning process with respect to Mathematics?
2. How can technology help students in their discourse?
3. How can we offer students a more personalized discourse that allows optimal development?

## Theoretical framework

With the purpose of creating a lens through which the said research questions can be approached, we will appeal to renowned authors to define terms and concepts that are crucial for the understanding of this research. The first concept is the "zone of proximal development" and its distinction with the "actual development zone," by Lev Vygostky; the second one is the "banking education" concept, by Paulo Freire.

First, the "zone of proximal development" and the "actual development zone" are two different stages of learning for a student. As stated by Vygotsky, "what is in the zone of proximal development today will be in the actual development level tomorrow - that is, what a child can do with assistance today she will be able to do by herself tomorrow."

For this research, I use the distinction between the two zones to evaluate the students' progress in their learning process. Moreover, the tools and activities that I consider using to improve a student's learning are also evaluated using the distinction, to determine whether a tool will be sufficient to help the student transition into the "zone of actual development."

For instance, the activity of students watching their professor resolve a mathematical problem on the board can be enough for them to understand how that solution was found, but

might not be enough for them to be able to implement that solution themselves. Thus, this activity might not be enough for a complete transition from the "zone of proximal development" to the "actual development zone." To that end, the assessed activity needs to be accompanied with more activities to further that transition.

As for the concept of a "banking education," it describes the practice in which students receive information, memorize it, and repeat it. This concept will also be carefully watched for during the research, since acquiring mathematical knowledge this way poses a problem for students who will in the future be needing to apply this knowledge in ways that are different from the way it was learned originally.

In fact, it is the case for most of mathematical knowledge, which require students to have a robust understanding of the fundamentals to the content being taught. Merely memorizing the content in the way that Paulo Freire calls in *the Pedagogy of the Oppressed* a "banking" pedagogy of learning, is insufficient for a long-term knowledge retention. An example of a pedagogy that is more adequate is the "problem-posing" one, which uses learning as a social participation.

**Study background**

The data of this research was collected within 9 visits to a high school in Oakland, California, where I volunteered to tutor students, helping them in their Mathematics homework, as well as other activities such as classes that teach Robotics & Programming, and classes that use Data-Driven Personalized Learning. The study was conducted from 02/07/17 until 04/27/17, my visits were from 3pm to 6pm, and I tutored for a total of 27 hours.

The high school in question was a public school located in a relatively poor neighborhood. It was a small high school, and I had noticed how there were students from a range of ages in the same class, one of them was much taller than the others, about the double of the size of all the rest of students, and more mature as well. While each day had slightly different number of students, in average, in a classroom of 20 students, 16 were 8 year-old students, and 4 were 14 years old. Overall, students were from very mixed origins and ethnicities. More specifically, students that I mention in this paper are:

| Referred as | Grade | Age |
|---|---|---|
| Student A, B, C, D, and E | 3rd grade | 8 years old |

**Methods**

The method with which I recorded data was note-writing and event-timing. I started by waiting until I left the high school to start writing my notes on my observations, as I thought it would be inappropriate to write in front of students. However, at the end of the first day, I realized that I was not clearly remembering some specifics in the activities that occurred. I therefore decided to write as the events occurred, by writing quick notes, and developing the notes during breaks.

When I was teaching a new technique for solving a mathematical problem, I timed the learning duration of different students without them knowing that I was timing them. In fact, I assumed that their knowledge of being timed could alter the results of my inquiry, which was an

analysis of the duration of their learning process in a usual and relaxed state, not a stressed one with the excitement of finishing first.

The coding system that I used is the following:

Banking education: students receive, memorize, and repeat.
Creativity: creative thinking
Social Learning: learning through social interactions
Language and Identity: specific language use that represents the identity of the student
Multimodality: teaching thanks to technology using aural, linguistic, spatial, and visual resources

The code 'Banking education' allowed me to highlight the moments were students were not fully learning, which prompted me to question the cause. To understand the reason, I questioned the environment of the student in which he or she was learning, and examined the tools used. The codes for the stated inquiries were the Multimodality, Language and Identity, Social Learning, and Creativity.

**Analysis and results**

Technology was used in various activities in this high school. For instance, there was an activity called Smarty Ants, during which the only job of the instructor was to make sure that the girls were in the right app, which is an almost nonexistent role of the instructor in the girls' development. However, in the other activity called Robotics, the teacher was much more involved with the development of students. This activity seemed to be using technology in a favorable way, by blending it with social learning without going so far as to replace human interaction. In fact, the teacher was using technology as a tool that brought significant value to the overall learning potential of students. For instance, the teacher explained the activity to students by showing them a video. This technique broadens significantly the reach of the teacher in terms of variety and complexity of content that they can teach, without requiring extensive training in the subject.

Perhaps one can debate on whether technology can be used in a better way in these previously listed activities, by making sure that it is used as a tool and not a replacement of the human interaction between teachers and students. Nonetheless, there were activities that hadn't changed with technology. One of the them is Mathematics tutoring, where students were still doing the same type of exercises that were given to previous generations, with the same exact tools. Pencil, eraser, and textbooks to fill.

**Different settings**

I tutored students in three different settings. The first setting was an empty classroom in which the teacher assigned me. She then brought one by one the students who needed help. There wasn't more than one student per classroom. The second setting is an empty classroom that had three students in the same classroom being tutored with three volunteers. The third setting was inside the classroom filled with other students doing other activities. In contrast to the previous setting which was a quiet and empty classroom, this classroom was full to its most, and had a lot of noise from students talking and laughing.

In the first setting, most students were not comfortable. They behaved as if they were grounded, they were not motivated and were barely making the effort to do the homework. With the exception of student A who was extremely efficient and fast in this setting. It therefore appeared that this setting helped him better focus and learn.

In the second setting, the teacher separated two girls to do their homework with different volunteers. When the teacher left, the girl asked me if she could sit and study next to her friend. When she did, the two girls were doing their homework together. Even though the girls were not studying all the time, when they were, they were more productive and joyful. This illustrates the efficiency of collaborative work, as mentioned in Vygotsky's writings.

In the third setting, students were too comfortable, laughing and helping each other. Consequently, it was much more difficult to prevent student B from copying on his friends' answers. Student B was in such a playful mood that me trying to get him to learn was for him a hide and seek game. One time, before trying to solve a homework problem, he asked me more than 10 times repeatedly "what's the answer, what's the answer, what's the answer, …." After giving him the answer, I tried to get him interested in the reason why the answer was right, but he just jumped to the next homework problem. On the other hand, student D was actually performing better in his homework in this setting, as opposed to his performance in the second setting. This student was very calm compared to the other boys. He was doing his homework in a more artistic manner, and used to show the drawings to his friends.

**Different mediums**

In accordance with the preferences that students had for different settings, their learning was also more efficient using different mediums. For instance, student C had a lot of difficulties in a question asking to calculate available seats around a pool that had a dolphin. Noticing that his difficulty came from his inability to visualize the pool and seats around, I replaced the pool with the field of his favorite NBA team, he then knew how to draw the seats and answer his homework's question. Another student was getting too distracted with his drawings of Dragon Ball Z, so I used the drawings to illustrate what the question was asking him, which got his attention back to his homework. A final example is the playful puzzle-like game; by having a fraction of the answers in a way that was similar to a puzzle of information he needed to sort through, the student was able to learn without getting stuck for too long.

This finalizes the illustration of how efficient it is to use different mediums that are more adequate to each student independently. However, while making educational games seems to make most students learn in a more enthusiastic manner, there is still the contrast with student A who actually seemed to separate seriously doing homework and playing.

**Different speeds**

When I was helping two students with their Mathematics homework, I noticed two differences. With student B, after I explained to him a solution and the technique to derive it, he understood and reproduced it. 4 minutes later, he had forgotten it and I had to repeat it again. On the other hand, student C remembered the technique I explained him and used it again 15 minutes after I first introduced it to him. I thereby witnessed how the two students needed to spend a different amount of time in their zone of proximal development before being able to transition to their zone of actual development level. Which means that, compared to student C,

student B needed me to spend more time assisting him with the new technique, before being able to use it without my help.

This finding proposes that students could have a better development if they were taught new content at different and independent speeds, which are better suited to each individual student.

**Different scope of content**

When I was tutoring student E, I realized that I needed at least 4 hours to teach him basics in Mathematics that he did not know or had forgotten, which would then allow him to understand the homework. He was very far behind, and this is most likely due to the concepts of the 'banking education' or 'zone of proximal development', since he had passed previous tests on these previous fundamentals but is now not able to understand and use them. Similarly, another student had a lot of difficulty reading and understanding the wording of the question which blocked him from doing the Mathematics problems, not because he did not know how to do the computations, but because he was not understanding the question itself. However, since it was a Mathematics problem that he wasn't able to finish, he was most likely going to be incorrectly assigned to more Mathematics problems instead of going back to the fundamental vocabulary that was taught in previous years.

To resolve this issue, students need to be assessed and helped in content that is not limited to their current academical year, instead of rushing to the next exercises and making even more fundamental gaps.

**Findings, limitations, future research**

To summarize, I found that different students have different speeds of learning, different comfort in settings, and different needs in mediums. Some students also appear to have specific gaps in their fundamental knowledge, which need to be identified and carefully addressed before tackling new contents reached by the class. Not meeting these specific needs led many times to limiting students' learning to the 'banking education', the 'zone of proximal development', or no learning at all. These observations lead us to conclude our need to use personalized learning for tracking students' development, recognizing specific gaps in knowledge, and optimizing students' discourse.

However, in order to strengthen these observations, we need to compensate for the limitation that this research had. For instance, the data scope needs to be broaden by researching more high schools that are in different geographical locations and that have more students. Moreover, we need to use a universal assessment tool, perhaps starting with the Teaching for Robust Understanding framework.

Personalized learning seems to be a promising development to resolve current barriers in education, to seek optimal development for future generations. In fact, experimentations and research are needed to test different existing personalized learning tools, evaluate their effectiveness, and conclude their implementation or improvement.

A first test can be made by implementing digitalized profiles of students, and storing in the cloud their detailed development track, which can be accessed by teachers in class and parents at home. There are also some promising development made in softwares that use Artificial Intelligence to generate specific questions that assess meticulously a student's need for development. Which prompts the following question, are we in the revolution of education yet?

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