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Critical Action Research with Urban[1] Youth: Studying Social Reality Through Mathematics

ABSTRACT: This paper describes a long-term action research project (over 15 years) on critical mathematics—a study of urban, public school students (ages 11 to 19) in the U.S. who used and learned mathematics to simultaneously learn about their social reality. Two major questions were: How does one teach critical mathematics? and What do students learn? The theoretical framework builds on Paulo Freire's concepts, epistemology, and theory of political change. The settings were two schools in low-income, working class Latino and African American communities. Students were active co-research participants and contributed to every aspect of the project.

KEYWORDS: action research, critical pedagogy, education, mathematics.

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This paper focuses on studying social reality through mathematics and is based on the work that I've been doing for over fifteen years, which is teaching mathematics. I teach mathematics to children from grades 7 to 12, which in our context means children from 11 to 19 years old.[2] The particular project I discuss here started in 1997. Although I was a university faculty member, I simultaneously taught my own mathematics class for five years in two different public schools in Chicago. In terms of the research questions that I asked as an action researcher or a participant observer, I focused on two major ones: How do we do this "critical mathematics teaching?" and also: What and how do students learn in these types of settings? These key questions were, of course, accompanied by minor, subsidiary questions. The theoretical framework on which my research was based includes Paulo Freire's concepts, in particular the Theory of Knowledge that he developed into how people learned, and his theory of political change. I worked in two schools in which the students were from low-income, working class Latino and African American communities. These young people were active co-research participants who contributed throughout to every aspect of the project.

Drawing on Paulo Freire's approach,[3] the overarching purpose of this work with young people was to use mathematical analysis, as one of many available ways, to help them understand their social reality so that they can change the world as they see fit.[4] In Paulo Freire's concept of knowledge, three various types of knowledge can be distinguished. The first one is Community Knowledge, which is the knowledge of one's life and experiences, the knowledge of one's culture, language and the community where one lives. The second type is Critical Knowledge, which is the knowledge of relations of power, including the recognition of oppression and injustice as well as exploring who benefits from what happens in society. The third type is Classical Knowledge, that is, school or academic knowledge, which is necessary for access and opportunities for people to continue education at the college level and have careers which provide them with economic means for themselves, their families and their communities. Crucially, these three mentioned types of knowledge are not isolated entities, and the boundaries between them should not be thought of as hard lines but rather as permeable membranes. As they interpenetrate and overlap each other, they cannot be entirely separated. Community knowledge, for example, may be, but need not be, classical and critical, etc. Briefly, these three types of knowledge are distinct and interdependent at the same time.

A major challenge that mathematics education in the US confronts, and in fact keeps failing to live up to, is connecting these three types of knowledge. For example, Classical Knowledge tends to be construed as what takes place in school, but lacks any correlation with community knowledge, i.e., the knowledge that students bring with them into the classroom. At the same time, Classical Knowledge conceived of in this way does not help students deeply understand the issues of injustice in society. It is restricted simply to school knowledge. In this prevailing landscape, there have been projects in mathematics education (in the US as well as elsewhere) that strove to start from Community Knowledge – students' language and culture – and use it as a foundation upon which to develop Classical Knowledge. In other projects (and I participated in them myself in my earlier years), attempts were made through mathematical analysis, to have students develop Classical Knowledge and Critical Knowledge about society at the same time without fully incorporating their culture and language, their community knowledge.

To recapitulate, in teaching mathematics, as well as other subjects in the US and other countries, connecting the three types of knowledge into one whole keeps proving extremely difficult. But it is exactly at the intersection of the three types of knowledge, in the area where the three overlap, that Paulo Freire's concepts are located. Even more, the crucial point does not lie in that Freire is situated in the middle, but in that he is situated in the middle in a very particular way. Meaning that his work *starts* with the community or popular knowledge of the learners (which is the source and basis for a liberatory curriculum and education, and responsible for creating and developing Critical Knowledge and Classical Knowledge at the same time), while constantly building on the Community Knowledge that students bring with them into the classroom.

This was the purpose of the mathematics class I taught in Chicago high school. The school was named "Sojo," which is an abbreviation of School for Social Justice, and my classroom consisted of students who came from two low-income, working class communities: North Lawndale, which is a mainly African American community and South Lawndale (called also Little Village), which is a predominantly Mexican community. In this context I tried to re-invent Paulo and involve students in the project as critical action researchers. The aspect of "re-inventing" needs special emphasis here since Freire himself admonished, "To follow me is not to follow me." He challenged people to re-invent in their own context the lessons that he learnt in his context, insisting emphatically that these lessons cannot be mechanically imported into other settings. The starting point for my project was students' community knowledge, and we––the students and myself––commenced our work before the school year even began by democratically negotiating and jointly agreeing on the study units we would discuss. I want to underscore that sitting down with young people and asking them: "What should we study that matters to you in your life and that we will learn about using mathematics?" is a relevant part of the research process, because it invites them to begin or to continue the process of reflecting on who they are and on their particular context. Consequently, they can deepen their understanding of what they already

know; they have an opportunity to know what they already know in more profound ways and on a theoretical level, using mathematics. This is simultaneously part of the research process and part of the theory of the knowledge acquisition process. Of course, it has its practical implications, because the teacher then faces the challenge of developing the curriculum comprising the selected units and coordinating them with mathematical issues. It proved highly demanding—not only did I spend the whole summer designing the curriculum around the ideas that the students proposed, but also I had to study some mathematics that I did not know that thoroughly.[5]

Ultimately, the students and I chose five units, one of which was Displacement.[6] Below I will present this particular unit in some detail. The purpose of the unit was to understand the common roots of displacement as the two different communities that the students came from experienced displacement in similar, but also different ways. Throughout, the students were genuine collaborators who contributed to decision-making and decided not only what we were going to study, but also at what time/pace we should study it and how to reschedule if needed. In this way, the research process was at the same time the process of sharing power, which also complies with Paulo Freire's postulates.

At the beginning of our work on displacement, we drew up a list of research questions. They included the following questions from students themselves: "Will we be able to stay here?" "From where and how does gentrification arise?" "What is the original purpose or plan?" "Why our neighborhoods?" "Where are families supposed to go?" The underlying idea in this framework was that our research questions would be the real questions that students raised and which they wanted to answer—through learning mathematics. This removes us from the situation where students ask the question that typically haunts a regular math class in the US: "Where am I even going to need this?" In our context, with students pursuing answers to their own questions, that kind of query was not raised. The students may admittedly have other reasons for not wanting to do math on a particular day, but they never ask why they need to learn this or that.

In addition to the class, I formed a group that we called "The Crew". "The Crew", whose membership kept changing all the time and ranged from four to seven members, met outside of regular class time and worked in a variety of ways as co-researchers. For example, some went on several trips to local, regional and national educational conferences (one student participated in about 15 over a few years). We traveled all over the US, demonstrating our work to others and sharing our insights and experiences. At the conferences the students from The Crew made presentations, appearing actually in four major functions. Firstly, they talked about themselves as researchers of their own learning. Commonly, conference participants asked them why they did that and how they began the process. Secondly, The Crew's members presented themselves as researchers of the learning process in the class as a whole. Thirdly, they were advocates of critical mathematics and students always stressed that it was imperative to talk to others about the work they were doing. And fourthly, they acted as teachers, who took adults through the things that they themselves had learnt

in our class. They volunteered to do all this extra work without any pay or extra credit. They devoted their free times, meeting after school, on Saturdays, and times when there was no school, spending hours on end to perform a tremendous amount of work that our trips and presentations required. They did all this because they believed in it.

In studying displacement we aimed to answer the question "Whose community is this?" In their community of North and South Lawndale, the number of house foreclosures grew steadily from 2005 to 2008, with the number of foreclosures in each community tripling within those three years. From 2001 to 2006 the median house price in North Lawndale went up close to 2.5 times. Even a cursory glance at the numbers show that there are plenty of social tensions to be studied here and a lot of mathematics can be applied to make sense of what is going on in the communities. One issue to study in this context was the mathematics of subprime mortgages, which could help explain why people could not afford their homes and why they were losing them. For this purpose, challenging though it was, we used *Discrete Dynamical Systems*, which are discrete versions of differential equations. Applying this relatively complicated pre-calculus topic, we could model mortgages; we could also delve into who gets subprime mortgages, noticing thereby a clear racial disproportionality. Additionally, we also explored how the transnational investors profited from the gentrification that was taking place in their communities.

Analysing the gentrification processes requires delineating the more particular community background. Notably, North Lawndale was being gentrified, but South Lawndale was not. This difference was predicated upon, for example, the housing stock or the proximity of transportation, which accounted partly for the variation. This, however, does not mean that South Lawndale did not face displacement. It did. Little Village (i.e. South Lawndale) suffered from deportations. Being a primarily immigrant Mexican community, the population of Little Village includes thousands who are there without any documentation and, thus, unauthorized in the US. So while for North Lawndale gentrification-related displacement meant being compelled to move out of the community, in South Lawndale (Little Village) deportation-related displacement meant being forced to move out of the country. And in both communities the number of foreclosures had increased dramatically. Clearly then, the displacement patterns are similar and different at the same time, which can be captured by means of mathematical analysis.

Displacement from the community vs. Displacement from the country

The latter is a multilayered phenomenon as it involves, first, displacement from Mexico to the United States, which is bound up with the effect of free trade agreements such as NAFTA. NAFTA contributed to the displacement of Mexicans from their countryside since it is cheaper for Mexico to import US corn—because of the free trade agreements and the US agricultural subsidies—than it is to grow corn in Mexico. This forces Mexican farmers off their land and makes them travel up north and settle in communities like Little Village, which is a displacement from Mexico to the

US. And then in the second turn of the process, these same displaced-from-Mexico migrants face deportation, which means the displacement from the US to Mexico. All these phenomena and processes of social reality can be investigated—and were investigated by us—using mathematics.

At the end of the school year, the students summed up the project, making public presentations to share what they had learnt with their neighbors, friends, families, and community members.[7] For this purpose, they prepared a number of slides illustrating their findings and insights into social reality obtained by means of mathematical analysis. First of all, they proposed their own definition and understanding of gentrification processes: gentrification is the displacement of low-income people or families out of their own community, which leaves the remaining residents struggling financially to keep up with the increasing house values; and when people are eventually forced to move out to a more affordable community, people with higher incomes appear and settle in the old community. Presenting this process, the students repeatedly asked the questions "Why should we care?" and immediately answered it, pointing out that "It's already here…" They, however, did not leave it at that purely declarative level, but proceeded to provide concrete examples, showing pictures based on actual real estate advertisements marketing houses built or situated in their own or neighboring communities. Reiterating the question "Why should we care?" they emphatically showed that this was the problem that concerned our class living in these two communities of North and South Lawndale. Using mathematical calculations, they demonstrated how their communities, being low-income ones, were targeted by gentrification.

Showing actual advertisements with specific figures, students asked, "Can you afford this?" And citing real figures of median household incomes, down payments, interest rates, etc., they categorically exposed the communities' inability to face such market and financial pressures. In one of the examples they used, the house value was $285 000, and the median household income was $20 253. With a 10% down payment, the remaining 90% of the $285 000 equaled $256 500, and with a 30-year mortgage with 5.25% interest rate (the interest rate at the time), the monthly payment amounted to $1 416, which amounted to $17 000 annually. "Hardship" as defined by the US government means spending more than 30% of your income on housing. To pay $17 000 a year for housing, one needed to make about $57 000 a year. And this was roughly 3 times the median family income in the community. The calculations incontestably showed that a regular, normal family in the community was not able to afford a house there. Having ascertained that, the students asked the question "How can they get away with it?" And the answer they offered was that they got away with it because those people, when talking about the plans, mentioned only the benefits that were convenient to the community, but passed over the disadvantages and effects that the processes actually have on the people in the community, such as foreclosures, rising prices, and displacement. They concluded their presentations asking, "What can we do?" and providing two answers. Firstly, people could gain knowledge. And secondly, people can organize.

It must be remembered still, that this kind of work is difficult and complicated and rarely develops in a steady, linear progress involving advances and retreats, successes and failures. There are no ready-made recipes to be applied or blueprints to be reproduced, and there are no textbooks offering rules and procedures to follow except those that we collectively produce ourselves. We truly make the road while walking. This is an on-going process of collective knowledge production involving teachers, students, and researchers, during which we theorise our practice and through that, understand our practice better and perform better, and still continue to theorise in a continuing cycle of action and reflection.

As one of my students wrote about our class at the end of the year, after the community presentations:

> We use life examples and took those numbers to find out if someone played with the numbers or not, or why are the numbers like this for a certain reason and what was the cause of it. We use math as our weapon to drill down the many problems in our life. And what we learn from reading the world with mathematics was to put it all in our presentation and present to both communities.

REFERENCES

Anderson, J. (1988). *The education of Blacks in the south, 1860-1935.* Chapel Hill, NC: University of North Carolina Press.

Anderson, G. L., Herr, K., & Nihlen, A. S. (1994). *Studying your own school: An educator's guide to qualitative practitioner research*. Thousand Oaks, CA: Corwin Press.

Carr, W., & Kemmis, S. (1986). *Becoming critical: Education, knowledge, and action research*. London: Falmer Press.

Frankenstein, M. (1987). Critical mathematics education: An application of Paulo Freire's epistemology. In I. Shor (Ed.), *Freire for the classroom: A sourcebook for liberatory teaching* (pp. 180-–210). Portsmouth, NH: Boyton/Cook.

Freire, P. (1970/1998). *Pedagogy of the oppressed* (M. B. Ramos, Trans.). New York, NY: Continuum.

Freire, P. (1994). *Pedagogy of hope: Reliving Pedagogy of the Oppressed* (R. R. Barr, Trans.). New York, NY: Continuum.

Freire, P. & Macedo, D. (1987). *Literacy: Reading the word and the world*. Westport, CN: Bergin & Garvey.

Gutstein, E. (2003). Teaching and learning mathematics for social justice in an urban, Latino school. *Journal for Research in Mathematics Education, 34*, 37-73.

Gutstein, E. (2012). Mathematics as a weapon in the struggle. In B. Greer & O. Skovsmose (Eds.), *Opening the cage: Critique and politics of mathematics education* (pp. 23–48). New York, NY: Sense Publishers.

Gutstein, E. (2013). Whose community is this? Mathematics of neighborhood displacement. *Rethinking Schools, 27*(3), 11–17.

Oxfam. (2003, August). *Dumping without borders: How US agriculture policies are destroying the livelihoods of Mexican corn farmers*. Oxfam Briefing Paper. Oxford: Author.

Skovsmose, O. (1994). *Towards a philosophy of critical mathematical education*. Boston, MA: Kluwer Academic Publishers.

Skovsmose, O. (2004). *Critical mathematics education for the future*. Aalborg: Aalborg University, Department of Education and Learning.

KRYTYCZNE BADANIA W DZIAŁANIU Z MŁODZIEŻĄ MIEJSKĄ: BADANIE RZECZYWISTOŚCI SPOŁECZNEJ PRZEZ MATEMATYKĘ

ABSTRAKT: Niniejszy artykuł przedstawia długofalowy (trwający piętnaście lat) projekt dotyczący matematyki krytycznej przeprowadzony metodą badań w działaniu. Dotyczy on uczniów (w wieku od 11 do 19 lat) szkół publicznych w dużym amerykańskim mieście, którzy uczyli się matematyki używając jej jednocześnie w celu zrozumienia otaczającej ich rzeczywistości społecznej. Główne pytania badawcze brzmiały: W jaki sposób można uczyć krytycznej matematyki? oraz Czego uczą się uczniowie? Podbudową teoretyczną projektu były koncepcje Paulo Freire'go, epistemologia oraz teoria zmiany politycznej. Projekt został przeprowadzony w dwóch szkołach w dzielnicach zamieszkanych przez latynoamerykańskie i afro-amerykańskie społeczności robotnicze o niskich dochodach. Uczniowie byli aktywnymi współbadaczami uczestniczącymi w każdym aspekcie projektu i wnoszącymi weń swój wkład na każdym jego etapie.

SŁOWA KLUCZOWE: badania w działaniu, edukacja, matematyka, pedagogika krytyczna.

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1. Before proceeding with my argument, I need to specify the word "urban" as used in the US context, because it often becomes a codeword for low-income, working class African-American and Latino people. In this story, I am actually referring to these communities. And when "Latino" is used in the US context, it is used to refer to people from a Latin American background, usually Mexicans, Puerto Ricans, people from the Dominican Republic, Salvador, Guatemala and similar countries. In Chicago, where I live, when one says Latino, one usually (but not always) refers to Mexicans or to Puerto Ricans.
2. To my knowledge, in the US, projects of this kind are for the most part done outside of mathematics. In many ways it's easier to do such work in the humanities, for example in history or in literature. In

the school where I worked, students could read Latino literature and/or African American literature and study the history of their community. In a history class it seems easier to bring up a point which could be often thought of as subjective, because the humanities seem to accommodate far more subjectivity, while mathematics is customarily construed as not fit for the critical understanding of social reality. Consequently, there is, relatively speaking, a much larger group of people in the US doing this kind of pedagogy in the humanities and relatively few doing it in mathematics and sciences.

3. I was not one of the people who read *Pedagogy of the Oppressed* by Paulo Freire back in the 70's. I come from a different political tradition. But when I was teaching at a school in a Mexican American community, I realized that I needed to understand what I was doing on a deeper level and to theorize my own practice in a way that went beyond my capacity at that moment of time. It was then that I turned to Paulo Freire. However, he was not the only source I drew on. One shortcoming of Freire, in the context that I worked, was that he did not comprehensively address issues of race and racism. This is, by the way, one of the targets of criticisms leveled at Freire, even by some of his American readers who deeply embrace, admire, and support his ideas. He is censured for failing to deal more substantively with race even though he was based in Brazil, which is the country with the largest number of people of African descent, besides Nigeria. To augment my theoretical framework, I turned to the literature, history, liberatory pedagogy, and liberatory philosophy of African Americans. And one of the key ideas that I borrowed, even though I am white and I understand that there are contextual disparities, is what many Black teachers in the South in the United States realized when they looked out at Black children in front of them. The children represented to the teachers their own survival and their own future. In other words, especially before integration of the US society, many Black teachers in the South believed that their struggle as teachers and as human beings was the same struggle that their students fought. In a similar sense, I see the young people I work with as being the ones who will eventually save my country and my world. I took this idea from my study of history and therefore view my students who are the key to our collective survival.
4. The research I am engaged in explicitly aims at changing society or rather at helping to create conditions for people to participate in changing the society—and through that process, to change themselves.
5. Another challenge that I had to face, like all those who do this kind of work, was teaching critical mathematics and meeting the criteria of assessment stipulated in the formal education framework. Students sometimes have to pass tests to go on to the next grade, and they definitely need to score in high-stakes standardized tests to go to college and potentially receive scholarships. Whether or not I endorse this kind of evaluation, I nevertheless need to make sure that the students pass the tests, because this has very real consequences in their lives. It has also consequences for my cause. Namely, if I teach this type of critical math and the students fail the standardized test, I not only do them a serious disservice, but I also undercut the whole project of doing critical math. Consequently, it is a compromise-fraught work, in which the teacher has to figure out how to prepare the students for tests and develop their critical mathematical knowledge. Bringing these two together and maintaining a balance between them is a tasking enterprise. The right focus can be quite easily forfeited either way: you can push the math too far, which means perhaps losing your students, their interest, and motivation as you move further and further away from their context, or you can fail to pay enough attention to math and, doing just the social reality study and political action, reduce your students' chances of scoring well on the tests. Difficult though the task is, my experience implies that there are various ways to manage it successfully. One of them involves being clear about the difficulty and making it an explicit question for the class, a topic in itself to talk about and study: How do we continue to do the math that we want to do, about understanding your reality and make sure that you pass the test? This needs to be jointly discussed because the teacher does not necessarily have the answer by her or himself. So this problem in itself becomes a study question that actually has to be answered collectively. Secondly, explicit test preparation needs to be done with the students. Thirdly, research in mathematics education strongly suggests that if one understands mathematics at a deep conceptual level, one can in fact

do the tests even though they tend not to ask questions on the deep conceptual level (they are usually multiple-choice, quick-answer questions). People are, thus, tempted to say: "Teach good math and the tests will take care of themselves". Even though if taken too literally this is probably too easy an answer, I believe, nonetheless, in the spirit of it. Fourthly, the students must understand why they are being tested in this way, so the teacher needs to put the nature of testing in the political frame and show the history of its uses and abuses, its role in the racist movement, in the eugenics movement, and in labor stratification. The students participating in my project, on the whole, did OK on tests. They learned mathematics and they learned about their social reality. This is not only my personal opinion, but also theirs.

6. Mathematics is, obviously, ubiquitous, both permeating the natural world with its rhythms and being an essential human cultural production, similar to language. In my project, however, it was approached as a method of critical understanding of and intervention into social reality. One of the reasons for such focus is that many people have been deprived of any pleasure of seeing and exploring the mathematical matrix of the world by their mathematical experiences at school. It does not concern very young children, who love mathematics until school interferes and changes it drastically. Consequently, among the teenagers that I taught, there were many students so disaffected with mathematics that they could be attracted to it only by very powerful stimuli, such as the direct pertinence of mathematics to the issues in their immediate environment that they acutely felt themselves. One of my students hated mathematics so deeply that even at the end of the course she said that she hated it still, but at least understood what she could learn through mathematics. One other reason for such a choice was, and I must express myself very carefully here as someone who is not from the community, that the conditions of life that my students experienced were sharp and when they defined them, they spoke about clear and present injustice. For example, the students proposed to study the criminalization of youth of color and, generally, people of color, the reason for that being their regrettable familiarity with the phenomenon. One student had a brother serving a prison sentence for something that he had not done, and everybody in the class knew people who were in prison or just out of prison. This was their experience. The things we actually discussed, such as foreclosures and gentrification were, likewise, acutely ever-present in their lives, and it made sense to me to support the struggles of this community using mathematics.

7. The presentations had a very important function beyond the mere culmination and recapitulation of the project. Namely, sometimes some of the students in this class could and did experience powerlessness and depression at seeing how despite the knowledge they had gained, certain processes distressing their communities could not be averted. Knowledge on many occasions failed to produce a rapid change, which came across as disappointing and potentially disabling. Yet, as the students themselves concluded in the reflective pieces they wrote throughout the project, the presentations furnished them with opportunities of counteracting this sensation of discouragement and vulnerability. They not only gained knowledge of their own community through mathematics, but were also able to teach others, to tell their families about what they had learned, and to share their more profound understanding of the problems afflicting their communities (e.g., foreclosures).