Maps, mobile tools, and media boards: Technologies for learning about the mathematics of pawn shops

Piloting a Mathematics Curriculum on Alternative Financial Institutions

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INTRODUCTION

City Digits is a design-based research project which leverages the power of technology to bring real-world information and a critical context into mathematics education. Through the curriculum students learn to use mathematics as a way to understand local phenomena from a critical perspective. Using a combination of mapping, data, and media technologies students are enabled to explore mathematics using social and demographic information. The current iteration of the project “Cash City” is a ten day module which focuses on the location and distribution of banks and alternative financial institutions (AFIs) including pawnshops, check-cashing stores, and wire transfer services.

THEORETICAL FRAMEWORKS

I. PLACE, CULTURE, AND MATHEMATICS

(Steele-King & Sikkink, 1995; Huang & Wejastrom, 2009; Gruman & Pries, 1999)

II. CRITICAL PEDAGOGY OF PLACE

(Ladson-Billings, 1995; Rubel & Chu, 2012)

III. STUDENTS’ EXPERIENCES

(Tate, 2005)

EXPLORING THE NEIGHBORHOOD

Once students are familiar with trends in financial services distribution at multiple scales, they gather data in the neighborhood around their school. Students use mobile devices in conjunction with the web-hosted Cash City tool to collect photographs of the neighborhood and conduct interviews with both inhabitants and store owners. All media gathered using these mobile devices is then geo-located and uploaded to the site.

IV. SPEAKING BACK: STUDENT OPINIONS

Finally students author opinions on the relative distribution of financial services using data collected through map explorations as well as media gathered and uploaded to the site. Students’ opinions are then published to the public for the audience to encourage further discourse around the issues raised through their engagement with the curriculum.

RESEARCH QUESTION

What role can digital technologies play in a curriculum focused on integrating place, culture, and mathematics?

RESEARCH CONTEXT

The ‘Cash City’ module was piloted in two New York City public high schools. In each case the classroom teacher led the sessions, with some support from the design team. Sessions were conducted during the school day as part of a regular class schedule.

I. THE COST OF PAWNING

The first four days of the curriculum are devoted to getting students to use mathematics to calculate the cost of obtaining and storing an item at a pawnshop. Students are first provided with a mental math (ratio tables) strategy. AFI is introduced as a metric for comparing interest rates between AFIs and the different banking options available to them if they need a loan.

II. EXPLORING MAPS

The next days in the module are spent thinking about the distribution of AFIs and banks throughout the city at multiple scales. This begins with a distribution activity centered on a walkable map of New York City and then moves into use of digital maps layered with demographic and location information about neighborhoods, boroughs, and the city as a whole. The digital maps are hosted on the Cash City tool site and include tabes that direct readers to location maps, demographic maps, or ratio maps that explore trends of financial services relative to other variables.

III. EXPLORING THE NEIGHBORHOOD

Students identify via Hispanic (51%), Black (32%), White (7%), and Asian (5%)

(100%) of students qualify for Free Lunch

(72%) of students qualify for Free Lunch

• Neighborhood school in outer borough with a social justice theme

• Students identify as Hispanic (75%), Black (14%), and White (1%)

CHALLENGES

This project has developed innovative curriculum supported by cyberlearning tools for use in urban high schools. Challenges related to technology include accuracy of database of geo-located information, utilizing web-hosted software rather than a native app on mobile devices, navigating operating system changes on mobile devices, and manually geo-locating student media when location services fail in the field. Other challenges relate to making the integration of technologies and curricular materials more transparent for teachers who do not benefit from the support of the design team.

CONCLUSIONS

Digital technologies can facilitate a critical place-based approach to mathematics teaching and learning. With Cash City, students investigate an issue in place, at multiple levels of scale, from local streetscapes to neighborhood comparisons to trends across the larger city. The digital maps of the city in which students live invite them to place their own neighborhood in a broader context and extend their understanding of local phenomena to more abstract scales. The mobile tools further reinforce this connection by making it possible for students to directly upload information from their physical neighborhoods onto the digital maps. The tools bring students’ learning from inside the classroom back out into the real world, as publishing students’ opinions on the web makes them viewable to the public and therefore meaningful in a context that extends beyond school boundaries. In the context of a critical place-based curriculum, digital technologies mediate between students’ critical understandings of mathematics and realities of their daily lives.

For more information, visit: CITYDIGITS.ORG