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ICT Oriented Toward Nyaya: Community Computing in India's Slums

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ABSTRACT

In many schools across India, access to information and communication technology (ICT) is still a rare privilege. While the Annual Status of Education Report in India (2013) showed a marginal uptick in the amount of computers, the opportunities for children to use those computers have remained stagnant. The lack of access to ICT is especially common in India's urban slum areas, which is privy to the "Matthew Effect" (Merton, 1968) where the poor become poorer based in part on the scarcity of high-tech resources. This article's purpose is to describe and report on ICT program interventions that target young people living in India's slums. Specifically, the article examines a case study of a grassroots effort, called the *community computing model*, in Bangalore, India. Using Amartya Sen's work on nyaya and Paulo Freire's work on conscientization, the article explains how this model of community computing infused and developed a social justice oriented and deeper "critical consciousness" of the slum community where this computer center was situated.

Keywords: *Bangalore; Community Computing; Conscientization; Educational Technology; Freire; India; Nyaya; Sen; Social Construction of Technology Theory (SCOT)*

INTRODUCTION

I do not think I will ever forget the frustration that a 10-year old child expressed when I asked her about computer technology at her government-run, public school in Bangalore, India. I inquired, "How often do you use computers at the school you attend?" The child responded, "Sir, never, sir. My teacher does not allow us to use the computer, Sir. She thinks we will break it. Sir, I am not allowed to touch the computer at my school, but I come here and am so proud to use it. I will continue to use the computer to help make my community better." The place that the student was referring to is called the Ramji Center. It is an example of a community computing center in one of Bangalore's largest slums.

Community computing is a grassroots model that seeks to empower people in marginalized (and, often, neglected) communities with basic computer skills. Community computing emerged as a model of information and communication technology (ICT) for development in Bangalore, India. The model provides children living in slum communities a place to use computer technology and develop digital skills. The purpose of this paper is to describe and report on case study research of the Ramji Center by examining how the children at the center used and assigned meaning to the center's computer technology. Specifically, the paper investigates how the uses for the computer technology led students to develop a critical consciousness of themselves and their community.

I organize the paper into four sections. In the first section, I introduce the study's social context and describe the theoretical frameworks that ground this study. In particular, I discuss the Social Construction of Technology (SCOT) theory (Bijker, 1995), Paulo Freire's (1970) work related to conscientization, and Amartya Sen's (2001) work on social justice or *nyaya*. In the second section, I describe the research methodology. In the third section, I report on the findings from this case study on the Ramji Center. In the final section, called Discussion, I discuss the study's

findings in relationship to the theoretical frameworks. I also further explain how the Ramji Center utilizes their ICT based curriculum towards social justice and the development of critical consciousness.

BACKGROUND

Bangalore is mirror of the great contrasts that is represented throughout India. While India is increasingly known for its highly skilled ICT industry, one third of the world's poor live in India. In his profound and sweeping book, *India after Gandhi*, Guha (2007) describes the contrasts in this way, "prosperity co-exists with human misery, technological sophistication with human degradation" (p. 711). Indeed, some parts of India are quite developed, but most of India is still developing (Guha, 2007; Kumar, 2010). An "emerging nation" is one label that policymakers often use to characterize India. But, as Guha (2007) perceptively notes it is difficult to identify or define India with one descriptor or label; India "is *sui generis* . . . it stands on its own" (p. 771). In many ways, Bangalore also reflects India's uniqueness.

Bangalore is framed by various meanings. Bangalore shares the dual, and somewhat binary, nicknames of India's Silicon Valley and India's Garden City. In early Indian history, Bangalore was known for being a lush retreat for South Indian royals. Today, Bangalore is a place that echoes with the hum of computer technology and the din of globalization. Bangalore as the nexus of globalization was popularized by the writings of Thomas Friedman, *New York Times* columnist and author of *The World is Flat.* Friedman (2005) associates Bangalore with the opportunities represented in a globalized world. He explains this association with the following rush of words, "Bangalore represents the possibility to collaborate and compete in real time with other people on more different kinds of work from more different corners of the planet on a more equal footing than at any previous time in history" (Friedman, 2005, p. 8). Bangalore represents the *possibilities* of Indian society. For example, uses for computer technology have helped to generate India's steady economic growth and reputation as a technological leader in today's global economy. And much of the discussion of India's reputation in this regard starts with the word Bangalore.

Yet, the uses for computer technology in India's schools are also problematic because of the realities of Indian society. Since developed nations' industries rely on the Indian workforce, India's reach as technological leader touches most developed nations. But this technological leadership barely even grazes many of India's urban slums and rural villages. Indeed, it is quite rare for India's government-run public schools in rural areas to have even a single working computer (ASER, 2013; Azim Premji Foundation, 2004). In urban areas, many children share the frustration of the 10-year old girl, who is introduced in the paper's first paragraph, because of the lack of access to computer technology. In India, as in other countries, it is the poor who continue to get neglected and marginalized when it comes to issues of equity and access to ICT. Raven (2013) explains this marginalization as reflection of the "digital divide, which is widely used to refer to differences in access to information and communication technologies, basically the gap between the 'haves' and the 'have not's'" (p. 174).

The Ramji Center seeks to bridge the digital divide that exists in Bangalore's urban slum neighborhoods. The origin of the Ramji Center helps to explain why the Ramji Center is so committed to its vision. The genesis of the community computing model starts with children from the slum, a community activist, and computer software engineers. The children were upset that they were not allowed to use computer technology at the government-run, public schools that they attended. They wanted to learn how to use computer technology and asked a local community activist, Ms. Lakshmi (a pseudonym), if someone could help set up a computer center in a small space that was not being used by the community.

Ms. Lakshmi liked the idea and had the children make a promise to not give up in their pursuit of computer education. She explained that they were the ones who were going to bridge the digital divide. Then, Ms. Lakshmi discussed the children's suggestions with some software engineers who worked in one of high-rise, office buildings next to the slum. The software engineers agreed to volunteer their time to help set up the center. Ms. Lakshmi found some people to donate a couple used laptops and desktop computers, and the Ramji Community Computing Center commenced. As mentioned earlier, the Ramji Center utilizes a unique model called community computing. The community computing model is a moniker that originated from the software engineers who helped to organize the Ramji Center in 2008. The volunteers explained that "community computing" is an empowerment initiative owned by the local community to address the widening digital divide through the use of free software.

Specifically, the community computing model seeks to empower local community through ownership of computers and computer education. The Ramji Center has a three prong mission for community computing: (1) Create self-sustained and employable young people who have excellent computer skills, (2) Enable upward social mobility to slum children by providing computer skills and educational support, and (3) Create agents of change in the local community who can be catalysts for social transformation. This mission is enacted in two unique ways. First, the mission is implemented through a cycle of "pass it on" education. Pass it on education simply means that the volunteers from the local software companies first worked with the teenagers in the Ramji Center to teach them basic computer literacy skills. Once these teenagers, who are all from the same slum, learned some basics they became the teachers for the younger children. Second, the Ramji Center mission is implemented using free, "open source" GNU/LINUX software. The course instruction includes hands on computer skill training that revolves around the free software movement. The Free Software Foundation website explains that free software is synonymous with liberation in that it lets people develop and improve software. The use of free software reflects the Ramji Center's larger commitment to the mission of social transformation. Free software allows the students to have equitable access as well as investigate how software is developed and changed. Later in the paper's findings section, I explain how the children at the Ramji Center used various free software programs to support their development of digital skills.

THEORETICAL FRAMEWORK

There are three theories that ground this research. First, the paper's conceptual frame, which also informs the methodology, is situated in the Social Construction of Technology (SCOT) theory. SCOT's core premise is that people give meaning and purpose to technology (Bijker, 2010). SCOT theory originated from Pinch and Bijker's (1984) case study investigation of the historical development of technologies like the bicycle and light bulbs. SCOT maintains that social groups, like students and teachers, construct the meanings and purposes for technology based on their social context and interactions. In a school setting like the Ramji Center, the social shaping of technology happens in a context of use and negotiation among students and teachers.

SCOT also offers a methodological approach for examining how people negotiate meaning for technology. SCOT's four step approach includes: (1) identifying the relevant social groups who share space in a technology's meaning construction; (2) examining each group's interpretative flexibility, which is their interpretations for using computer technology; (3) investigating how the social groups negotiate their interpretative differences; and (4) examining each social group's demographics or "technological frame" in relationship to their interpretations for computer technology (Bijker, 1995). This methodological approach is helpful in uncovering how and why people assign meaning to computer technology based on their social context and interactions. I discuss more about how I use SCOT's methodological approach in the methodology section of this paper.

In order to examine how the coupling of computer technology with social justice at the Ramji Center, I use two additional theories. The paper is informed by the works of Sen (2001, 2009), and Paulo Freire (1970, 1994, 2004). So what do I mean by social justice? Conceptions of social justice have been influenced by John Rawls (1999) assertion that justice is fairness. Justice gets exercised through the upholding of rights and liberties, which are situated in equality and the common good. Sen (2001, 2009) situates social justice in the everyday lives of people, not just the larger institutions that network people. Sen's (2009) conception of justice starts with an examination of the world's "manifest injustices" (p. 259). He explains that social justice ought to be more concerned with removing injustices, rather than defining a just, utopian society. Sen employs the Sanskrit word, *nyaya,* to anchor his conception of social justice. Nyaya, which Sen (2009) defines as realized justice, is connected to how justice "actually emerges" and not just the law and order that societies happen to have not just the in comprehensive to have (p. 20). This paper's working definition for social justice, that I will explain momentarily, is rooted in the concept of nyaya, which I describe as realized justice as it actually happens.

While nyaya serves as a foundation for my working definition of social justice, the definition is further informed by the writings of Paulo Freire. For Freire, education's true purpose was for the development of a critical consciousness of the world. Freire (1970) termed such critical consciousness as conscientization, or *conscientizao*, which he describes as knowledge "that emerges only through invention and re-invention, through restless, impatient, continuing, hopeful inquiry that human beings pursue in the world, with the world, and with each other" (p. 58). Freire equates conscientization to an education that liberates; an education that helps learners to transform who they are and how to change their reality. I imagine that if Freire were still alive, he would embrace Sen's understanding of social justice being synonymous with nyaya, or realized justice. Freire might also emphasize the importance of literacy as it relates to nyaya. For Freire, literacy involved more than just the ability to read and write; rather, literacy meant "reading the world" and "re-writing the world." Reading the world is the critical examination of the social realities, including the "manifest injustices" (Sen, 2009, p. 259) that exist for many people. Re-writing the world speaks to how those injustices can be transformed through knowledge and action. Such transformation is where nyaya is actually realized in the lived experiences of people in their communities.

Thus, social justice is cognizant action to reveal and root out injustices; it is the consciousness of societal inequalities and injustices that dehumanize people. Yet, social justice also includes action. Through the acknowledgement that society does not have to be this way; social justice transforms inequalities. This work of actual societal transformation is what makes social justice, or nyaya, so robust and gritty. Nyaya happens in communities, among people, in relationship to the wide context. In the paper's findings section, I share how the Ramji Center is making inroads toward nyaya through their uses and meanings for computer technology.

METHODOLOGY

Grounded in the SCOT framework, the study's research questions are the following: (a) What are the meanings and uses for computer technology in the Ramji Center?; (b) What characterizes the social shaping of computer technology at the Ramji Center? I divide these primary questions into the following research sub-questions that are based on SCOT's heuristics.

1. Who are the relevant social groups and what is the social context like at the Ramji Center?
2. What meanings do the study's relevant social groups (students and teachers) assign to computer technology?

3. How do the relevant social groups at the Ramji Center negotiate the meaning for computer technology use? To what degree is there stabilization?
4. How does the Ramji Center's social context help explain the meaning they assign and negotiate for computer technology?

I organize the findings section by addressing each question one by one. I utilize a case study research design in the ethnographic tradition (Geertz, 1973). According to Yin (2008), case study is a research design for empirical inquiry that allows for the investigation of complex phenomena within in an authentic context. The study employed qualitative and quantitative methods to compile a case study of the Ramji Center. The study's data were collected between November 2010 and April 2011. The study's sample was drawn from the Ramji Center (a pseudonym), which is a community center in Bangalore. The study's child participant sample is 13 elementary-aged kids, who are at the fifth grade age range (10 and 11 years old). The study's educator participant sample is five educators, who all live in the same community as the students, and range in age from 16 years old to 22 years old.

There were four qualitative data sources: field notes from on-site observations, a student focus group interview, educator interviews, and collected artifacts like curriculum documents and digital images. The study's observation protocol provided focus for field observations. The student focus group interviews and tutor interviews were structured to identify perceptions for using computer technology. Collected artifacts included curriculum documents and digital images as visual data of the Ramji Center's computer hardware and software. Two sources of quantitative data included: a student questionnaire and an educator questionnaire. The questionnaires generated demographic data and identified the participants' perceptions about using computer technology.

I analyzed the qualitative data using a three-step interpretive approach and the constant-comparative method (Miles & Huberman, 1994). Pattern-matching logic (Yin, 2008) was also utilized to identify patterns in the data that either do or do not match with Freire's conscientization. I analyzed the quantitative analysis at a descriptive level. These descriptive statistics were intended to provide "snapshots" of participant perceptions of computer technology. The quantitative results were helpful to triangulate findings about the participants' perceptions of computer use. However, the quantitative data only provided basic descriptive statistics and not intended to claim causality.

FINDINGS

As mentioned earlier, I report the findings for this research by addressing each SCOT question. The first question is: *Who are the relevant social groups and what is the social context like at the Ramji Center?* I will first address the context. The Ramji Center is an after-school community center located at the end of what some might call a narrow, "back alley" of a slum. Three story tenements tower above the alley. The tenements are densely populated with families. The alley serves as a kitchen, latrine, washroom, and the communal laundry area. The center is located in a one-story building that serves as both a computer center and a communal area for the slum. The building is one large room about 8 meters in length by 3 meters wide. The walls are a two-toned color with canary yellow on top and baby blue on the bottom. The cement floor is painted an auburn color and is dusty. The room has four large windows that open up to a view of the alley way. A metal locker, a wooden table, four chairs, and a bookshelf make up the room's furniture. A framed portrait of Dr. B.R. Ambedkar hangs on the main wall. Inscribed below his portrait are these words, "Father of India's Constitution." One of the rules of the center is to remove shoes before entering; yet, many students arrive barefoot and explain they prefer to walk around the slum neighborhood that way.

The Ramji Center holds classes for elementary-aged slum children on weekend evenings for two hours at a time. The center has a desktop computer and three laptop computers, which students take turns using. The Ramji Center educators post a rotation schedule so that all the children who attend get about 15 minutes on the computer. Students primarily play computer games or go to a computer art program called Tux Paint. Students who are waiting for their turn on the computer receive tutoring for their school homework. The last 15 minutes of each weekend lesson is dedicated for singing and dancing. The songs that the students sing are social-justice oriented and in the Tamilian language.

Children and the center's educators are the relevant social groups related to this study. About 20 children regularly attend on the weekends, of which 80% are girls (the students are between 8 years old and 12 years old). I interviewed 13 students who were 10-11 years old. As previously mentioned, the educator participant sample is five educators, who all live in the same community as the students, and range in age from 16 years old to 22 years old. All the participants' parents are either day laborers or house servants. Many of the parents are Tamilians, who migrated to Bangalore from Tamil-Nadu, the Indian state that neighbors the State of Karnataka where Bangalore is the capital. The families move to Bangalore looking for jobs and economic opportunity, but find that the housing market is unaffordable. Thus, many cannot afford to live in an apartment on their meager wages from daily work, so they end up renting in the slums. Most of the children in this study reported that they live in a one room flat with, at least, four or five other people and sometimes with another whole family. Firewood and garbage are the common sources of fuel used to cook food in the slum's alleyway. None of the children's families owned a car. Instead, most the children reported that their family had a bicycle that was used for transportation. Additionally, all the study's children reported that their families owned a television and a cell phone. The study's participants reported that the average amount of books in the place they lived was seven. Finally, more than 75% of the study's children shared that they wanted to become software engineers in the future.

The second question is: *What meanings do the study's relevant social groups (students and teachers) assign to computer technology?* This question seeks to identify the different interpretations that relevant social groups have related to computer technology. At the Ramji Center, the students and educators had different interpretations for the computer's purpose. The educator's interpretations aligned closely with the Ramji Center mission statement whereas the students' interpretations were focused more on the activities, which they enjoy the most while at the Ramji Center: Playing games.

In Table 1, I organize the interpretations by percentage of how often that interpretation. I also include example participant quotes that illustrate each interpretation. Table 1 shows that while the Ramji Center's participants assigned different meanings and interpretations for computer technology, confidence and self-esteem were common themes among the two groups. The students talked about the computer games they get to play as part of developing confidence on the computer. Confidence development also connects with the Ramji Center's mission statement related to children seeing themselves as part of the catalyst for social transformation. See Table 1 for more details.

***Table 1**: Relevant Social Groups' Interpretations for Computer Technology at the Ramji Center*

Teachers' Interpretations	Students' Interpretations
1) Self-esteem - 60% "*the computer makes me proud of who I am"*	1) Games a pathway to confidence – 62% *"I am so proud to use computers"*
2) Upward mobility – 20% "*knowing the computer is the children's way out of the slum"*	2) Computers are fun - 23% *"I like the computer, it does not make me tired"*
3) Social transformation – 20% "*my computer skills can make the community better"*	3) Computers as special knowledge - 15% *"computer is important for my future"*

The third question is: *How do the relevant social groups at the Ramji Center negotiate the meaning for computer technology use? To what degree is there stabilization?* The fact that the Ramji Center students and teachers agree on a similar interpretation for computer technology (i.e., the development of confidence) shows a level of consensus related to the stabilization of meaning. So how did this consensus of meaning happen? I asked this question to the educators, and they explained how when they first started, the educators tried to teach using GNU-Linux (free, open source software) to even the younger, elementary-aged students who attended. The educators noticed that the younger students were either bored or unruly and many dropped out of the program. So the educators changed the curriculum for younger students. Game playing has become the focus in order to keep the younger students attending and to help spark their interest in learning about computers. As one of the educators explained, "The children are motivated to play games and make things with the computer and these things help build their confidence with the computer's keyboard." Another Ramji Center educator posited that such motivation would most likely increase the chances that the children will continue to consistently attend Ramji Center. The educators also explained that the Ramji Center children grow older; more advanced computer skills would be introduced. Yet, the educators were especially attuned to the importance of keeping children motivated to return each weekend to the Ramji Center. The key, though, is to have students consistently attend and buy into the Ramji Center mission.

One form of buy in is to also have students learn how to create artifacts and documents on the computer. In my field observations at Ramji Center, I observed the children playing games on the laptops. The favorite games were chess, a racing car game, and a free software Cricket type game. The children also enjoyed using the OpenOffice Impress program to create projects that reflected the Ramji Center's mission of having the children become future change agents in their community. For example, one such project was a poster design. For this project, the children created a poster that explained a social problem with both images and words (in English and in the Tamilian script, which is the mother tongue language of many children living in the slum). The children created posters that included topics like: child labor, air and noise pollution, the danger of firecrackers, and women's rights. The poster's purpose was to raise awareness of community and social issues. Such a project fits with the center's goal of promoting social justice through computer use.

The last question is: *How does the Ramji Center's social context help explain the meaning the students and educators assign for computer technology?* Prior to visiting the Ramji Center, I had the opportunity to interview and chat with one of the software engineers who volunteered to help get the Ramji Center started. During our interview, the software engineer focused his conversation on understanding the context where the Ramji Center is situated. He explained how

most of the students and educators were the daughters and sons of day laborers and house servants. For many of them, they had never even touched a computer before coming to the Ramji Center. The Ramji Center played an important part in the slum community by providing access to computer technology hardware and software.

The software engineer also discussed and was quite familiar with many education theorists, including John Dewey and Paulo Freire. When I asked the volunteer about the impetus for volunteering and helping to start the Ramji Center in the slum, the volunteer stated, "I think of what Paulo Freire said about education without social action is no education at all. So we are guiding students in learning computer skills that will empower them to make their community better."

Indeed, throughout the interviews and data collection with the study's participants, words like empowerment, empower, community, and improvement were oft repeated. For example, when I asked one of the Ramji Center educators why computer education was important for the center's children, here was the response, "The computer is a better way to learn more without a teacher. I want the children to know that the computer is useful in the field of life, they can use the computer to improve their life." I followed up on this question by asking, "How so, how does the computer help to improve a child's life?" The educator responded by exclaiming, "The world tells the children that this [the slums] is where they belong, but knowing the computer is their way out. By knowing how to type in English, make presentations, and work a computer, the children make the community better, too."

The Ramji Center student participants also agreed with this sentiment. When I asked the children in the student focus group interview if they thought that computer technology would prepare them for the future, all the children enthusiastically agreed that it would. I asked a couple of the children to explain how and why. Here are the responses that they gave: 1) "Sir, yes, sir. Sir, knowing how to use the computer is important for my future. I want to be software engineer, so the computer is something I will use every day." Thus, the Ramji Center's wider social context shapes the emancipatory meanings that students and educators assign to the technology.

DISCUSSION

Ramji Center is an example of educational settings that is committed to computing towards nyaya through, in part, the development of a critical consciousness. Earlier in the paper, I referenced Sen's (2009) use of the term, nyaya. I adopted Sen's notion of nyaya to define social justice as cognizant action to reveal and root out injustices. Throughout this section, I discuss the ways that the Ramji Center use for computer technology was social constructed for nyaya or social justice.

The first way that I focus is on is access, which is a big part of the Ramji Center's mission statement. Indeed, the Ramji Center's vision is oriented toward providing computer technology access and skills to underprivileged children, who are often ensnared by the inequalities and injustices that characterize life in India's slums (Dalrymple, 2009; Deb, 2011; Guha, 2007). Lack of access to resources is an injustice that continues to persist in these communities. For example, in India's government-run, elementary schools, computer technology is quite scarce. And like the Ramji Center children reported, even if there are computers in the school, children are often not allowed to even touch the computers until they are in the seventh or eighth standard. The Ramji Center addresses this issue of access by providing computer technology for the students to use. Furthermore, the students were encouraged to use the technology. It is no surprise that the students and educators perceived that such access is liberating and a key part helping to develop confidence.

Another way that the Ramji Center were computing towards nyaya was in giving their students a voice. Srinivasan (2006) provides an instructive analysis regarding social justice oriented computer education. Srinivasan (2006) explains that the power of computing towards nyaya is that it "directly engage the voices, categorical notions and discourses directly from the community themselves" (p. 357). The inception of the Ramji Center is an example of Srinivasan's quote. For example, when the Ramji Center's children voiced their request for computer technology, their voices were heard and acted on. In India and in many other countries around the world, including the United States, the voices of children are often suppressed and silenced. Indeed, it is rare in the literature to find instances where children, especially underprivileged children, have political power or influence; where their collective voice is truly heard. However, in the case of the Ramji Center, it was the children who helped to get the center started.

A third way is through media authorship. One of the affordances of computer technology is that it is a malleable tool that gets used for many purposes. Indeed, an important benefit of computer technology is that it allows for the creation of content and media (Srinivasan, 2006). Computer technology is powerful because it can be shaped, changed, and re-purposed. The Ramji Center help guided their students to create and present content with computer technology. This shows the possibilities of using computer technology to develop a critical consciousness by rewriting or, more fittingly perhaps, to reprogramming the world. The uses for computer technology can have an emancipatory quality; it can be used to disrupt, intervene, and question the existing powers structures. For example, when the Ramji Center educators had the children create their poster projects about social issues, there was also the expectation that the children would hang their posters in the community in order to raise awareness. Such acts are oriented toward nyaya as students develop a deeper and "critical understanding of technology that is infused with the growing capacity for intervention in the world" (Freire, 2004, p. 85).

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