Using Digital Technology and a Community Based Approach to Improve Educational Outcomes for Culturally, Linguistically Diverse and Exceptional Children in Pakistan: A Conceptual Framework

Eirini Gouleta[1], James C. Witte[2], Bethany Letiecq[3]

Abstract

This paper discusses a project designed to create a holistic, scalable model to significantly improve the reading skills of children in grades one through three in Pakistan. Innovative aspects of this project include: 1) In terms of technology, we adapt digital tools in ways that are appropriate to the landscape of a developing country. Our vision of technology extends beyond the digital to include paper based and learning materials, such as manipulatives and realia, designed in concert with the digital instructional tools. 2) It is innovative in that we approach family and community engagement by combining a Community of Practice (CoP) approach with a Community Based Participatory Research approach (CBPR). We engage families and the local community to deliver technology and instructional materials, but also work with families and communities to develop, implement and evaluate the technology and instructional materials. 3) Our approach is innovative in that it is holistic. Incorporating mother tongue instruction and culturally appropriate materials, while drawing in all students including those with special needs, will create an 'edu-system.' This paper details the background and significance of the project, the underlying conceptual framework, the methodological approach to design and evaluation, as well as the plan for pilot implementation.

Keywords: Culturally Linguistically Diverse and Exceptional (CLDE) Children, Learning Disabilities, Early Literacy and Assessment, Mother Tongue Instruction, Technology, Community-Based Approaches, Media and Communications, Pakistan

1. Introduction

Pakistan's list of challenges runs long and deep: political instability, corruption, dire levels of literacy, low levels of economic and social development, terrorism, conflict and insurgency combined with recent natural disasters. The existing educational infrastructure, and indeed all aspects of the nation's infrastructure, have suffered man-made and natural adversities and deteriorated through neglect and lack of maintenance. Similarly teachers and students have been exposed to dislocation, disruption and violence, while limited resources have led to protracted and pervasive underinvestment in human capital.

Developing and channeling the potential human capital of Pakistan's youth is critical to the nation's future and to the relations of Pakistan with other countries. Two-thirds of Pakistan's estimated 180 million citizens are under the age of 30, while fully half are 22.6 or younger (CIA World Factbook, 2014). It is widely recognized that dramatic improvement is needed at every level of Pakistan's educational system, if this 'youth bulge' is to lead to peace and stability rather than conflict and turmoil both within the country and outside of its borders.

[1] *George Mason University, 4400 University Drive, Fairfax, VA 22030, United States of America*
[2] *George Mason University, 4400 University Drive, Fairfax, VA 22030, United States of America*
[3] *George Mason University, 4400 University Drive, Fairfax, VA 22030, United States of America*

Overall, education policies and reforms of the past 50 years have done little for access to a better education for all in Pakistan. UNICEF figures (2012) place adult literacy at 54.9%, i.e., nearly half the population age 15 and over cannot read and write. The primary school net enrollment rate is 79.0% and attendance rate is 70.0% for boys, while the net enrollment rate and attendance rate is 65.0% and 62.3% for girls respectively. Net enrollment rate drops at the secondary school level to 34.6% for boys and 28.9% for girls. Only 5.1% of Pakistan's youth aged 17-23 are currently enrolled in higher education. However, it is worth mentioning that any statistics provided about education rates in Pakistan may be questionable, as other sources report that on any given day across the country about 13% of the teachers and 18% of the students are absent (ASER 2012). If we also consider that there are hundreds of 'ghost teachers and schools' in the country it is very difficult to state with conviction that any given figure or statistics regarding education in Pakistan can be truly valid and reliable.

Additionally, safety concerns in many regions, combined with the unprecedented natural disasters that hit the country the past decade –horrific floods and earthquakes- and lack of access to education for the poor and marginalized have problematized every educational reform. This has placed Pakistan in a state of 'education emergency' (Khattak, 2012). Furthermore Pakistan's linguistic diversity (see Figure 1) and the ways it has been dealt with pose political, organizational and administrative problems and obstacles for educational reform. There are over 60 languages spoken in the country; about 44% of the population speaks Punjabi followed by Pashto (15%), Sindhi (14%), Seraiki (10%), Urdu (8%), and Balochi (3.5%) while other major languages spoken are Hindko, Kashmiri, Khowar, Kohistani, Brahui, Baryshaki, Arabic, Dari, Persian, and Turkic.

Figure 1: *Linguistic map of Pakistan; Source: Fred Bolor, 2009*

Although Urdu is the native language of only 8% of the Pakistanis, together with English, the post-colonial language, they are used as languages of instruction in the vast majority of Pakistani schools. This leaves more than 9 out of 10 of the country's children without access to education in their mother tongue (Coleman, 2010; Pinnock, 2009; Walter, 2009). In Punjab in particular, the majority of the approximately 100 million habitants speak Punjabi and other minority languages. In recent years, the English Language Initiative (ELI) was instituted by the provincial government mandating English and Urdu to be the media of instruction in public schools (each language is accorded 50% of the instructional time) leaving students and teachers at the mercy of poor quality of teaching and learning as the majority of the teachers do not speak English at all (Gouleta, 2013).

Despite the obstacles, there have been significant efforts to improve literacy in Pakistan by development partners, donors, Civil Society Organizations (CSOs), NGOs and communities. Save the Children began in 2009 a pilot project titled Literacy Boost (LB) in the Battagram District, Allai, Tehsil in Khyber Pakhtunkhwa - Pakistan's former Northern Frontier Province. In addition to reading interventions and assessment, the LB project involved working with teachers and the communities to improve children's literacy skills. It focused on three major areas: using assessments to evaluate the five core reading skills (phonemic awareness, phonics and spelling, comprehension, fluency, and vocabulary) in both Pashto (the home language of the children) and Urdu (the language of instruction); community mobilization and involvement in reading action; and teacher professional development on teaching the five core reading skills and the curriculum. The pilot project involved 10 experimental school sites and 5 comparison schools. Baseline data were collected from all schools in December of 2009 –prior to intervention- and endline data in December 2010 (Save the Children, 2011).

The children in all schools came from similar socioeconomic background. However, the baseline data revealed that the comparison school students had significantly higher reading scores in all five assessed reading skills than the experimental schools' students. For this reason, the research team set as a benchmark the 75th percentile for the LB children to at least read at this level by the end of the academic year.

Results revealed that although LB schools started significantly lower, they outer-performed the control schools in all reading skills and the numbers on the non-readers significantly dropped (67% versus 36% their comparison peers). At the end of the year LB students surpassed in fluency in Pashto the comparison students reading correctly on average 30.92 words per minute (wpm) compared to 10.25 wpm. And in Urdu, they surpassed them with a 33 wpm average score, double that of their comparison peers. Similarly, LB students read accurately in both Urdu (77.89%) and in Pashto (60.7%), as compared to the control group who read with lower accuracy (65.82%) and (21.8%) in both languages respectively. Ninety two percent of LB girls and boys could name their favorite story and 80 percent could give a summary.

The project was proven especially beneficial for girls increasing significantly both their reading skills and learning outcomes (with 44 wpm and 66 percentage points in accuracy) notable given the fact that girls' education faces tremendous challenges in Pakistan. Especially in Khyber Pakhtunkhwa, girls remain one of the most disadvantaged student groups in the country due to prevailing poverty, gender and cultural practices, lack of female teachers and gender appropriate school facilities, reliance on girls' labor for household chores, conflict and insurgency (Gouleta, 2014).

Teachers reported learning a lot of instructional strategies on how to support children's literacy skills and parents reported great satisfaction with the program and that they were now able to participate and get involved in their children's learning (a total number of 1,743 parents, 30% of whom were mothers) and attended five LB reading awareness sessions to support their children's efforts to read. Although this project did not incorporate technology, it did focus on literacy in both the mother tongue and the language of instruction and on community and parental involvement. Lessons learned from this literacy project and others taking place in Pakistan will inform our pilot project and strengthen our approach incorporating successful elements and avoiding pitfalls.

2. An Innovative Approach

This paper describes a pilot project designed to create a holistic, scalable model to significantly improve the reading skills of children in grades one through three. The project will be carried out in the Punjab province in Pakistan and will involve two school districts,

one of which will serve as a control site, while the second will receive our proposed intervention. The control site would then be the location for our first effort to scale up the proposed intervention.

There are several innovative aspects to this program. First, in terms of technology, we propose to adapt digital tools in ways that are appropriate to the landscape of a developing country. Tools for PCs and tablets will be created for use in the schools, while cellphone-based tools will be created to reach out to parents and their children away from school. Cell phones are widespread in Pakistan and the fee structure allows users to receive messages at no cost. These messages will offer encouragement and tips to parents and children reinforcing school participation and learning. Further, our vision of technology extends beyond the digital to include paper based learning materials, manipulatives and realia, which will be designed in concert with the digital instructional tools. Cards, puzzles and game boards are all appropriate technologies for home environments that lack reliable electricity, never mind Internet connectivity. An innovative aspect of our approach will be to create these items in a manner that emulates and is analogous to the digital materials students will be exposed to in the classroom. In addition, high and low assistive technology and instructional materials will be developed for children with learning, physical, and cognitive disabilities.

Second, our project is innovative in that we approach family and community engagement through a Community Based Participatory Research approach (CBPR). The project does not only partner with families and the local community to deliver technology and instructional materials. Rather, we will also work with families and communities to develop, implement and evaluate new technology and instructional materials. The project will build a strong partnership between academic researchers and community partners in the experimental district. Using a CBPR approach to build trusted partnerships is critical as community partners develop a stake in the program and trust in the outside researchers, while also providing local cultural knowledge that helps to make the program more effective. Within the scope of CBPR, we will develop a Community of Practice (CoP) enhancing and reinforcing stakeholders' participation and sustainable capacity building after the completion of the pilot project. The particulars of this initial project will not necessarily transfer to another community; however, an overall approach that builds on the particulars of each distinct community is highly transferable and scalable.

Third, our approach is innovative in that it is holistic. Working with communities and education stakeholders, children, teachers, researchers, and families while incorporating local culture, mother tongue instruction and materials, and drawing in all students - including those with special needs- we will create, support, and work within a specific 'edu-system' (see Figure 2). *We define an 'edu-system' as an education community of interacting stakeholders and their geographical, physical, cultural, social, political and economic environment. Like an ecosystem it is an interconnected, complex network that can only be understood as a whole.*

Figure 2: '*Edu-system,' the education community of interacting stakeholders*

By addressing the needs of the particular 'edu-system,' we recognize the significance of the web of connections between school, families and the community as a whole. Therefore, we are in a position to identify the educational needs and interventions necessary for literacy development and academic improvement, while making every stakeholder a true partner in promoting literacy for young students. Barker et al. (2005) stress that along with students, teachers and other important stakeholders the communications infrastructure and related devices are essential aspects of the learning environment. Similarly we see learning technologies as part of the 'edu-system.'

Our evaluation plan calls for pre and post comparisons of the Early Grade Reading Assessment (EGRA) scores for the experimental site and similar comparisons between the experimental and control site. We will also use data from assessments already in use in Pakistan either through the Annual Status of Education Report (ASER) or school-based instruments. We will provide teacher training on how to develop appropriate and valid formative and summative assessments to measure and monitor student learning and academic achievement. We will measure the use of technologies to improve reading both within the school and in the community.

In the remainder of this paper we discuss the project's background and significance and the underlying conceptual framework drawing on literature related to User-Centered Design (UCD) and the community based approaches, CBPR and CoP. We present the research approach, followed by consideration of a pilot implementation of the project. We conclude with the project's emphasis on iterative evaluation and reflect on its implications for expansion and replication to other areas and settings.

3. Background and Significance

In recent years, the government of Pakistan has introduced promising policies (including the National Education Policy of 2009, Education Sector Reforms, National Education for All Plan 2000-2015, and the insertion of Article 25a in the Constitution) and has begun efforts for improvement to all levels of education, in particular the participation of girls in primary school. Emphasis has been placed on increasing the enrollment and attendance rates in primary and secondary schools.

However, even among those in school very few are actually learning. Student achievement is lagging significantly in all instructional languages, English, Urdu, Sindhi, Pashto, and in mathematics. More than 50% of fifth graders are not able to demonstrate basic literacy and numeracy skills expected at the second grade level (ASER, 2012). Some

examples from specific provinces illustrate the extent of the problem. In 2012, more than 64% of fifth graders in Balochistan were performing below the third grade level in Urdu and mathematics. In the Federally Administered Tribal Areas (FATA) more than 11% of tenth graders were reading below the second grade level both in Urdu and Pashto. Learning levels are 'alarmingly' different between males and females at all socio-economic levels, except for girls who come from the richest income group (ASER, 2012, pg. 22). Illiteracy levels across the country are dismal; extreme education poverty affects the most vulnerable populations including those children who belong to linguistic minorities and have learning disabilities (UNESCO, Misselhorn, Harttgen, and Klasen, 2010).

Furthermore, the Pakistani budget for education is below that of other South Asian countries and the Gender Equality Education Index (GEEI) is the lowest in the region. Public spending on education can help reduce the gender gap by targeting poor and under-privileged girls in a way that increases their access to available services (Chitrakar, 2009; Sabir, 2002). There are still significant gender gaps in educational outcomes especially in rural and remote regions, particularly the northern areas of the country. The most disadvantaged groups in terms of school enrollment and completion fall at the intersection of gender and other types of marginalization: i.e., combinations of being a girl, poor, disabled, a member of a linguistic, religious, or cultural minority, and living in a rural area.

4. Conceptual Framework and Research Approach

This project draws on literature from three distinct approaches, all of which share a common, underlying grassroots orientation— community based participatory research, user centered design and communities of practice —in an effort to improve literacy outcomes.

4.1. Community Based Participatory Research Approach (CBPR)

For this project we will employ a CBPR approach (see Figure 3). By using CBPR, we intend to partner from day one with community members to build the program for research and action from the ground up. Therefore, the community partners together with the researchers and university partners will determine the research questions, methods, and action steps. CBPR as our research approach provides the platform with the values and principles of our engagement process. These are democratic, iterative, just, participatory processes that shift power to the community.

Figure 3: *The cyclical, iterative, and democratic process of CBRP in our project*

CBPR is critical when seeking to build partnerships centered on family and community engagement (Israel et al., 2005; Minkler & Wallerstein, 2008) and offers important opportunities for addressing the literacy and well-being of Pakistani children and

families. CBPR in education, social policy and public health studies is a collaborative approach where academic researchers, NGOs, CSOs, community members and other stakeholders are equitable partners in all phases of the research process (Israel et al., 2005). The goal of CBPR is to improve the lives of the people engaged in the research; thus CBPR can be understood as a participatory, collaborative and iterative process that works to empower participants through community-driven research, education, and action (Israel et al., 2005). CBPR is not a method, but rather an *investigative orientation* to research aiming to change the balance of power and blur the lines between 'researchers' and the 'subjects' of research (Minkler & Wallerstein, 2008).

CBPR begins with the goal of addressing a community-identified problem (e.g., child literacy), and at its base is a commitment to researching issues that matter in people's lives (Letiecq & Schmalzbauer, 2012; Ospina et al., 2004; Reason & Bradbury, 2008). CBPR principles have played an instrumental role in several large-scale epidemiological and international studies (Ferreira & Gendron, 2011; Lueng, Yen, & Minkler, 2004; Rhodes et al., 2006). The approach has been recognized as critical in allowing researchers to build partnerships with communities with little history of research engagement or histories of mistrust of institutions that are now attempting to build bridges and inroads to ameliorate significant social problems.

Our proposed strategy for working with Pakistani families and communities is built on the premise that effective community participation should result in a trust-based, democratic partnership that meets the expectations of both community members and researchers (Minkler, 2004; Wallerstein & Duran, 2008). Using mother tongue based instruction and materials will allow all family and community members to actively participate including the elderly and those who do not speak Urdu or English. CBPR addresses the expectations of community members, who want community problems to be solved and their voices to be heard, and researchers who expect their study procedures to reflect rigorous and accepted standards of scientific practice.

In this project, community members will participate in all components of the proposed efforts and will be empowered to define problems, actualize new skills, assist with data analysis, interpret results, and inform intervention development, implementation, and evaluation. Academic and other scientists, on the other hand, will not just be 'objective investigators' but active learners in the process (Ferriera & Gendron, 2011). Cultural information gleaned from the community will be used to inform the research process, which is inherently iterative, as knowledge gained refines the study in an ongoing fashion. The research process is also responsive to the needs and cultural milieu of community members. As partnerships are formed, we take cues from the community as we develop the most appropriate methods of engagement.

A central tenet of CBPR is that the community-researcher partnership is built from the community up, where all partners are focused on building community capacity to sustain efforts long after the research project has been completed or funding no longer exists (Israel et al., 2005). Because of this underlying goal of sustainability, care and time is needed on the front end of research efforts to establish trusted partnerships and a community-based infrastructure that will not only guide the proposed project, but will sustain longer-term community goals.

4.2 User-Centered Design (UCD)

To reinforce and strengthen the learning process and improve literacy outcomes we will develop and use new technology. These will include digital learning tools and companion, analogous manipulatives and realia using a synthesis of best practices drawn from the methodologies of UCD (Stone, Jarrett, Woodroffe, and Minocha, 2005).

In a seminal paper, Gould and Lewis (1985) presented three principles that guide the UCD process (See Figure 4): (a) *Early and continual focus on users and their tasks.* This requires direct contact with users, including discussion and observation of their tasks and work environment, and identification of their wants and needs, which we will put into practice at our pilot implementation site. (b) *Empirical testing with users.* This involves observing users doing real work with mockups and prototypes of product concepts. (c) *Iterative design.* This involves refinement of the design, based on the results of user testing, to bring the product into conformance with explicitly stated performance specifications.

Figure 4: *User Centered Design (UCD)*

The use of a UCD process is considered to be the current 'best practice' for the development of systems that involve substantial user interaction. This process aims to produce products that are both useful—they help users accomplish their goals—and usable—so that the product is reasonably easy to learn and use. Usefulness and usability, in turn, lead to rewarding user experience and user acceptance. In the development of our tools, our attention will focus on three types of users: culturally, linguistically diverse and exceptional children including those with cognitive, physical and learning disabilities, their parents and families, and their teachers. UCD methodology seeks to create a system that meets the needs of all user groups. More specifically the process may be divided into four steps (see Figure 5):

1. *Identifying user needs.* The development process will begin with interviews of representatives of each of our three groups of users (children, parents/families and teachers) and observations of them in their use environments. The 'voice of the user' represented by these interviews and observations will be translated into a set of user needs that the tool must satisfy. Personas—descriptive models of users, what they wish to accomplish, and why (Cooper and Reimann, 2003)—will be developed based on the data gathered. These personas will represent the users of the tool during the development process.
2. *Establishing design specifications*. The results of the needs analysis phase will be used to drive the development of a set of usability requirements for the tool. Use scenarios will be developed for the personas. These scenarios will describe a persona's activities in a narrative that allows exploration of their goals, work contexts, and needs. A list of performance metrics—precise, measurable specifications for the performance of the tool in the hands of its users—will be defined in terms of the activities described in the use scenarios. Target values along each of the metrics will be set based on other educational materials that have been positively received by the user groups.
3. *Conceptual design*. Several different prototypes that have the potential to meet the users' needs will be developed and explored systematically. Low-fidelity prototypes of these concepts will be constructed and tested with users in the context of the use scenarios. The results of these tests will determine the refinement and combination of features from the prototypes to create the most promising concept for further design.
4. *Detail design, testing, refinement, and delivery*. The objective of this final phase of the development effort is to assure the usability, usefulness, and acceptance of a working tool

in the hands of its intended users. While the specific measures of performance on which the tool will be evaluated will be driven by the specific needs of the user groups, it is expected that all of the following aspects of usability will be included in the evaluation of the final product: a) time to learn to use the tool; b) retention of skill in using the tool over time; c) task performance time; d) task performance quality; e) subjective user satisfaction.

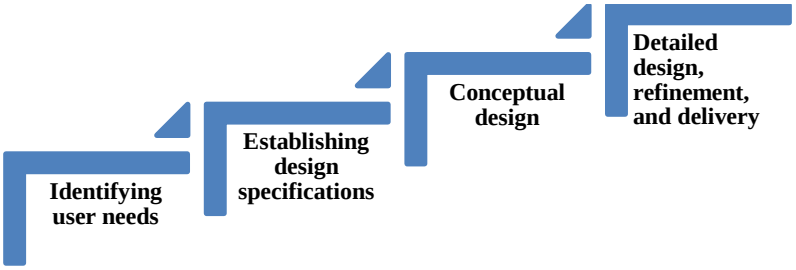

Figure 5: *User Centered Design (UCD) Process*

4.3 Communities of Practice (CoP)

CoPs are 'our first knowledge-based social structures' and can be found in every area of human activity (Wenger, McDermott & Snyder, 2002, p.5). Their value in the short-term lies in their capacity to improve organizational outcomes and work experience; their long-term value can be found in their potential to develop organizational capacity and foster professional development.

CoPs are flexible and evolving. They are different than teams and networks because they define themselves in the process of doing. They stay together through common interests and shared learning. They are created for a specific purpose addressing the common concern or passion (Wenger, 1998a). Members of CoPs are individuals who share a common concern or passion, set of problems and through their ongoing interaction deepen their knowledge and expertise in the area of interest (Wenger, McDermott & Snyder, 2002, p.4).

In our project a CoP can be developed by the teachers and other school professionals who serve CLDE students in an effort to improve their instructional and assessment practices and consequently the literacy outcomes of their students; the researchers, parents, families, and other community members who share the common goal of improving the literacy of the children in the target community; education government officials and stakeholders from the world of media and communications.

CoPs are formed for a variety of reasons. However they all share the following three fundamental structural characteristics: 1) a *domain* of knowledge that affirms its purpose and creates common ground and a sense of common identity; 2) a *community* of people who care about this domain leads to interactions and relationships based on mutual respect and trust, while creating a supportive social context for learning; and 3) a shared *practice*, which is the specific knowledge the community develops, shares, and maintains in order to be effective in the domain of interest (Wenger, McDermott & Snyder, 2002, p.27-28).

CoPs evolve in five stages (see Figure 6): 1) *Potential*, which occurs when people face similar situations without the benefit of a shared practice, find each other and discover commonalities; 2) *Coalescing*, which takes place when members come together, recognize their potential, explore connectedness, define joint enterprise and negotiate community; 3) *Active*, which is the time when members develop a practice through joint activities, create artifacts, adapt to changing circumstances, and renew interest, commitment, and relationships; 4) *Dispersed*, when members no longer engage intensely but stay in touch and call each other for advice and the community is still active as a force and center of knowledge: 5) *Memorable*, when the community is no longer central, but people continue to

recall it as a significant part of their identities. They tell stories about the community and preserve its artifacts and memorabilia (Wenger, 1998a).

The way each member participates in a CoP varies as each participant has the option of being central or peripheral at different times. Therefore, in a CoP we may find active, occasional, peripheral or transactional participants. The most central participants comprise the nuclei group of the CoP. Moreover, participation can take three specific forms: *engagement*, *imagination*, and *alignment*. In *engagement*, members find various ways to interact with each other and participate in the community while *imagination* allows them to reflect and explore. In *alignment*, members' perspectives, interpretations and actions are oriented to reach higher goals (Wenger, 2000).

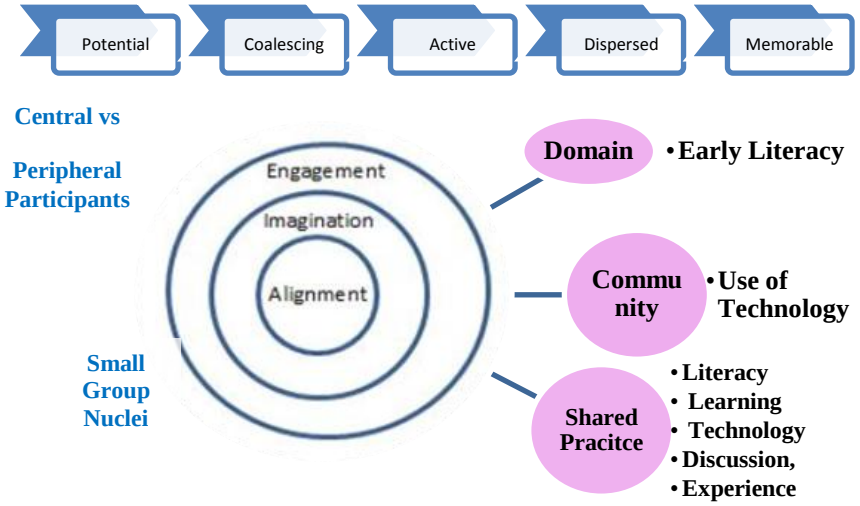

Figure 6: *Community of Practice Approach; Models of Belonging circle adapted from c2012, Joyce Yukawa, from* http://www.jyukawa.com/main/cop

In a study on Tibetan bilingual education and teacher professional development (Gouleta, 2011), in which the CoP approach was utilized with positive outcomes, there were certain important elements that are worth mentioning. There was a harmonious flow among the members in assuming the different roles over time such as commitment at various levels including assuming responsibility for the task at hand, taking on a leadership role, and holding themselves accountable for task completion and quality. Interesting are the following insights gained from the study (Gouleta, 2011):

> Essential elements of our community of practice were our flexibility and adaptability in welcoming new members and new ideas and also our openness and willingness to grow, reflect, and learn from the continuously evolving needs of our project. We followed democratic procedures in everything we did and all decisions we made valuing equally every member's opinion. (p.17)

5. Moving from Concept to Practice

Translating the concept developed above into a concrete project to improve literacy among early readers involves four steps: 1) *Needs Assessment*, 2) *Design*, 3) *Implementation*, and 4) *Evaluation*. These steps are each reviewed in the following sections and summarized below (see Table 1).

5.1 Needs Assessment

From the start of the project, the *needs assessment* phase, CBPR will be our research approach. We will engage in meetings, organize focus groups, and conduct observations and interviews with a range of community stakeholders. It is quite unlikely that there will be pre-existing organized research efforts among local stakeholders to improve student reading outcomes. However, it is very likely that students, teachers, parents/families and other members of the community will have established opinions, perceptions and judgments regarding the local schools and the extent to which their students are learning to read. In this case, during the needs assessment stage the aim will be to determine the content and source of these opinions, perceptions and judgments, to design the research questions and set the plan of action.

During the needs assessment, the project will identify those aspects of the existing learning materials and patterns of community engagement that are contributing to poor reading scores in the target population. This will involve visiting schools in the study area, examining the materials, observing their use in the classroom and interviewing students and teachers, as well as the students' parents and other family members about how these materials are used. The aim of this activity is to identify the shortcomings in the design, availability and use of the existing materials and practices. The assessment of learning technologies will also consider the needs of those with learning disabilities so appropriate assistive technologies can be incorporated to meet the needs of exceptional students.

Similarly, the level of community engagement will be assessed through observations and interviews of existing shared concerns and domains of knowledge related to literacy to help us determine the feasibility and interest in establishing CoP. This is the first stage, *potential*, for initiating a CoP approach, when people find each other and discover commonalities.

We will also consider existing reading scores for the target population to obtain an initial determination of outcomes in this particular setting and the extent to which local students lag behind grade level curricular standards. Students in these schools will be assessed with EGRA to provide an independent, individual-level indicator of student literacy.

5.2 Design

As described above, following a CBPR approach we will engage all community partners in the design of the project. Therefore, the design plan described below is somewhat tentative and may be modified as we engage with our community partners. Our approach to designing learning technologies will have a user-centered focus which will guide efforts to move the project from concept to practice. The key elements of this approach, an *early and continual focus on users and their tasks, empirical testing with users and iterative design*, will inform the development of learning technologies and other materials.

The design of culturally and linguistically appropriate learning materials, including digital tools as well as more traditional materials made of physical objects, such as books, puzzles or chalkboards, will start with initial prototypes based on the observations and interviews conducted as part of the needs assessment. Instructional materials and learning technologies to promote and support mother tongue instruction and assessment will be developed and utilized.

Whether digital or traditional, all instructional materials will incorporate features drawn from current best practices in promoting early reading. Language skills, but also familiarity with the technological competencies of different types of users, will be incorporated in this process. Toward this end, the initial prototypes will be designed in a way that more traditional materials are then created in a manner analogous in content and user experience to the digital tools developed for classroom based instruction. In the classroom

there will be teachers and physical environment that can support the use of PCs or tablets. When students go to a home that may well lack electricity, tablets would be ineffective even if they were available. However, by setting up the tasks and activities found in the more traditional materials in ways that are analogous to the tablet based instructional materials, then work outside the classroom will support classroom learning. Periodically, during the design process, researchers and technology developers will put prototypes of the instructional materials in the hands of the various users and incorporate their feedback into the next design iteration.

During the design, the community of practice will already be in stage 2, *coalescing*, a time that provides members the opportunity to come together, explore their potential and connectedness, and define and negotiate the CoP. The shared common goal for the CoP will be the improvement of literacy outcomes for all boys and girls who attend grades K through 3 in the target school. Members of the CoP will range from 1) engineers and software developers, who will be developing digital technologies, to 2) students, school teachers and administrators who will be using these technologies and materials to improve teaching and learning, to 3) parents and families who will be supporting their children in the learning process and will be providing the community of practice with a wealth of cultural and linguistic knowledge for the development of appropriate materials and instructional practices and assessment, to 4) other stakeholders including education policy makers, to media and communication specialists, to education and social science researchers

During the design, the CoP may decide to establish physical and virtual spaces for meeting. For example, members may meet face-to-face in the village square on an ongoing basis to engage each other around efforts to increase reading outcomes. Participants will also have the opportunity to create online spaces or virtual CoP. In addition, the members of the CoP will decide about which actions need to be taken, divide actions and work to be done, engage in joint activities and learning as a whole group or in smaller groups, create a timeline for deliverables, and complete projects or tasks undertaken.

During the design process EGRA will be piloted and modified to meet the culturally, linguistically and developmental needs of students. Teachers and administrators will receive training on how to administer the instrument, record the data and interpret the results. They will also receive training on effective instructional practices in early literacy and reading and how to develop teacher-made formative and summative assessments to track student progress and inform instruction throughout the school year in order to maximize teaching effectiveness. An assessment data management information system will be developed to better help educators, administrators, and researchers to track, record, and interpret the data collected from both the informal formative and summative assessments and the standardized EGRA and ASER assessments.

5.3 Implementation

During the implementation of the project students, teachers and community members in the pilot site will begin using the newly developed instructional materials, while nothing will change in the control site. It is at this juncture that the CBPR approach will play an extremely important role. If the evaluation of the intervention is to be effective then it is critical that researchers know the extent to which the new instructional materials and technologies have actually been deployed and used. Therefore, CBPR team members will need to observe users in the classroom, home and community so that if reading scores do not improve, or not to the degree expected, it can be ascertained as to whether this stems from a shortcoming in the materials and technologies or from the fact that they were not utilized as intended.

In the implementation phase the CoP will be at the *active*, stage in the process. This stage is very important in terms of the engagement and productivity of the members, who develop a common practice and participate in joint activities and tasks to promote literacy and student learning. Throughout this stage, the CoP will support the implementation in school and out of school the culturally appropriate technologies and learning materials that have been developed, including teacher guides, lesson plans and assessments.

When the project is in the implementation step, the modified EGRA will be given as a pretest to develop a baseline—together with previous ASER test scores, if available. Assessment data will be aggregated by gender, grade level, parent literacy levels, home language, and socioeconomic levels. During the school year, teachers will be assessing students regularly utilizing formative and summative assessment, while they will be recording, interpreting the results, and modifying their instruction to insure that all children are learning. In addition, since there will be new technologies, materials, and instructional practices utilized for the improvement of reading, teachers will be divided into pairs or groups and will engage in action research in the classroom, testing the new intervention materials, instructional approaches and assessments while recording their findings to inform the efficiency and effectiveness of the various types of interventions. Classroom observations, student, teacher, and parent interviews will be conducted in the beginning, middle, and towards the end of the project to explore perceptions, attitudes, and opinions about the practicality and effectiveness of the interactional interventions and the overall project.

5.4 Evaluation

In the evaluation of pilot instructional materials, learning technologies and the impact of the CoP on reading scores, we will determine specific measures to assess outcomes in consultation with our community partners, including students, parents/families, and teachers. These processes are critical to ensuring our methods are culturally sensitive, valid and responsive to the communities. Because CBPR is an iterative process, what we describe here is tentative, as our methods and analytical strategies will likely be adapted through interaction with our community partners.

Evaluation of instructional materials and learning technologies will build on the qualitative and quantitative data collected during the implementation phase by members of the CBPR team. Members of the team, including education and social science researchers, will synthesize data concerning the extent and quality of user experience with the materials. This synthesis will then be used to see if the intervention with instructional materials and technologies can be linked to changes in reading scores compared to the control group. This data may also be used to inform the development of future instructional materials and their usage in the classroom.

During the evaluation we will use both quantitative and qualitative approaches to evaluate the CoP. Through the use of interviews, focus groups, reflections, lessons learned and anecdotal records we will evaluate the quality, depth and breadth of engagement of the participants to determine if this may account for changes in participants' attitudes toward literacy and community support for students. The evaluation will take place towards the end of stage 3, *active*, and in the beginning of stage 4, *dispersed*, when the members are no longer intensely interacting but the communities will still be a force and center of knowledge.

At the end of the school year, EGRA and ASER instruments will be administered again to the students to document growth or decline on reading achievement. Assessment data will be aggregated by gender, grade level, parent literacy levels, home language, and socioeconomic levels to determine the role –if any- the above factors may play in the distribution of scores. The results will be compared with baseline data.

Table 1 summarizes the relationship between each of the above steps and the distinct aspects of the project efforts (UCD, CoP, and participation in CBPR activities) derived from our conceptual framework and the outcome we hope to positively influence (reading scores):

Table 1: Action steps in our early literacy improvement project

Participation in CBPR activities during the four steps of the project	**Use of learning technologies**	**Engagement in a community of practice**	**Reading scores**
Needs assessment **Observations, focus groups, and interviews with community partners to determine needs, research questions and course of action**	Inventory of existing learning technologies and their use through observation and interviews	Observation and interviews of existing and prospective shared concerns and domains of knowledge related to literacy	Analysis of most recent existing reading scores and administration of EGRA exam
Design **Identification and recruitment of possible community based participants and decision of how they could be part of research**	Utilization of a user-centered approach to develop an array of digital and physical learning materials	Bringing members together to define and negotiate their community of practice	Examination of the reliability and validity of EGRA and other existing assessments for measuring project impact
Implementation **Work with community members on goals, methods and analysis of data regarding other aspects of project**	Distribution of learning materials to students, teachers, parents/families. Observation and interviews on use	Engagement of the community of practice in developing activities, artifacts and commitment	Modification of assessments as needed and administration prior to intervention to establish baseline
Evaluation **Critical reflection of participants on CBPR process and activities**	Percentage of students, parents/families and teachers using learning technologies and quality of user experience	Percentage of participants engaged in the community of practice and the quality of that practice	Re-administration of EGRA and modified assessments to measure outcomes

6. Concluding Thoughts

With this paper we present the concept underlying our ongoing efforts to improve literacy skills of the culturally, linguistically diverse and exceptional children of Pakistan. Despite efforts by the national and provincial governments, non-profit organizations, civil society organizations, country donors, international agencies and other development partners and billions of dollars spent in the past decades, the country still suffers from high levels of illiteracy. The year 2015 has arrived and Pakistan has failed to meet the Millennium Development Goal targeting universal basic education for all boys and girls in the country.

We recognize that educational reform, especially in conflict and fragile environments, is incremental and progresses at a slow pace. Nevertheless, we believe that a substantial part of the failure can be attributed to the fact that the traditional approaches to education development do not work. Part of the reason may be that they usually are top down in orientation, are fragmented in nature and not holistic, and leave out important stakeholders and change agents in the process. Therefore, we propose a shift in the way we think about education development beginning with a CBPR research approach, while simultaneously including state-of-the-art and research based learning technologies and instructional and assessment practices. In our conceptual framework every stakeholder is valued and included in action. The process and outcomes are the shared responsibility of those who are ultimately the beneficiaries of this process, community members, children and families.

Though the project is a work in progress—a concept to be implemented —we believe that it brings together important and diverse elements to create a unique approach to improving early reading outcomes. We recognize that we do not have all the answers and with this paper we seek to disseminate our conceptual framework that encompasses a holistic approach to improving literacy in Pakistan and possibly other countries or communities facing similar issues.

The paper does not present a finished project and the overall orientation to the task of improving early childhood reading outcomes in Pakistan comes with long lead time. The hope is to make progress in the short term, but in reality dramatically improving reading skills among Pakistan's culturally, linguistically diverse and exceptional children will require a long term sustained effort. For this reason, the project's orientation is iterative: ongoing processes and practices are evaluated and the results inform future processes and practices.

It is also our hope that educators and social scientists in similar situations can apply the approach from this concept paper to other culturally and linguistically diverse communities throughout the Global South and in other parts of the world where literacy improvement is critical. It is our wish that in their efforts others will critique and improve the ideas presented here.

Addressing literacy challenges around the globe, particularly in regions suffering from conflict and fragility and with rapidly growing populations, is of such import that education and social science researchers ought to share strategies and findings immediately and not wait for a final formative evaluation. To wait would be to condemn another generation of children to a life of limited literacy or illiteracy, and the limitations and hardships that this will bring to them and to the societies in which they live.

References

- ASER (2012). *Annual status of education report* (National). ASER Pakistan. Retrieved from http://www.aserpakistan.org/document/aser/2012/reports/national/National2012.pdf
- Barker, A., Krull, G., & Mallinson, B. (2005). A proposed theoretical model for m-learning adoption in developing countries. *Proceedings of mLearn 2005*. Retrieved from http://www.mlearn.org.za/CD/papers/Barker.pdf
- Chitrakar, R. (2009). *Overcoming barriers to girls' education in South Asia: Deepening the analysis*. United Nations Children's Fund: Regional Office for South Asia (UNICEF ROSA) U.S. Central Intelligence Agency (2014). *CIA world factbook*. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/
- Coleman, H. (2010). *Teaching and learning in Pakistan: The role of language in education*. The British Council. British High Commission: Islamabad, Pakistan

- Cooper A, Reimann R. (2003). Implementation models and mental models. In Cooper A, Reimann R (Eds.) *About Face 2.0: the essentials of user interface design* (pp. 21-32). Indianapolis: Wiley Publishing.
- Ferreira, M. P., & Gendron, F. (2011). Community-based participatory research with traditional and indigenous communities of the Americas: Historical context and future directions. *International Journal of Critical Pedagogy*, 3(3), 153-168.
- Gould, J. D. & Lewis, C. (1985). Designing for usability: key principles and what designers think. *Communications of the ACM*, 28(3), 300-311.
- Gouleta, E. (2014). The critical issue of girls' education in Pakistan: Challenges and promises. *NABE Perspectives, pp. 9-11*, January-March edition.
- Gouleta, E. (2013). Linguistic policy and practice in Pakistan: Implications for literacy and the education of children. *TESOL Bilingual Basics*, July edition.
- Gouleta, E. (2011). A bilingual education professional development project for primary Tibetan teachers in China: The experience and lessons learned, *International Journal of Bilingual Education and Bilingualism*. *15*(1), 1-19.
- Israel, B., Eng, E., Schulz, A., & Parker, E. (2005). *Methods in community-based participatory research for health.* San Francisco: Jossey-Bass.
- Khattak, S.G. (2012). Assessment in schools in Pakistan. *SA-eDUC Journal, 9*(2). Retrieved from: http://www.nwu.ac.za/webfm_send/58399
- Letiecq, B. & Schmalzbauer, L. (2012). Community-based participatory research with Mexican migrants in a new rural destination: A good fit? *Action Research Journal*, 10(3), 244-259.
- Leung, M.W., Yen, I. H., & Minkler, M. (2004). Community-based participatory research: A promising approach for increasing epidemiology's relevance in the 21st century. *International Journal of Epidemiology*, 33, 499-506.
- Minkler, M., & Wallerstein, N. (2008). *Community-based participatory research for health: From process to outcome (2nd ed.).* San Francisco: Jossey-Bass.
- Minkler, M. (2004). Ethical challenges for the "outside" researcher in community-based participatory research. *Health Education and Behavior, 31,* 684-697.
- Ospina, S., Dodge, J., Godsoe, B., Minieri, J., Reza, S., & Schall, E. (2004). From consent to mutual inquiry: Balancing democracy and authority in action research. *Action Research Journal, 2* (1): 47-69.
- Pinnock, H. (2009). *Language and education: The missing link*. Reading: CfBT Education Trust and Save the Children.
- Reason, P. & Bradbury, H. (2008). *Handbook of action research: Participative inquiry and practice (2nd ed.).* Thousand Oaks: Sage.
- Rhodes, S. D., Hergenrather, K. C., Montano, J., Remnitz, I. M., Arceo, R., Bloom, F. R., Leichliter, J. S., & Bowden, W. P. (2006). Using community-based participatory research to develop an intervention to reduce HIV and STD infections among Latino men. *AIDS Education and Prevention, 18*, 375-389
- Sabir, M. (2002, Winter). Gender and public spending on education in Pakistan: A case study of disaggregated benefit incidence. *The Pakistan Development Review*, 42 (4), Part II
- Save the Children (2011). Literacy boost results: Pakistan. Save the Children. Retrieved from https://www.eddataglobal.org/countries/index.cfm?fuseaction=pubDetail&ID=461
- Stone, D., Jarrett, C., Woodroffe, M., & Minocha, S. (2005). Introducing user interface design. In D. Stone, C. Jarrett, M. Woodroffe & S. Minocha (Eds.), *User interface design and evaluation* (pp. 3-24). San Francisco: Elsevier.

- UNESCO, Misselhorm, M., Harttgen, K., & Klasen, S. (2010). *Deprivation and marginalizationin education*. Data set prepared for UNESCO, 2010. Paris: UNESCO. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/GMR/html/dme-5.html
- UNICEF (2012). *Country statistics: Pakistan*. Retrieved from http://www.unicef.org/infobycountry/pakistan_pakistan_statistics.html
- Wallerstein, N. B., & Duran, B. (2006). Using community-based participatory research to address health disparities. *Health Promotion Practitioner, 7*, 312-323.
- Wallerstein, N. & Duran, B. (2008). The theoretical, historical, and practice roots of CBPR. In M. Minkler & N. Wallerstein (Eds). *Community-based participatory research for health: From process to outcomes* (pp. 25-46). San Francisco: Jossey-Bass.
- Walter, S. (2009). *Language as a variable in primary education*. Arlington, TX: SIL International
- Wenger, E. (2000). Communities of practice and social learning systems. *Organization*, 7, 225-246. Doi:10.1177/135050840072002
- Wenger, E. (1998a, June). Communities of Practice: Learning as a Social System. *Systems Thinker*.
- Wenger, E., McDermott, R. & Snyder, W., (2002). *Cultivating communities of practice, A guide to managing knowledge.* Boston, Massachusetts: Harvard Business School Press.