Position Paper: Systems Based on Embodied Interaction for Underprivileged Children

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ABSTRACT
This position paper portrays my approach towards learning tools based on embodied interaction for underprivileged children in Chennai, India. It outlines my ongoing Master Thesis in New Media Art and Design. Participatory design research revealed challenges of a community. This paper argues how these challenges can be turned into opportunities with the help of participatory design.

Keywords
Embodied interaction, children, learning technologies, India, participatory design

ENABLING OPPORTUNITIES
Design equips people to do things in ways that were not possible before. It means recognizing challenges and creating enabling opportunities for people.

At the University of Art and Design Helsinki, I learned that designers should encourage users to participate in the design process in order to turn challenges into enabling opportunities. Participatory design can lead to more successful design by taking the needs of people into consideration [3].

Participatory design research with an underprivileged community in Chennai, India showed that teachers, children, and the Chennai government desire a learning approach that enables students to learn from their immediate environment by using all senses. Existing methodologies (for example, understanding geometric shapes through touch) suggest an embodied approach to cognition. Nevertheless, it is currently not a fundamental learning principle in the schools that the participatory research was completed at.

The educational framework of these schools is formal. School and home learning environments do not contribute to each another. Parent’s engagement with the learning processes of their children is small, because the relevance of the school content to their lives is not apparent to them. Children that depend on school as their main source of learning have marginal “educational opportunities” [5].

Mobile technologies are in use by the people of Chennai. They are open towards advanced technologies [6], but schools do not use these technologies for education.

My hypothesis is that introducing mobile learning technologies based on embodied interaction creates the opportunity for children to take greater charge of their own learning process. Furthermore, embodied interaction in educational material can bridge the perceptual gap of home and school learning and enable parents to participate in the learning process of their children.

BACKGROUND
“Grasp - hold firmly and comprehend fully” is my Master’s Thesis in progress. It relates to a university project held at the Helsinki University of Technology and the Aalto Design Factory called Nokia.Expand. It was sponsored by Nokia and D-Switch, and realized in collaboration with the University of Art and Design Helsinki, the Helsinki University of Technology, the Rhode Island School of Design, the Massachusetts Institute of Technology, and the Indian Institute of Technology Kanpur. It ended on April 24, 2009.

Nokia.Expand aimed to design a mobile learning tool for underprivileged children in developing countries. The project aspired to put learning into the hands of children on a community-based level. Results of the project are proof of concept software applications, industrial design prototypes, and recommendations for future research.

Figure 1: low-tech prototyping workshop with children in Chennai
Participatory design research was performed in order to identify similarities, differences, and practices of specific communities that could guide soft- and hardware design. Children, parents, and teachers in the Ramavaram neighborhood of Chennai and a community within Kibera in Nairobi, Kenya were engaged. Four different low-tech prototyping workshops (see Figure 1) were performed with 15 children aged 9-11 in each community. Interviews were the predominant mode of interaction with their parents. Small focus groups of five government-school teachers were conducted. They included scenario development. Interviews happened with other teachers in both communities as well.

Nokia.Expand revealed challenges which mobile technologies will face when entering the educational sector in developing countries, exemplified by the Chennai and Nairobi sites. “Grasp - hold firmly and comprehend fully” will continue working with the Chennai community.

When designing for children, it is especially important to note that what is accessible in one culture might not be for another. Participatory design research methodologies will act as platform for developing relevance through recognition of user practices.

INTRODUCING ACTIVE LEARNING
The Chennai government schools that we worked with received Active Learning Methodology (ALM) block resource training a few months prior to our arrival in January 2009.

ALM was developed jointly by the governmental Sarva Shiksha Abhiyan (SSA, Hindi: Education for All Movement) and The School of Krishnamurti Foundation India (KFI), a charitable institution committed amongst others, to rural education. In 2007, ALM was first introduced to 120 governmental schools across Tamil Nadu. Today, positive feedback has increased the amount of schools using the methodology across the county.

ALM builds on Meyers and Jones “active learning” theory from 1993, which recognizes learning as an active process and acknowledges different ways in which people learn [4]. The aim is to put students at the center of their learning process by supporting methodologies that are hands on with minds on. Students are encouraged to create and reflect on their creation process. For example, a KFI teacher explained that, in order to understand the linearity of time, students look at their own personal history. They then discover significant events of their own lives that they can process into a timeline. Thus, the children learn through creation, as well as visual representation.

The introduction of ALM to government schools means that a personalized and action-centric way of learning is desired. Children should act and do, as well as think about what they are doing [4].

EMBODIED LEARNING IS A PERSONAL EXPERIENCE
Each student has different interests and a different pace of learning. Currently, education is treated as a product that is carried out according to a predefined timeline for each student in the same way, without considering the individuality of the learners.

In Chennai, the teacher’s time limitations and the large amount of students (between 40 to 60 students per class) make it difficult to attend to the personal needs of each student.

In order to create a unique learning experience for every student a non-linear approach to learning is needed.

The perception of the environment happens through the body and performed activities. It is perceived differently by each person, and thus is unique for every person.

Andy Clark examines the inter-play of physical actions and the environment. He illustrates an action-centric view of cognition by using the example of fetching a ball [2].

We become aware of an event in the world through our bodies, as we recognize a ball moving in the air. The impression releases a physical expression that we send back to the world. In order to catch the ball, we change our body position depending on the perceived position of the ball. The world absorbs our expression as an impression. A change happens in the environment when we catch the ball. This change can then be seen as an expression of the world and it releases another impression on us. We know we met the goal of fetching the ball. Events follow one another rapidly. The impression-expression model continues in the next event.

![Figure 2: Impression-expression model](image)

Alternating impressions and expressions of two physical entities, the body and the world, result in cognitive experience. Figure 2 illustrates the processes involved in an action-driven perception through embodied interaction.

Embodied interaction is an experience that introduces the needed non-linearity to learning. The non-linearity is caused by a multimodal and action-centric inter-play of the human body and the world.

Systems based on embodied interaction enable a customized learning experience that is essentially driven by the learner. Following this train of thought, embodied
interaction can enable personalized and flexible learning when integrated in mobile technologies.

While the formal approaches to learning places the emphasis on the destination of filling the vessel [7], embodied interaction prioritizes the journey.

THE WORLD IS A DICTIONARY

During the participatory design research with the underprivileged communities, teachers referred to the importance of children learning how to orient in the world several times. When probed, they expressed that children need to learn about themselves, as well as their place in context of the world. KFI likes to see children as active learners who learn from their environment [4].

“It is crucial for children to understand where to find information and how to make sense of the artifacts around them” said a teacher during a focus group session. The children should not only rely on one source of information, but practice using various sources of knowledge.

Further, artifacts can be seen as physical aids to our thought process. Clark calls this “external scaffolding” [1]. Using the example of Scrabble tiles, Clark refers back to Krish to explain how the manipulation of a physical environment can essentially help our thoughts, and thus become an extension of our mind. Through moving the tiles, assemblies of words can be tried out and are easier recognized than by going through the same process only mentally.

Just like a dictionary serves as a consulting source, the world is there to be referred to, learned from, and learned with.

EMBODIED LITERACY FOR ALL

Our bodies absorb the clues that come forth from the environment. Many of the clues are physical and can be consciously felt. The touch of the environment can be experienced through movement of the body. Seymour Papert explains action-centric knowledge by using the example of baking. Once he felt the correct consistency of croissant dough through the circular motion of his whisk, Papert knew “in his fingers” that the dough was well stirred [7].

This example shows that the combination of culturally relevant activities (stirring with a whisk), with a performance in order to manipulate the environment (dough), creates awareness.

Each student and their parents have a different perception of the world, as well as a different home scenario. Explicit common denominators between parents and their children are their shared physical environments and their ability to perceive the world through their bodies.

Food preparation is a basic life activity that assumes different manifestations according to culture. Existing practices of a culture influence the embodied interaction with an artifact. Supporting for example these gestures in a design creates relevance to the learner’s home setting, because people can recognize them.

Learning happens from the known to the unknown. The shared and immediate environment of parents and children holds cultural artifacts that are known and thus relevant to both. Integrating these artifacts along with physical customs can create a layer of relevance to school material that does not exist now. Through such an embodied literacy, the parent’s perception can be shifted.

Interactive systems that are based on learning through all senses, as well as the immediate environment, can bridge the perceived gap between home and school learning.

PARTICIPATORY DESIGN

ALM Social Science and English lessons were observed during the participatory design research in Chennai (see Figure 3). The ALM procedure varies slightly from school to school, but the fundamental observations were similar. The teachers agreed on the value of ALM, but performing the new methodology while at the same time trying to stay true to formal structures, like fulfilling the quota of graduates, causes conflicts.

In a government school classroom, a teacher read out a poem and then instructed the students to create a mind map of the content. Students either copied the content from the back of their books, or spent their time concentrating on the aesthetic appearance of their mind-maps. The teacher explained that the figure of the mind-map was not of importance. Nonetheless, many children spent more time drawing then paying attention to the underlying concepts. One girl drew a parrot and the important phrases of the poem were hidden amidst the leaves and the tree on which the parrot was sitting.

Children enjoy drawing mind-maps, but the process disguises the task of understanding the essence of the poem. It could be argued that instead of acting as essential interaction in order to understand, mind mapping is in fact an additional task.

Education is a basic need, and the aim of introducing a more active approach to learning can enhance the well
being of the underprivileged children in Chennai. However, SSA’s and KFI’s approach requires improvement.

A. K. Jaiswal points out that it is important to consider the special needs of underprivileged people. A service that was initially developed for a considerably different user group should not be transferred into an underprivileged user setting without alteration. He further argues that underprivileged people need to be looked at as “producers” and “consumers” [6]. I would prefer to refer to “producers” as design participators and to “consumers” as users.

To understand what is needed children and other stakeholders need to participate in the design process [3]. Transforming existing services with this understanding in mind can create a genuine impact on the well being of the users.

ALM was not re-engineered with or for underprivileged user groups. It is a general approach for all government schools in Tamil Nadu. It thus does not take the challenges of the Ramavaram community into consideration.

Practices and experiences shape the way artifacts are used [8]. Practices and behaviors vary for different user groups. In learning where interaction with the world has direct influence on the perception, it seems especially important to understand and consider user practices when designing services.

Thus, a participatory design approach to introduce ALM would have been beneficial. The designers would have gained understanding of the scenarios, and the community would have developed an understanding of the approach early on in the design process.

CONCLUSION
Participatory design research with the Ramavaram community revealed challenges that underprivileged people are facing in regards to education. Children have little influence on their own learning process. Learning is predefined and does not consider the individual learning abilities of each student. Additionally, parents do not participate in the learning process of their children.

The example of ALM showed that there are reasonable signs of interest in embodied interaction for learning, but the implementation needs improvement.

My objective was to show that embodied interaction can make learning an experience that is driven by the learner.

Knowledge that exists within the environment could be learned from, and learned with. Systems that enable children to physically engage with their environment in order to learn from it can aid their cognitive processes.

Furthermore, I argued that environment and embodied practices are influenced by culture, and thus relevant to parents and children alike. Embodied interaction would offer more relevance to school learning towards parents and thus build a platform with which to participate in the children’s learning process.

In view of the cultural importance of interaction and environment, participatory design methodologies with children, parents, and teachers can ensure the integration of culturally relevant practices. Introducing these systems to the setting can then turn the challenges into enabling opportunities.

Two questions that I would like to investigate further touch upon the system’s role and multi-cultural relevance.

- If artifacts can aid the mental processes of a person, what is the role of a system that is based on embodied interaction and that is aimed to enable underprivileged children and parents in Chennai to learn from and with their environment?
- How can a system that is based on embodied interaction facilitate an accessible embodied and multimodal literacy for underprivileged children and parents in Chennai?

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